



VT510 Video Terminal

Programmer Information

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Introduction

This manual provides programmers with information needed to write applications for the VT510 video terminal. This manual has the following parts, chapters, and appendices:

- Part I, VT510 Video Terminal
 - Chapter 1, Overview
 - Chapter 2, Terminal Set-Up
 - Chapter 3, Desktop Features
- Part II, VT510 ANSI Mode
 - Chapter 4, ANSI Control Functions Summary
 - Chapter 5, ANSI Control Functions
 - Chapter 6, SCO Console Emulation
 - Chapter 7, Character Sets
 - Chapter 8, Keyboard Processing
 - Chapter 9, Communications
 - Chapter 10, Printer Port
- Part III, VT510 ASCII Emulation
 - Chapter 11, ASCII Emulations and Control Functions
 - Chapter 12, ASCII Escape Sequences
 - Chapter 13, Defining and Loading ASCII Character Fonts
- Appendix A, VT Keyboard Legend Data
- Appendix B, Enhanced PC Keyboards
- Appendix C, ASCII Keycodes and Local Functions
- Appendix D, ANSI Control Function Index

For general user information, see the *VT510 Video Terminal Installation and Operating Information* manual.

Conventions

The following conventions are used in this manual:

Set-Up features

`Alt/Ctrl/Print Screen`

Terminal Set-Up menu selections appear in **boldface** type.

Multiple keys are separated by a slash (/) and should be pressed in combination. That is, all three keys `Alt`, `Ctrl`, and `Print Screen` are pressed down at the same time.

Characters in control functions

Control function characters are in **boldface** type. Below each character is a column/row number that indicates the character's position in a standard code table. For example:

| | | | | |
|------------|-----|----------|---|--------------------|
| ESC | # | 6 | ← | Control function |
| 1/11 | 2/3 | 3/6 | ← | Column/row numbers |

Parameters

Parameters appear in italic type.

Note

Provides general information.

Part I

VT510 Video Terminal

This part includes the following chapters:

- Chapter 1, Overview
- Chapter 2, Terminal Set-Up
- Chapter 3, Desktop Features

1.1 Introduction

The VT510 is a low-cost, single-session, text video terminal featuring enhanced keyboard and communications flexibility.

Three models of the product are available:

- North American
- International
- International MPR II compliant (low emissions)

All three versions have a 25-pin stacked male/female RS-232 connector (EIA-232), a 6-pin EIA-423 (MMJ) connector, and a Centronics parallel connector. These ports connect to a host or a printer.

Table 1–1 VT510 Model Differences

| Feature | North American | International | Low Emission |
|-----------------------------|----------------|---------------|--------------|
| FCC class (USA) | A | B | B |
| CSA class (Canada) | A | B | B |
| VDE compliant (Germany) | - | yes (B) | yes (B) |
| VCCI class (Japan) | - | 1 | 1 |
| MPR II compliant (Sweden) | no | no | yes |
| User-adjustable centering | yes | yes | yes |
| User-adjustable rotation | no | yes | yes |
| National keyboard languages | 5 | 27 | 27 |
| Power cord | fixed | detachable | detachable |

1.2 Communications Features

The terminal provides:

- Two bidirectional, asynchronous serial communication ports for host and local printer
- Baud rates from 300 to 115.2K baud
- Centronics parallel printer port
- 25-pin serial connector
- Expanded flow control options:
 - Software flow control using XON/XOFF or XPC
 - Hardware flow control using DTR/DSR

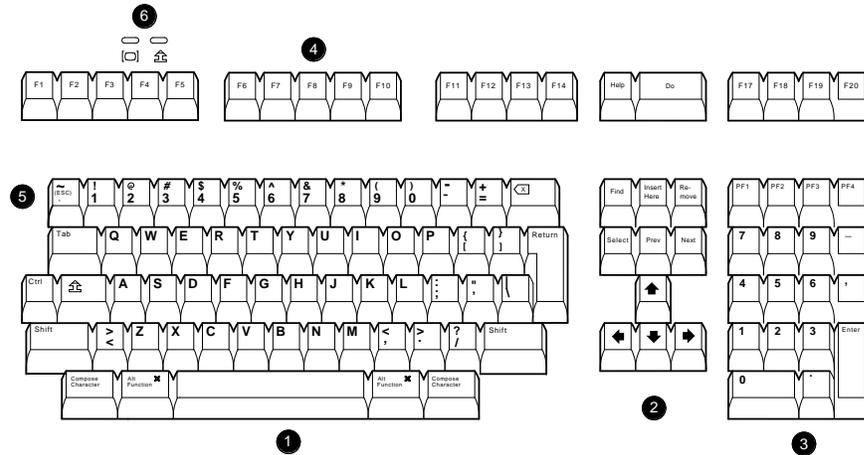
Overview

1.3 Keyboard Features

1.3 Keyboard Features

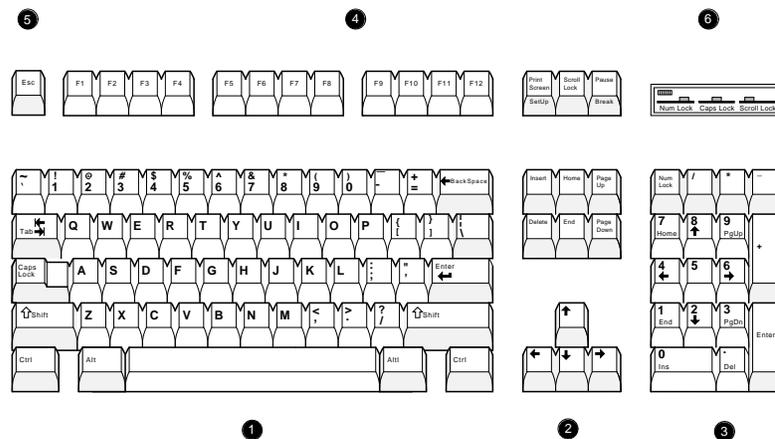
The VT510 offers a choice of two keyboard layouts—a VT keyboard layout (LK450) or an enhanced PC keyboard layout (PCXAL). The VT keyboard (Figure 1–1) and the PC keyboard (Figure 1–2) differ in the placement of some of the keys, like the arrow keys. A VT keyboard has 20 function keys, **F1** through **F20**, above the main keypad, while a PC keyboard has 12 function keys, **F1** through **F12**.

Figure 1–1 Sample VT Keyboard Layout



MA-1520-92.DG

Figure 1–2 Sample PC Keyboard Layout



LJ-00226-T10

- ❶ Main keypad, ❷ Editing keypad, ❸ Numeric keypad,
- ❹ Function keys, ❺ Escape key, ❻ Indicator lights.

The keyboard has the following features:

- An IBM PS/2 6-pin mini DIN connector.
- Keyboard keys that can be reprogrammed to send single characters, to send character sequences, or to invoke local functions (Hold, Copy and Paste, Remove, Insert, Print Page, Toggle Autoprint, Set-Up, Break, and so on).
- A local user-defined key editor. Key definitions can be saved in nonvolatile memory.
- Eight levels of user-defined function keys: Unshifted, Shifted, Control, Shift Control, Alt, Alt/Shift, Alt/Control and Alt/Shift/Control.
- 804 bytes of nonvolatile memory available for custom user-defined keys (UDKs). The maximum length for a UDK definition is 255 bytes.

1.4 Printer Port Features

The terminal has the following printer port features:

- A Centronics parallel printer port.
- IBM ProPrinter support.
- Bidirectional serial communication ports (male and female).
- Baud rates from 300 to 115.2K baud.
- Null characters that can pass as data to the printer port.

1.5 Display and Text Capabilities

The terminal has both ANSI and ASCII display and text processing capabilities. The features of each are listed below.

1.5.1 ANSI

- Macro capability
- Display: 26, 42, or 53 data lines
- Selectable page size: 24, 25, 36, 42, 48, 50, or 72 lines
- Full status line (occupies one data line)
- Separate keyboard indicator line
- Three pages of 24 lines
- SCO Console mode

1.5.2 ASCII

- Terminal emulations:
WYSE: 50+, 60 native, 160 text only, 120, 150, PCTerm
Televideo: TVI 950, 925, 910+
Applied Digital Data Systems: ADDS A2
- Dim and invisible character attributes

Overview

1.6 Enhanced Set-Up

1.6 Enhanced Set-Up

The terminal provides an enhanced menu-based Set-Up, allowing common features to be accessed easily from a single screen. All Set-Up features are host controllable to allow remote configuration. The terminal also has a means to lock out the local setup.

Set-Up menus are available in English, French, German, Italian, or Spanish. For details, see Chapter 2, Terminal Set-Up.

1.7 Desktop Productivity Features

The terminal has the following desktop productivity features:

- Local copy and paste (not available in PCTerm mode)
- Time of day clock (host or locally set, no battery back up)
- Desktop calculator with decimal, octal, and hex conversions
- Display character set tables

For details, see Chapter 3, Desktop Features.

1.8 Character Set Support

In addition to the traditional Digital graphic character sets (DEC Multinational, NRCS, and so on), the VT510 supports Cyrillic, Greek, Hebrew, Turkish, most Eastern European languages, and PC character sets. For details, see Chapter 7, Character Sets.

1.9 Ergonomics (Human Factors) Features

The terminal is designed to provide a high-quality human interface and long-term reliability at low cost. The VT510 offers 72 Hz refresh, full overscan, or both at slightly reduced resolution. The terminal has the following features:

- 35.5 cm (14 in) flat face, antiglare CRT screen
- Improved resolution of 800 × 432 pixels
- 72 Hz refresh
- Overscan (see Table 1-2)
- Additional fonts (see Table 1-3)
- Tilt/swivel base
- Choice of keyboards
- Accessibility aids

1.9 Ergonomics (Human Factors) Features

Table 1–2 Configurations vs. Overscan Availability

| Refresh Rate | Lines per Screen | Overscan Available |
|--------------|-------------------|--------------------|
| 72 Hz | 24/25/26 | yes |
| 72 Hz | 36/42 or 48/50/53 | no |
| 60 Hz | all | yes |

Table 1–3 VT510 Font Sizes

| 80 Columns | 132 Columns | Maximum Number of Lines |
|------------|-------------|---|
| 10 × 16 | 6 × 16 | 26 lines + keyboard indicator line |
| 10 × 10 | 6 × 10 | 42 lines + keyboard indicator line |
| 10 × 8 | 6 × 8 | 53 lines + keyboard indicator line |
| 10 × 13 | 6 × 13 | 26 lines + keyboard indicator line (72 Hz with overscan) |

1.10 Field-Upgradable Firmware

All VT510 models include support for a 4 Mbit (512 KByte) ROM cartridge option. The base unit comes with a factory-installed ROM. The ROM cartridge connector is protected by a ROM cartridge cover. To install new code, the ROM cartridge cover is removed, and a ROM cartridge with attached cover is plugged into the ROM connector. The new code completely supersedes the factory-installed ROM code. It does not overlay or extend the factory code.

Note

If you service the terminal with a ROM cartridge installed, remove and save the ROM cartridge to put it on the new terminal.

1.11 PCTerm Mode

PCTerm mode is designed to allow the terminal to emulate the console of an industry-standard PC.

A separate character set selection is used for PCTerm mode. This selection is controlled by the **PCTerm character set** selection in Set-Up and the DECPCTERM control function. Changing this selection does not affect the VT character set selection.

Overview

1.12 Comparison with Other ANSI Products

1.12 Comparison with Other ANSI Products

The VT510 is functionally compatible with other ANSI products with the following exceptions:

- **Terminal ID**

The Primary Device Attributes can report additional extensions to cover new features. See Chapter 4 for a summary of the control functions. The Secondary Device Attributes are different.

```
VT510    CSI > 61 ; Pv ; 0 c
```

Where Pv is the firmware version number.

- **Dynamically Redefinable Character Set (DRCS) Fonts**

The VT510 has four buffers, which can load up to two dynamically redefinable character sets, each with an 80-column font and a 132-column font.

- **Keyboards**

DEC LK401 and compatible keyboards cannot be used on the VT510; however, the VT510 can emulate other keyboards when configured accordingly.

- **Single Session**

The VT510 is a single-session terminal.

- **PC Character Sets**

PC character sets are available in SCO Console mode, and they do not require the keyboard to send scancodes, as PCTerm mode does.

Terminal Set-Up

This chapter describes the extensive VT510 Set-Up features, which include contemporary windowing techniques that are easy to access. These techniques make it easy to move about and select features. Set-Up is used to examine or change terminal operating features, such as transmit/receive speeds, type of cursor, or key definitions.

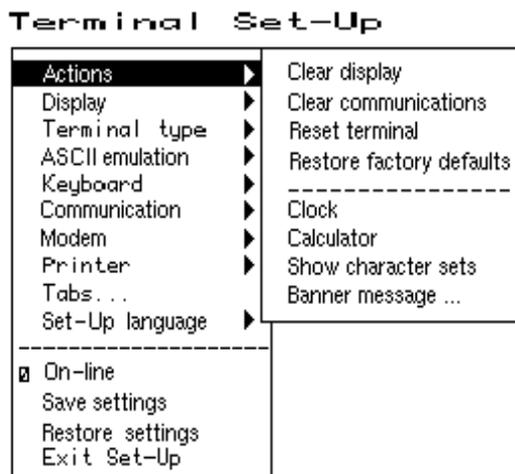
2.1 Entering Set-Up

You enter Set-Up by pressing the key designated as the Set-Up key. Pressing this key alternately places the terminal in Set-Up mode or returns it to the operating mode.

| On ... | The Set-Up key is ... |
|---------------------------------|--|
| a VT keyboard layout | F3 on the top row. |
| an Enhanced PC 101/102 keyboard | Caps Lock/Print Screen (or Alt/Print Screen) above the editing keypad. |

The Set-Up function may be reassigned to other key combinations or can be disabled if desired.

Figure 2-1 Set-Up



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The Set-Up display consists of pull-right menus. You can move back and forth with the arrow keys. Pressing **Enter**, **Return**, **Do**, or **Select** invokes the action or setting for the current menu item.

Terminal Set-Up

2.1 Entering Set-Up

Note

Set-Up can be programmed to lock out setup; however, when you press **F3** as the first key after the terminal is powered on, you always enter Set-Up, regardless of which keyboard you use or how **F3** is defined.

2.1.1 Effects of Entering Set-Up

Placing the terminal in Set-Up mode causes no loss of data if a Flow Control protocol is in use on the communications port. When you enter Set-Up by pressing the Set-Up key, the text on the screen temporarily disappears and the first Set-Up menu is displayed on the screen. Upon exiting Set-Up, the previous text is restored.

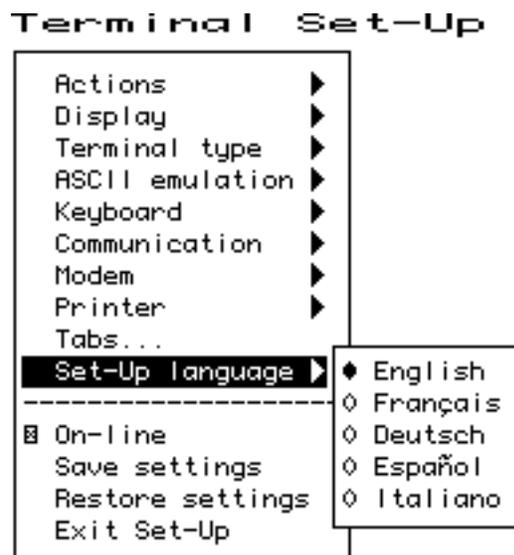
Entering Set-Up has the following side effects:

- Any compose sequence in progress is aborted and the keyboard is unlocked.
- The Indicator Status Line is enabled and remains enabled while in Set-Up.
- Printer operations are suspended and are resumed upon exiting Set-Up.

2.1.2 Set-Up Languages

The VT510 Set-Up menus can be displayed in five languages using a Set-Up feature. A menu allows you to choose the language in which all subsequent Set-Up menus and displays are written. Selections from this Set-Up language menu (Figure 2-2) take effect immediately. This feature can also be invoked by DECSSL.

Figure 2-2 Set-Up Language Selection



2.1.3 Power-On Settings and Defaults

The VT510 terminal stores many of its feature settings in nonvolatile memory (NVM). Nonvolatile memory retains these settings even when power is shut off. In addition to storing operator-selected features, the terminal retains the factory default settings in permanent memory. By using Set-Up, you can modify

individual terminal features, recall the feature settings stored in nonvolatile memory, or recall the factory default settings.

In this chapter, the defaults are shown with a solid bullet (●) in lists and in **boldface** in text.

2.1.4 Self-test Error Messages

At power-up, the VT510 terminal executes a series of self-tests, displays a message indicating whether the self-tests were successful, and displays a banner message. (To change the banner message, see Section 2.4.6.)

If the self-tests detect an error, one of the following messages is displayed on the terminal in place of "Selftest OK."

Table 2–1 Error Messages

| Message | Meaning |
|--------------------------------|--|
| NVR Error - 1 | A firmware update, or loss of power while writing to the NVR during a Save settings process may cause this error. Try Save settings again. If that does not work, Recall factory defaults and select Save settings again. |
| RS-232 Port Data Error - 2 | Communications problem inside terminal. Call for service. |
| RS-232 Port Controls Error - 3 | Communications problem inside terminal. Call for service. |
| Keyboard Error - 4 | Turn the terminal off, and make sure the keyboard cable is plugged in. Turn the terminal on. If the problem continues, try another keyboard. If the new keyboard does not work, the problem is inside the terminal; in which case, call for service. |
| EIA-423 Port Error - 5 | Communications problem inside terminal. Call for service. |
| Parallel Port Error - 6 | Communications problem inside terminal. Call for service. |
| ROM Cartridge Error - 7 | Turn the terminal off, and make sure the ROM cartridge is seated firmly on its connector pins. Turn the terminal on. If the problem continues, try another ROM cartridge. If the new ROM cartridge does not work, the problem is inside the terminal; in which case, call for service. |

Terminal Set-Up

2.1 Entering Set-Up

2.1.5 Context Sensitivity

On the screen, a check box or radio button (●) indicates the current user selection and normally reflects the operating state of the terminal.

Certain feature selections overlap and could contradict each other, so they cannot be active at the same time. These are called *context sensitive* features, which are displayed with the dim video attribute in Set-Up. Example:

You cannot select **ASCII emulation** ▷ **Pages** menu item when you are in a VT emulation mode, because the **Display** ▷ **Lines per page** menu item performs the same function.

When a context sensitive feature is dimmed, it does not affect the user's selection, which may indicate the feature is enabled even though it is not currently selectable. Example:

You cannot have a 10 × 16 font with overscan at 72 Hz. If you select this font size at 72 Hz, *Overscan* is not available and is dimmed; however, its checkbox can still be checked.

Table 2-2 lists the set-up features that are context sensitive.

Table 2–2 Context Sensitive Set-Up Features

| | Menu Item | Dimmed when . . . |
|--------------------------|---|---|
| Display ▷ | Lines per screen | WYSE is selected; use ASCII emulation ▷ Data lines and Pages . |
| | Lines per page | |
| | Cursor direction | Keyboard language is not Hebrew. |
| | Overscan | Display ▷ Refresh rate = 72 Hz and Lines per screen = 42 or 53. |
| Terminal type ▷ | Terminal ID to host | Terminal type ▷ Emulation mode is other than a VT or SCO console. |
| | <input type="checkbox"/> 7-bit NRCS characters | Emulation mode is set to VT100/VT52; or Communication ▷ Word size is 7-bits; or no 8-bit NRC set exists for the keyboard language. |
| ASCII emulation ▷ | | Terminal type ▷ Emulation mode is set to VT or SCO console. |
| | TVI page-flip | Terminal type ▷ Emulation mode is other than TVI. |
| Keyboard ▷ | Key encoding ▷ Character, Scan code and Key position | ASCII emulation is selected, or a PC keyboard is connected. |
| | Data processing keys | A PC keyboard is connected. |
| Communication ▷ | Half duplex | The host Communication ▷ Port select is set to S1=comm2 . |
| | Transmit flow control ▷ DSR and Both | The Modem ▷ Enable modem control is selected. |
| | Receive flow control ▷ DTR and Both | The Modem ▷ Enable modem control is selected. |
| Modem ▷ | Disconnect delay and Modem speed | The Modem ▷ Enable modem control is not selected. |
| Printer ▷ | Serial print speed, 2-way communication, Transmit flow control, Receive flow control, Word size, Parity, and Stop bits | The Communication ▷ Port select is set to one of the print=parallel selections. |
| | DEC/ISO char sets | IBM ProPrinter is selected. |
| | PC character sets | DEC ANSI printer is selected. |
| | Print mode ▷ Controller | Display ▷ Show control characters is selected. |

Terminal Set-Up

2.1 Entering Set-Up

2.1.6 Set-Up Summary Line

The Set-Up Summary Line (Figure 2–3) shows the important set-up features that affect whether the terminal can successfully communicate with the host. If the terminal is not working, the Set-Up Summary Line allows you to quickly verify if the communication features are set appropriately. The summary line is displayed below the last data line, where the status line would normally appear.

Figure 2–3 Set-Up Summary Line

```
S1=comm1 9600N81 ISO Latin-1 North American VT510
```

The Set-Up Summary Line contains the following set-up information extracted from the Set-Up displays.

| Information Displayed | Communication Feature |
|-----------------------|--|
| S1=comm1 | Port selected: comm1 or comm2 |
| 9600 | Transmit speed: 9600 baud |
| N | Parity: N=none, E=even, O=odd, M=mark, S=space |
| 8 | Word size: 7 or 8 bits |
| 1 | Stop bits: 1 or 2 bits |
| ISO Latin-1 | Default character set or PC set in PCTerm mode |
| North American | Keyboard language |
| VT510 | Emulation mode |

The summary line is visible whenever the terminal is in Set-Up, except under the following conditions:

- You press a **Shift** key. Pressing either **Shift** key causes the normal Indicator Status Line to replace the Set-Up Summary Line.
- The status line is temporarily replaced by an error or status message from the terminal. In this case, the error or status message is shown in place of the status line until you type another key.

The Set-Up Summary Line appears in the currently selected set-up language.

2.1.7 Set-Up Status Messages

The Status or Set-Up Summary line is sometimes replaced by a Set-Up status message until the next user keystroke. Set-Up status messages are displayed whenever the effect of a set-up action would not otherwise be apparent. Example: "Done" is displayed after the Reset terminal action has completed.

The following are set-up status messages:

- Done
- NVR Error

2.1.8 Status Line

The VT510 terminal has a status display with the following features:

- The clock time appears on the status display if the local clock has been initialized since the terminal was last powered on.
- In the ASCII emulation modes, the host-writable status line becomes the WYSE Editing status line.
- The Accessibility Aids feature ("sticky keys") displays icons in the status line. For details, see Chapter 8, Keyboard Processing.

The VT510 Indicator status line includes the Active Position Indicator, Printer Status Indicator, Modem Status Indicator, and local clock time in the desired format. Example:

```
1(24,008) Printer: None Modem: DSR 3:15 PM
```

2.1.9 Keyboard Indicator Line

The Keyboard Indicator Line has the following features:

- It is displayed in the Set-Up language.
- It has active keyboard layout. Nothing is displayed for Group 1. "G2" is displayed for Group 2, along with a small icon representing the right side of the top of the keycap. (To see this icon, press `[Ctrl/Alt/F2]`. To return from Group 2, press `[Ctrl/Alt/F1]`.)
- For Greek, Hebrew, and Russian, "G2" is replaced by "Grk", "Heb", and "Rus", respectively.
- When the Num Lock state is active on an EPC keyboard, "Num Lock" is displayed.
- When an EPC keyboard is operating in VT style, "VT" is displayed in place of the Num Lock indicator.
- In French and Spanish, an icon replaces the word "Lock" on the indicator line.

Example:

```
Heb Num Lock Copy Hold Lock Compose Wait
```

Using **Define key...** to redefine keys on the numeric keypad will affect only the Num Lock off state of these keys. When Num Lock is on, these keys will always send their factory default ASCII numerals and characters. The Num Lock behavior of these keys cannot be reprogrammed.

Scenario: Imagine the keyboard having two numeric keypads: one for Num Lock Off, and the other for Num Lock On. Only the Num Lock Off keypad can be reprogrammed. The Num Lock On keypad retains the factory defaults.

2.2 Set-Up Screen Text

The main menu, shown in Figure 2-4, is the first menu displayed whenever you enter Set-Up. As the first menu, it holds the main directory of Set-Up features and those features which are commonly accessed and must be easy to find at all times. The Actions submenu is also displayed, since the Actions menu item is currently selected.

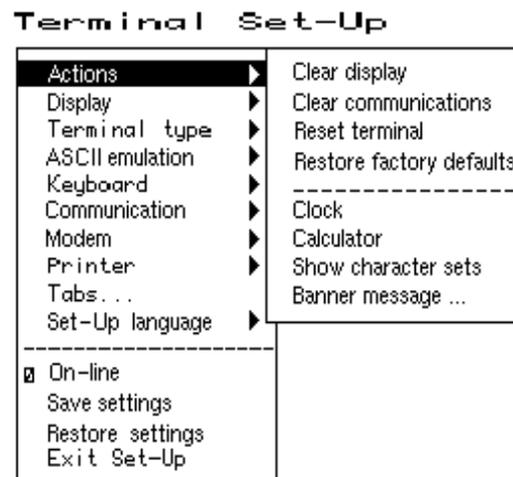
Terminal Set-Up

2.2 Set-Up Screen Text

Unless stated otherwise, the following general descriptions apply:

- Changes to feature settings do not take effect until you exit Set-Up. Only net changes have an effect—a change to a new value and back to an old value has no effect.
- The setting choices for some features are shown in the corresponding Set-Up displays. Where all the choices could not be displayed, additional choices are listed immediately under the figure.

Figure 2–4 Main and Terminal Actions Menu



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Pressing moves the cursor to the next item in the main menu. Pressing moves the cursor right to the first item of the submenu, making it the active menu.

2.3 Main Menu

The following descriptions refer to Figure 2–4.

The items above the dividing line in the main menu form a directory to the major functional areas of set-up features. Each item has a corresponding submenu or dialog box. Below the dividing line are features that need to be easy to find from any menu.

2.3.1 On-Line

The **On-line** feature allows you to select whether the terminal directs keyboard input to its host port UART to communicate with a remote host (On-Line), or directs keyboard input directly to the screen (receive character parser) without sending to a remote host (off-line or local).

Note

The **On-line** selection is different from the Local echo mode in the Communications Set-Up submenu. When **On-line** is disabled (local mode), nothing is sent to the host. Any keyboard input is directed to the receive character parser, which updates the screen.

In contrast, **Local echo** causes characters sent to the host port to also be directed back to the receive character parser, as if they had been received (echoed) from the host. Local echo is temporarily disabled when the terminal is in either Local mode or Local Controller mode, because keyboard input is already being redirected to the screen or printer port.

If an NVR error occurs during power-up, the terminal switches to Local mode.

Terminal reports, such as Answerback, DA, CPR, DECTSR, DECRPM, DECRPSS, DECAUPSS, DECCIR, DECTABSR and DSR, are not directed to the display. While in "local", host communications are put on "hold": All data received is buffered. If necessary, an XOFF is sent (or DTR is deasserted) to prevent buffer overflow. This buffered data is directed to the display when On-line mode is reentered. Note that the received character buffer (silo) is responsible for sending XON and XOFF when needed, not the On-line/Local state.

When in Local mode, modem signals, including DTR, are unaffected. No disconnect is performed. The functions of the printer port remain unchanged in Local mode. They function the same as in On-line mode.

When in Local mode and Printer To Host mode is selected, data from the printer port is displayed on the video terminal.

When both Local mode and Printer Controller mode are selected, the terminal is in Local Controller mode. Keyboard characters are sent to the printer port. Note that in "regular local" mode, any keyboard output is directed to the screen, but in "regular controller" mode, the keyboard output is directed at the host port. When Local Controller mode is exited to Local mode, the terminal redirects keyboard output from the printer to the screen (and parser). When you change from Local Controller mode to Printer Controller mode, the terminal transmits the characters accumulated in the receive silo to the printer.

2.3.2 Save Settings

The **Save settings** menu item, when invoked by pressing `Return` or `Enter`, causes the settings for most Set-Up controlled operating features to be saved in nonvolatile memory, where they become the power-on settings. These features include:

- Cursor direction
- Copy direction
- Auto wrap mode
- CRT saver
- Overscan
- Refresh rate
- Emulation mode

Terminal Set-Up

2.3 Main Menu

- VT default character set
- PCTerm mode and default character set
- Transmit 7-bit controls
- ASCII emulation features
- Keyboard language (VT or PC, not both)
- Up to 60 defined keys—Individual keys can have up to 255 characters. Limit = 804 bytes.
- All Communication submenu features (port select, word size...)
- All Modem submenu features
- All Printer submenu features
- Set-Up language

The **Keyboard encoding mode** is not saved.

2.3.3 Restore Settings

Restore settings is an action field that is used to replace all saved Set-Up parameters with the values stored in the NVR. As a side effect, this feature performs a disconnect sequence, clears the screen, reinitializes the user-definable keys (as saved), clears the soft character set, returns the cursor to the upper left corner, aborts any print operation in progress, aborts ESC, CSI, and DCS sequences (and control strings), and shows "Done" on the status line. This action can also be invoked by the RIS control function.

2.3.4 Exit Set-Up

The **Exit Set-Up** menu item, when invoked by pressing `[Enter]`, causes the terminal to exit Set-Up. The effect is identical to pressing the Set-Up key while in Set-Up.

2.4 Actions Menu

The following descriptions refer to Figure 2–4. Certain Set-Up features instruct the terminal to perform an immediate action when they are invoked. These features are grouped in the terminal Actions menu.

2.4.1 Clear Display

The **Clear display** feature clears the active page (including the lines which have temporarily disappeared while the you are in Set-Up).

2.4.2 Clear Communications

This feature is used to clear communication buffers and flags. It does not affect the On-Line/Local state. It is not invoked by any control functions.

Clear communications:

- Aborts any print operation in progress
- Aborts any escape sequence, control sequence, control string, or character string processing (ESC, CSI, DCS, APC, OSC, PM, SOS)
- Clears the keyboard buffers
- Clears the receive silo

- Clears the transmit silo
- Takes the terminal out of Printer Controller mode
- Sends XON on to the host port
- Sends XON to the printer port if Printer To Host and XOFF are enabled
- Resets XOFF received flags on both ports
- Does not clear the screen
- Clears KAM locked condition
- Clears the "printer port has seen DSR since power up" flag

2.4.3 Reset Terminal

The **Reset terminal** Set-Up feature resets the terminal to a "known state." This function is like Soft Terminal Reset (DECSTR), except DECSTR resets the Character Set mode to "8-bit Characters" and **Reset terminal** does not.

Additions:

- Keyboard encoding is reset to "character."
- PCTerm mode is not selected.

Note

From Set-Up, a soft reset using **Reset terminal** always works regardless of the terminal mode; but using mode changing control functions (DECSCS, S8C1T, S7C1T, DECANM), the soft reset is sometimes not performed.

2.4.4 Restore Factory Defaults

Restore factory defaults is an action field that is used to replace all existing Set-Up parameters with the values stored in ROM (the factory defaults). As a side effect, it does the following:

- Performs a disconnect sequence
- Clears the screen
- Reinitializes the user-definable keys
- Clears the soft font
- Returns the cursor to upper-left corner
- Aborts print operations in progress
- Aborts ESC, CSI and DCS sequences
- Displays the "Done" message on the status line

2.4.5 Clock, Calculator, Show Character Sets

The **Clock**, **Calculator**, and **Show character sets** menu items are used to invoke the corresponding desktop productivity features. Refer to Chapter 3.

Terminal Set-Up

2.4 Actions Menu

2.4.6 Banner Message

The **Banner message** menu item invokes a dialog box with a 30-character limit. When this feature is selected, a dialog box is displayed with a reverse video text entry area 30 characters long. If a **Banner message** is currently defined, the message is displayed in the text entry area. The <X> or key can then be used to delete backwards and enter a new **Banner message**.

All characters that can be generated by the keyboard are legal in this field (including primary and secondary keyboard language characters). As such, no errors are reported, except when trying to enter more than 30 characters. In this case, the bell rings (if enabled), and no more characters are accepted. The factory default message is no message at all (a blank field).

From the **Actions** menu, select **Banner message....**

1. Press or to display a dialog box.
2. Enter your banner message.
3. Press the to select button.
4. Press or to return to the Set-Up menu.
5. Use the **Save settings** menu item to save the Banner message.

2.5 Display Menu

Many of the features in Figure 2-5 can be controlled by the host control sequences listed in Table 2-3. The control functions are described in Chapter 5, ANSI Control Functions.

Figure 2-5 Display Menu

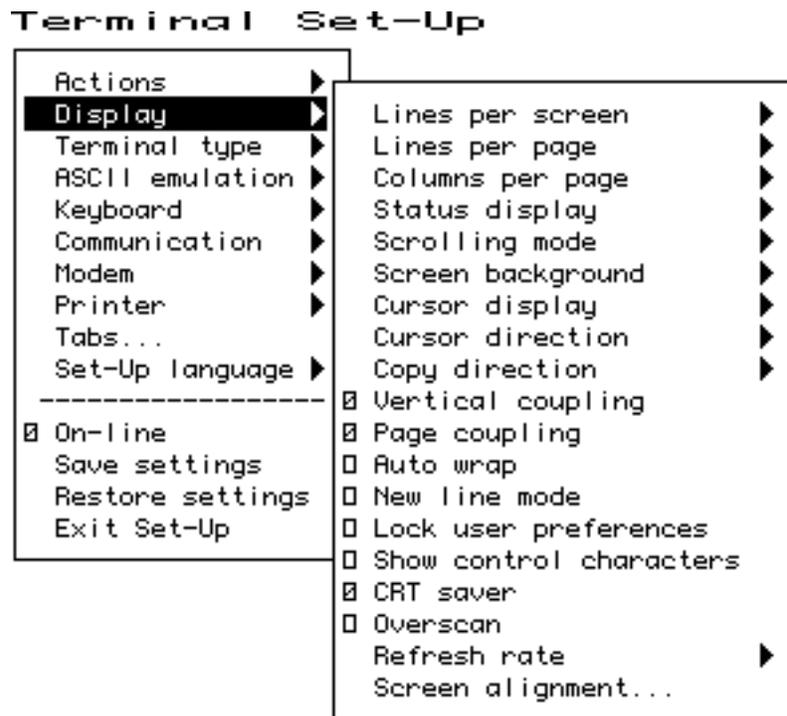


Table 2-3 Display Set-Up Features and Control Functions

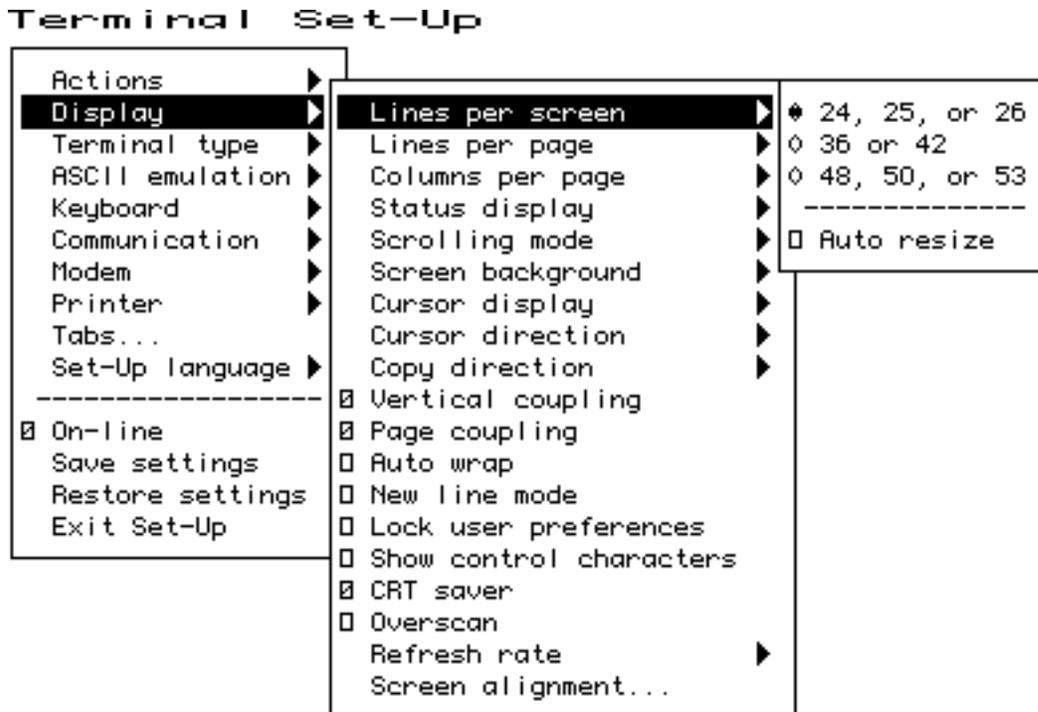
| Set-Up Feature | Control Function |
|-------------------------|-------------------|
| Lines per screen | DECSNLS |
| Lines per page | DECSLPP |
| Columns per page | DECS CPP, DECCOLM |
| Clear on change | DECNCSM |
| Auto resize | DECARSM |
| Status display | DECSSDT |
| Scrolling mode | DECSCLM, DECSCLS |
| Screen background | DECSCNM |
| Cursor display | DECTCEM, DECCUSR |
| Cursor direction | DECRLM |
| Copy direction | DECRLCM |
| Vertical coupling | DECVCCM |
| Page coupling | DECPCCM |
| Auto wrap | DECAWM |
| New line mode | DECNLM |
| Show control characters | CRM |
| CRT saver | DECCRTSM |
| Overscan | DECOSCNM |
| Refresh rate | DECRFR |

Terminal Set-Up

2.5 Display Menu

2.5.1 Lines per Screen

Figure 2-6 Lines per Screen Menu



This menu (Figure 2-6) chooses a font that enables the selected number of lines to be viewed. Note that you cannot view more lines than the number of lines on a page (**Lines per page**).

If the **Status display** is enabled, it is displayed using one of the same **Lines per screen** as the text for the corresponding session.

This is an operator preference feature and cannot be changed by control functions if the operator preference is set to **Lock user preferences**; however, if **Auto resize** is enabled at the same time, then the number of **Lines per screen** changes when the page size changes.

This feature can be changed from the host using the DECSNLS control function. Or, it may be changed indirectly from the host if **Auto resize** is selected and the page configuration is changed using DECSLPP.

2.5.1.1 Auto Resize

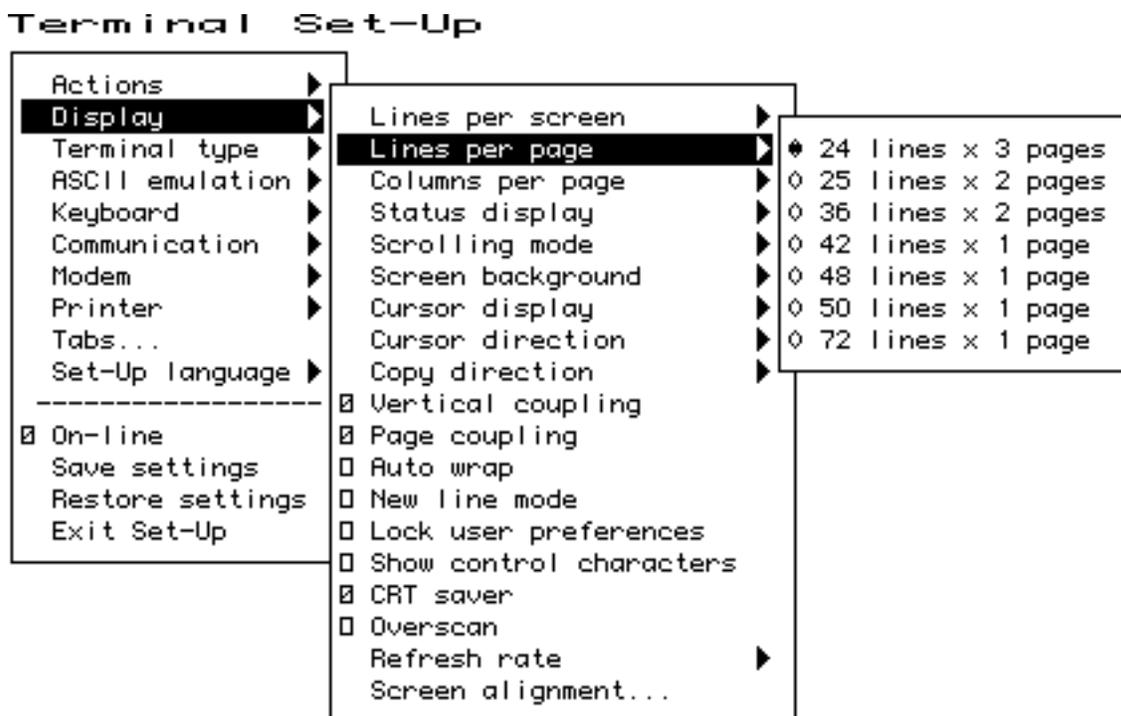
When **Auto resize** is enabled, the number of lines per screen changes automatically each time the page arrangement changes, either by the host or through Set-Up. Table 2-4 shows how the screen size changes whenever the page size changes when Auto Resize is set.

Table 2-4 Lines per Page vs. Lines per Screen When Auto Resize is Set

| Lines per Page | Lines per Screen |
|----------------|------------------|
| 24 | 26 |
| 25 | 26 |
| 36 | 43 |
| 42 | 43 |
| 43 | 43 |
| 48 | 52 |
| 52 | 52 |
| 72 | 52 |

2.5.2 Lines per Page

Figure 2-7 Lines per Page Menu



This menu (Figure 2-7) allows you to select the page size in lines and number of pages. The page size determines the addressing range for cursor positioning and scroll regions. The number of lines that can be displayed depends on the current setting of the **Lines per screen** feature.

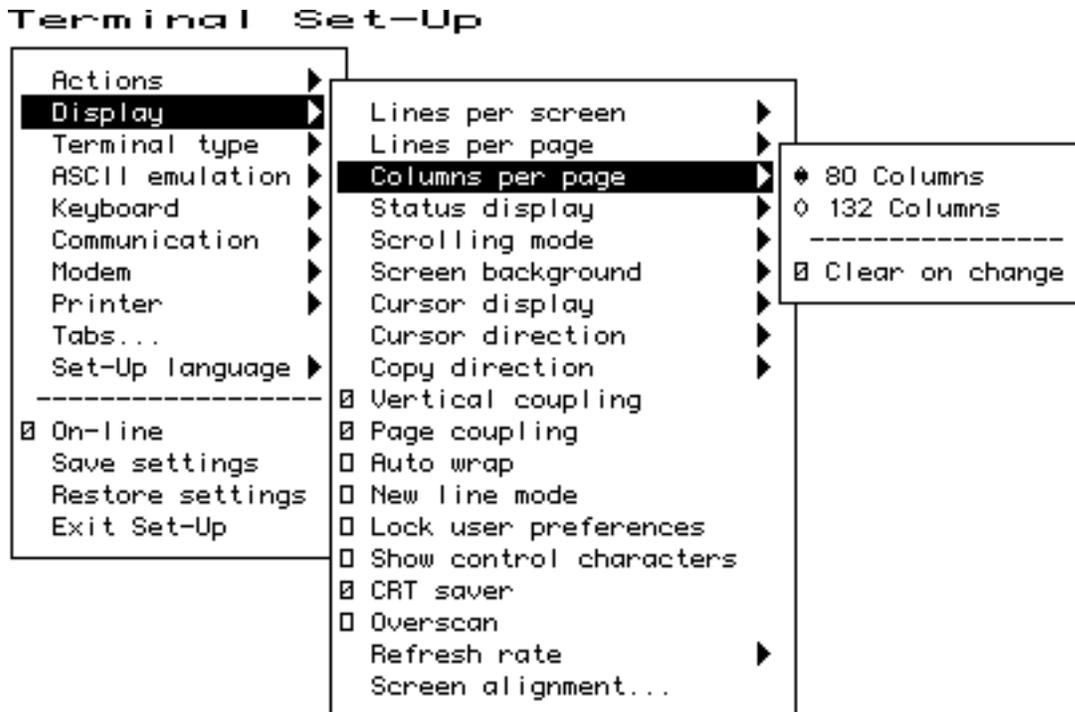
This field is also invoked by the DECSLPP control function.

Terminal Set-Up

2.5 Display Menu

2.5.3 Columns per Page, Clear on Change

Figure 2-8 Columns per Page Menu



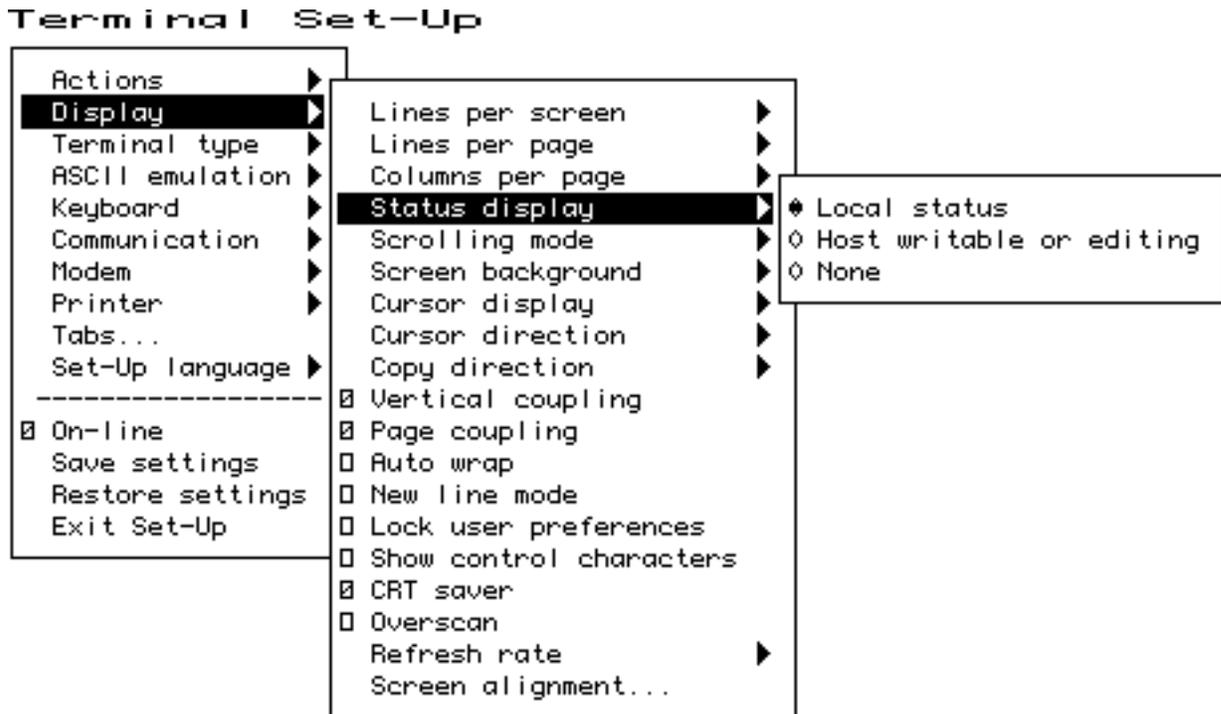
This menu (Figure 2-8) allows you to select an 80- or 132-column display for text. If **Clear on change** is disabled, changing this feature does not clear page memory, except when changing from 132 columns to 80 columns; then, columns 81 through 132 of each page are cleared. Changes to this field take effect immediately.

This field is also invoked by the DECSCPP and DECCOLM control functions. The **Clear on change** feature invokes the DECCOLM sequence only. *It does not erase page memory.*

2.5.4 Status Display

The **Status display** can be enabled in the selections shown in Figure 2-9.

Figure 2-9 Status Display Menu



2.5.5 Scrolling Mode

The **Scrolling mode** menu allows you to select how fast lines appear on the screen.

| Scroll Selection | Scroll Rate |
|--------------------|---|
| Slow smooth | Smooth steady scroll at approximately 9 lines per second (two scan lines per frame time). |
| Fast smooth | Smooth scrolls at approximately 18 lines per second. |
| Jump | Displays new lines as fast as they are received, causing a jump scroll on the screen. |

This is a user-preference feature. If **Lock user preferences** is set, then this field is not invoked by any control functions.

2.5.6 Screen Background

The **Screen background** can be either dark or light, with **dark** as the default.

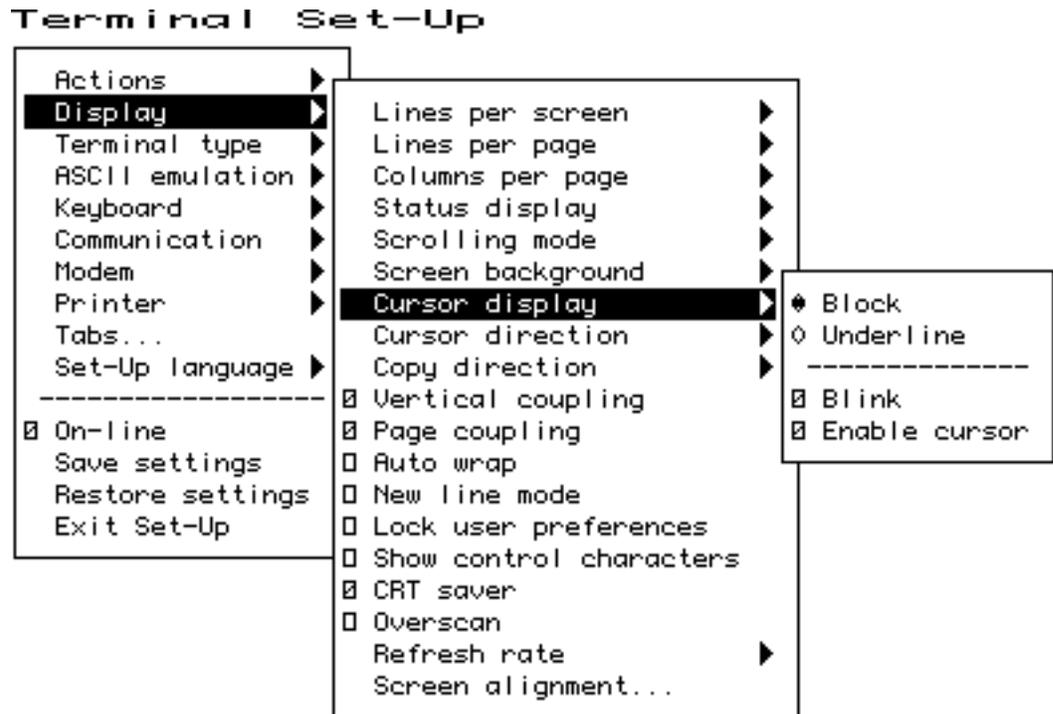
Terminal Set-Up

2.5 Display Menu

2.5.7 Cursor Display

The **Cursor display** can be enabled in the selections shown in Figure 2–10.

Figure 2–10 Cursor Display Menu



2.5.8 Cursor Direction

The **Cursor direction** default is **left to right**. If a Hebrew keyboard is connected to the terminal, a selection is available for right to left.

2.5.9 Copy Direction

The **Copy direction** default is **left to right**. If desired, you can change this selection to right to left. The cursor direction and the copy direction should be matched.

2.5.10 Vertical Coupling

Vertical coupling selects whether the user window automatically pans to follow the cursor when the cursor is moved vertically to a part of the page that is not in the currently displayed user window. Panning does not occur until the input buffer becomes empty and the cursor is displayed.

When **Vertical coupling** is disabled, the user window does not follow the cursor. If the cursor moves above or below the visible portion of the page, the cursor is no longer visible.

2.5.11 Page Coupling

Page coupling selects whether the user window automatically follows the cursor when the cursor is moved to a page that is not currently in the user window. When page coupling is enabled, moving the cursor to a page that is not currently displayed causes that page to be displayed. Panning does not occur until the input buffer becomes empty and the cursor is displayed.

When **Page coupling** is disabled, the user window does not follow the cursor. If the cursor moves to a page that is not currently displayed, the cursor is no longer visible.

2.5.12 Auto Wrap

Auto wrap selects where a received character is displayed when the cursor is at the right margin.

This field can be invoked by the DECAWM control function. The **Auto wrap** setting can be saved in NVM.

2.5.13 New Line Mode

When enabled, **New line mode** selects the characters transmitted by Return, CR, or CR+LF. It also determines the action taken by the terminal when receiving line feed, form feed, and vertical tab, LF, or CR+LF.

This feature can be invoked by the DECNLM (SM/RM) control function.

2.5.14 Lock User Preferences

The **Lock user preferences** feature allows you to prevent the host from modifying user-preference features. If set to lock, the user-preference features cannot be changed by host control functions.

The following user-preference features are locked and unlocked by this feature and when locked, cannot be changed by control functions:

- Auto repeat
- Scrolling mode
- Screen background
- Tab stops
- Keyboard definitions
- Lines per screen
- Auto resize
- Overscan
- Refresh rate

2.5.15 Show Control Characters

Show control characters allows you to select a normal display or a display called Control Representation mode or CRM. This "monitor and show all" display includes graphic representation of control characters,

When **Show control characters** is enabled, special CRM symbols are used for the C0 and C1 control areas of ISO 2022 conforming character sets. Other characters are displayed using the current user preference supplemental set. See Chapter 4, ANSI Control Functions Summary.

Terminal Set-Up

2.5 Display Menu

2.5.16 CRT Saver

If the **CRT saver** feature is enabled and the terminal is inactive for 30 minutes (no keyboard activity or input from a host computer), the monitor screen goes blank to reduce wear on the CRT. No data is lost when the **CRT saver** feature is active. Any keyboard activity or input from the host computer reactivates the monitor. The factory default setting is **CRT saver** enabled.

When the monitor goes blank, a blinking hollow cursor is displayed in the lower-right corner of the screen.

2.5.17 Overscan

Overscan can be enabled for most character fonts. Overscan is disabled (dimmed) when the display **Refresh rate** is set to 72 Hz and the **Lines per screen** is set to either 36 or 48 lines.

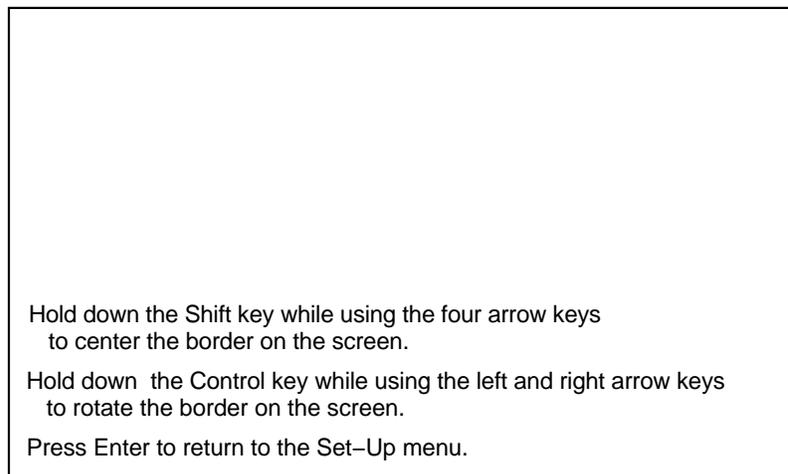
2.5.18 Refresh Rate

The screen **Refresh rate** can be set to **72 Hz** (default) or to 60 Hz.

2.5.19 Screen Alignment

The **Screen alignment** menu item is used to invoke a screen alignment display (Figure 2–11). For international units only, screen rotation is provided to compensate for the Earth's magnetic field. Follow the instructions on the screen.

Figure 2–11 Screen Alignment Display

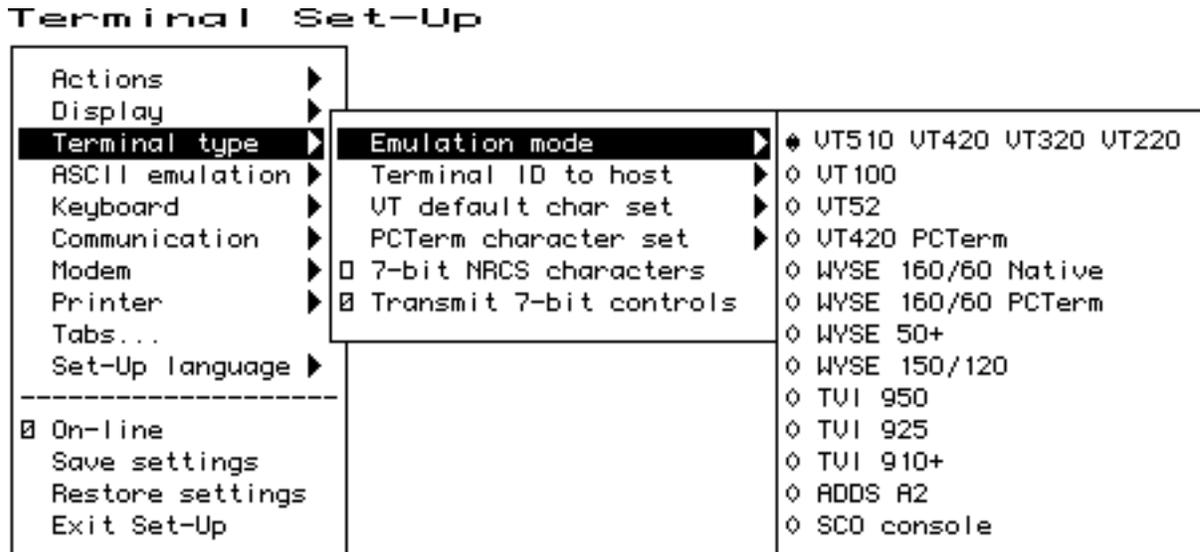


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2.6 Terminal Type Menu

You can select terminal type and emulation modes using the menu shown in Figure 2-12.

Figure 2-12 Terminal Type and Emulation Mode Menu



2.6.1 Emulation Mode

Emulation mode is the primary means of selecting different terminal modes or emulations. Changing terminal modes or emulations usually performs some initialization of the terminal state.

Example: Selecting a VT mode performs a soft terminal reset (DECSTR).

PCTerm mode can be selected or deselected independently from the other emulations. The ASCII modes use WYSE PCTerm emulation. The ANSI modes use VT420 PCTerm emulation.

This feature corresponds to the DECPCTERM, DECTME, DECANM, and DECSCL control functions described in Chapter 5, ANSI Control Functions.

Changing the conformance level (DECSCL) does not change the operating level reported to identify the terminal to the host. It only changes the way extensions are reported.

Terminal Set-Up

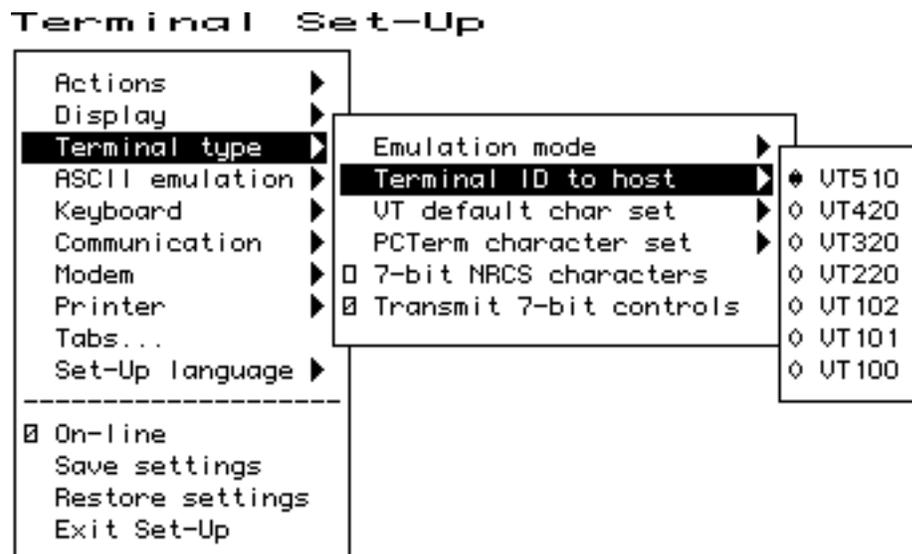
2.6 Terminal Type Menu

Notes

- Printer operations are not affected or halted by a change in mode.
 - A soft reset is always performed as a result of a mode change from Set-Up.
 - Changes resulting from most, but not all, of the above sequences also cause a soft reset. Exception: Entering VT52 mode (via DECANM) does not cause a soft reset from VT100 mode, but does cause a soft reset from VT500 mode.
-

2.6.2 Terminal ID to Host

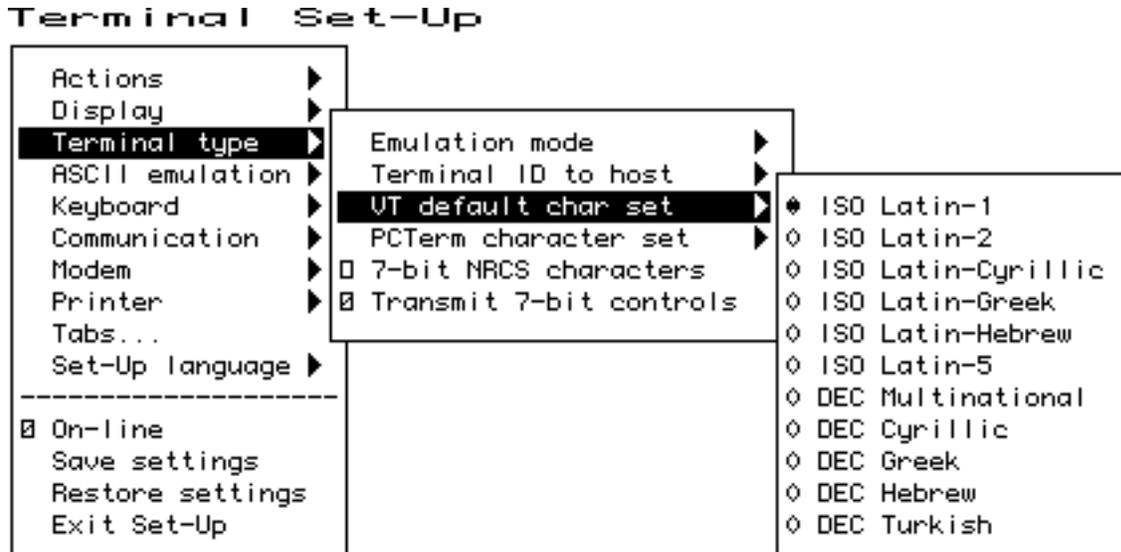
Figure 2–13 Terminal ID to Host Menu



Terminal ID to host (Figure 2–13) selects how the terminal identifies itself to host software, specifically the Primary Device Attributes response (DA). The default ID is "VT510." For a list of the responses, see the Device Attributes sections in Chapter 5. This field has no effect when the terminal is in VT52 mode. The feature corresponds to the DECTID control function described in Chapter 5.

2.6.3 VT Default Character Set

Figure 2-14 VT Default Character Set Menu



This feature (Figure 2-14) selects the default international character set to use for output as initialized in G0-G3 and GL/GR. It corresponds to the DECAUPSS (Assign User Preference Supplemental Set) control function described in Chapter 5.

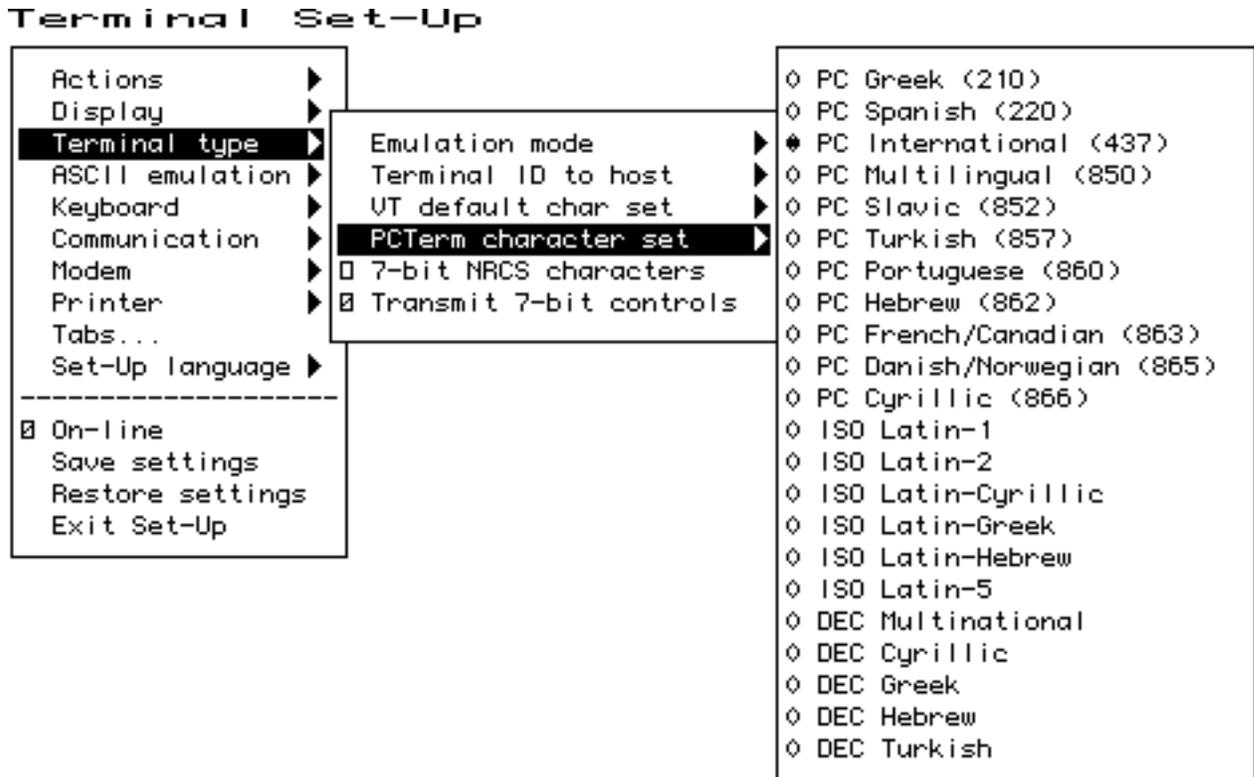
Only ISO Latin-1 and DEC Multinational are available on the North American terminal.

Terminal Set-Up

2.6 Terminal Type Menu

2.6.4 PCTerm Character Set

Figure 2-15 PCTerm Character Set Menu



This feature (Figure 2-15) selects which PC code page will be used in PCTerm mode. This feature is also invoked by the DECPCTERM control function described in Chapter 5.

PC Greek, PC Spanish, PC International, PC Multilingual, and PC French/Canadian are available on the North American terminal.

2.6.5 7-Bit NRCS Characters

This feature enables National Replacement Character Set mode (DECNRCS), as described in Chapter 5. When **7-bit NRCS characters** are selected, a corresponding 7-bit NRC set is used depending on the keyboard language. See Chapter 8, Keyboard Processing for details. Group 2 or secondary keyboard language characters may still be used if they are in the 7-bit character set. This feature is dimmed unless there is a corresponding NRC set available.

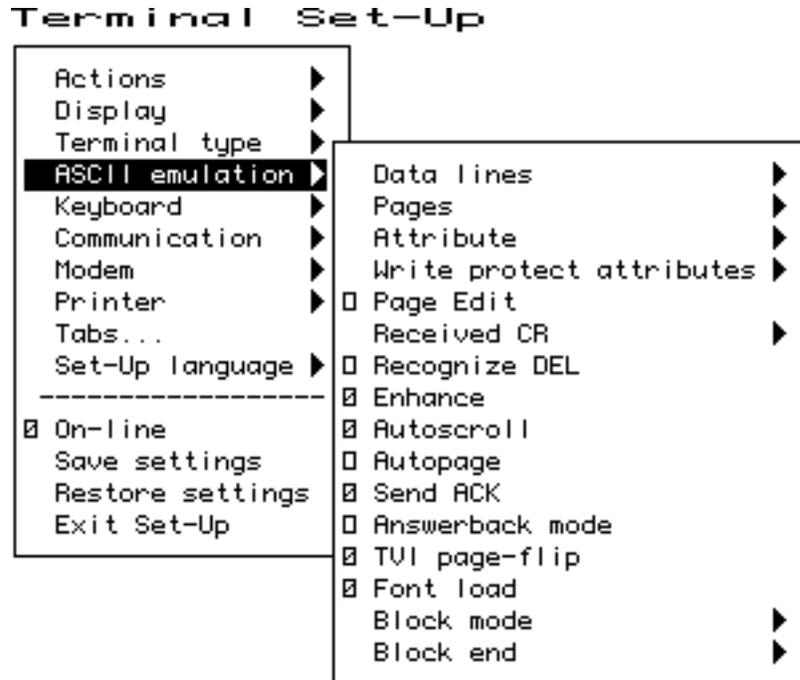
2.6.6 Transmit 7-Bit Controls

Transmit 7-bit controls selects whether C1 control codes are sent in their original 8-bit form (disabled) or converted to their 7-bit **ESC [** form.

This field is invoked by a parameter to the DECSCL control function and by the S7C1T and S8C1T control functions.

2.7 ASCII Emulation Menu

Figure 2–16 ASCII Emulation Menu



The features, shown in Figure 2–16 and listed in Table 2–5, are specific to the ASCII emulation modes supported in the VT510. The default is shown in **boldface** type. Refer to Part III for details.

Table 2–5 ASCII Emulation Features

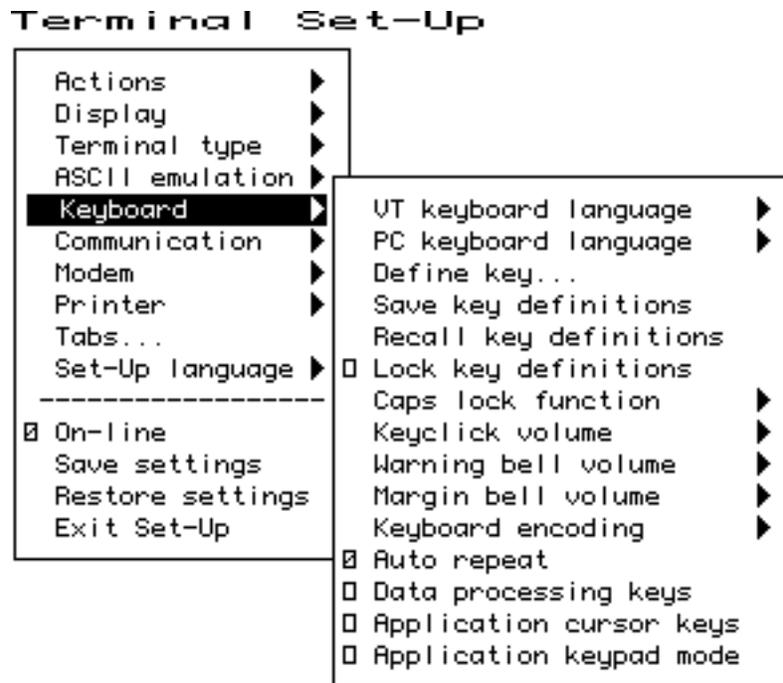
| Feature | Selections | Determine... |
|--------------------------|---|--|
| Data lines | 24 , 25, 42, 43 lines | The number of data display lines visible, not counting any status lines. |
| Pages | 1 × lines 2 × lines 4 × lines * | The page size and number of pages. 1 × lines selects each page to be the number of data lines visible on the screen. The * makes the display of a single page invisible. |
| Attribute | Character , line, or page | How visual attributes are applied per character, line, or page. |
| Write protect attributes | Dim , blank, reverse, underline, and/or blink. | The visual attributes used to highlight and specify write protected data. |
| Received CR | CR or CRLF | Carriage return or carriage return line feed. |
| Block Mode | Conversation or Block | Transfer method. |
| Block End | US/CR or CRLF/ETX | At the end of a block transfer, transmit a carriage return or an end-of-text character. |

Terminal Set-Up

2.8 Keyboard Menu

2.8 Keyboard Menu

Figure 2–17 Keyboard Menu



Several of the features shown in Figure 2–17 are self-explanatory and correspond directly to control functions listed in Table 2–6. For additional information, see Chapters 4 and 5.

Table 2–6 Keyboard Features and Control Functions

| Set-Up Feature | Control Function |
|--|--|
| Keyboard language | DECKBD |
| Switch between primary and secondary keyboard language | DECESKM (general), DECHEBM (Hebrew), DECNAKB (Greek), DECCYRM (Cyrillic) |
| Caps lock function | DECLCK |
| Keyclick volume | DEKCKV |
| Warning bell volume | DECWBV |
| Margin bell volume | DECMBV |
| Keyboard encoding | DECKPM |
| Auto repeat | DECARM |
| Data processing keys | DECKBUM |
| Application cursor keys | DECCKM |
| Application keypad mode | DECKPNM, DECKPAM, DECCKM |

2.8.1 Keyboard Language

Some keyboards allow you to select two different keyboard layouts and easily switch between them (English and Hebrew, for example). This feature allows the VT510 to support both existing conventions and emerging standards for extending the graphic input and/or switching between languages in dual language environments. (The North American keyboard has only one keyboard language, English.)

The primary keyboard language corresponds to Group 1 (per DIN 2137) and generally references the legends on the left half of the keytops.

The secondary keyboard language corresponds to Group 2 (Group Shift per DIN 2137) and generally references the legends on the right half of the keytops.

Unless overridden, **Ctrl/Alt/F1** makes the primary keyboard language active, and **Ctrl/Alt/F2** makes the secondary keyboard language active. (These are factory defaults, standard on PCs.)

Selecting a new keyboard language in Set-Up automatically initializes the keyboard character set, as described in Chapter 8, Keyboard Processing.

Changes to this field take effect immediately. Changing this field to North American or Dutch and then exiting Set-Up or going to another menu resets the **7-bit NRCS characters** feature to disabled. There is no "7-bit characters" mode for the North American or Dutch keyboards. This field affects the language of the keyboard indicator line.

2.8.2 Define Key Editor

The Define Key Editor is an advanced function that allows the terminal to adapt to environments that do not match the preprogrammed settings.

Caution

This function is designed to be easy to use; however, unless you understand the consequences of remapping various key combinations, use caution when using this feature. When you press **F3** as the first key after the terminal is powered on, you always enter Set-Up, regardless of which keyboard you use or how **F3** is defined.

The **Define key** menu invokes the Define Key Editor.

To ensure consistent access to Set-Up features, the following rules apply for interpreting keystrokes.

- Within Set-Up and the Define Key Editor, the four arrow keys along with **Enter**, **Return**, **Do**, and **Select** are interpreted according to their standard definitions, regardless of how they may be redefined at other times. The one exception is when pressing the key to be defined.
- When copying one key definition to another, the standard key definition for a key is copied, not the current definition. This copy method ensures that keyboard functions are not lost within the Define Key Editor.

Terminal Set-Up

2.8 Keyboard Menu

Figure 2–18 Define Key Editor, Select Function

Define Key Editor
Available memory: 804

Press key to be defined: F2 Key number: 113

Define key as
 UDK Function Alphanumeric Copy of key default: ____

| Modifiers: | Definition: | Select function: |
|------------------|---------------|-------------------|
| Unshifted | Print Page | Print Page |
| Shifted | Print Display | Set-Up |
| Control | ± Autoprint | Break |
| Shift ctrl | cs, 12, 6~ | Hard Reset |
| Alt | _____ | ± Autoprint |
| Alt shift | _____ | Disconnect |
| Alt ctrl | _____ | |
| Alt shift ctrl | _____ | |

OK Apply Cancel

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2.8.2.1 Copy of Key Default—Moving a Standard Function

The simplest way to reprogram a key is to copy the behavior of another key. You can use **Copy of key default** to copy the factory default for a key to be defined to any position on the keyboard. You cannot, however, use this feature to edit the code transmitted by individual keys. To move factory default key functions:

1. From the **Keyboard** menu item, select the **Define key ...** function, and the **Define Key Editor** menu will appear.
2. Press the key for which you want to assign a new behavior. If the key is a function key, a screen similar to Figure 2–18 is displayed. Names are displayed in the Set-Up language selected (not according to keyboard language). The ± symbol indicates a toggle feature. Names are truncated to 12 characters in the definition field.
3. Press to highlight the **Copy of key default** radio button (●) and press .
4. Press the key whose factory default behavior is what you want your defined key to do.
5. Press to highlight the OK or Apply button and press .

2.8.2.2 Customization

If you want to program a key to behave differently than one of the factory defined keys, then you will need to know about the following VT510 key categories:

- Function: Keys such as the arrow keys (↑, ↓, ←, →), the **Shift** modifier key, or the Set-Up key, used to transmit function key sequences or to perform local terminal functions.
- Alphanumeric: Keys used to transmit alphanumeric characters.

2.8.2.3 Modifier Keys

Modifier keys vary from within the Function and Alphanumeric categories. A modifier key is a key that modifies the behavior of other keys when it is pressed and held down. For example, pressing an alphanumeric key in combination with the **Shift** modifier key will normally send the shifted or uppercase characters for that key.

Modifier keys are treated as a special kind of local terminal function. The VT510 function modifier keys are: **Shift**, **Ctrl**, and **Alt**. VT510 alphanumeric keys can also be modified by pressing **Group Shift** (**Alt Gr** on enhanced PC keyboards) and **Alt/Shift** (**Shift-2**). Modifier keys themselves cannot normally be modified by other keys. A key assigned to act as the **Shift** modifier, for example, cannot transmit a function sequence when pressed in combination with **Alt**. Defining a key as a modifier key makes all assignable combinations of that key act as a modifier.

2.8.2.4 Creating a New Function

To define a new function key:

1. From the **Keyboard** menu item, select the **Define key . . .** function, and the **Define Key Editor** menu will appear.
2. Press the key for which you want to assign a new behavior.
3. Press the **←** or **⇒** key to highlight the **Function** radio button (●) and press **Enter**.
4. Press the **↑** and **↓** keys to highlight the modifier combination that you want to define (Unshifted, Shifted, Control, and so on) and press **Enter**.
5. Press the **⇒** key to move to the **Select function** scroll box. Press the **↑** and **↓** keys to highlight the desired keystroke function from the list and press **Enter**.
6. Press the **←** key to return to the **Modifiers**.
7. Repeat steps 4 through 6 to define other modifier combinations as desired.
8. Use the arrow keys (↑, ↓, ←, ⇒) to highlight the OK or Apply button and press **Enter**.

2.8.2.5 Examples of Creating New Functions

Examples of when to create new functions include:

- Changing the **<X>** or **Delete** key to delete when unshifted and to backspace when shifted.
- Disabling the **Compose**, **Break**, and Set-Up keys by assigning them to have no function.

Terminal Set-Up

2.8 Keyboard Menu

2.8.2.6 Correcting a Mistake

If you make a mistake or want to start over, select the Cancel button or select the **Exit Set-Up** menu item. Your changes will not be recognized until you select the OK or Apply button. To save key definitions, select the **Save key definitions** menu item from the **Keyboard** menu.

The Define Key Editor is very powerful and you may make mistakes in learning how to use it. But no matter how you redefine the keys, you can always enter Set-Up by pressing **F3** after powering on. Additionally, you can always select the **Restore factory defaults** menu item from the **Actions** menu.

2.8.2.7 Creating A New Alphanumeric Key or Keyboard Layout

The method for creating a new alphanumeric key is similar to that for function keys, except that you can define different modifier combinations and you enter alphanumeric values differently.

If the key was previously programmed as a function key, the function definition will be empty. Once any function definition is applied, all the alphanumeric definitions for that key are lost. *A single key cannot act as both a function key and an alphanumeric key simultaneously.*

To define a new alphanumeric key:

1. From the **Keyboard** menu item, select the **Define key . . .** function, and the **Define Key Editor** menu will appear.
2. Press the key for which you want to assign a new behavior.
3. Press the **←** or **⇒** key to highlight the **Alphanumeric** radio button (●) and press . The character transmitted when this key is unshifted is highlighted.
4. To select a different character, press the corresponding key on the keyboard, or use the numeric compose key to generate a new character.
5. If desired, press the **⇒** key to move to the **Non-spacing accent** scroll box. Press the **↑** and **↓** keys to highlight any non-spacing accent from the list and press .
6. The code transmitted by the unshifted alphanumeric key when pressed in combination with the Control key is calculated automatically and displayed in the **Definition** column. If desired, you may redefine this function.
7. If desired, select an Alt Function modifier combination for the alphanumeric key from the **Select Function** scroll box. You may choose a function, including a user-defined key (UDK) sequence. The default for the Alt Function is **None**.
8. Press the **←** key to return to the modifier selection.
9. Use the arrow keys (**↑**, **↓**, **←**, **⇒**) to highlight the OK or Apply button and press .

Terminal Set-Up

2.8 Keyboard Menu

- Terminal only The sequence is sent only to the screen, as if it had just been received from the host.
- Host only The sequence is sent only to the host, regardless of the communication settings.

Press again to select one of the following buttons:

When you select Cancel, you only cancel the changes to the currently selected modifier combination.

2.8.2.10 Programming Notes

- When you press as the first key after the terminal is powered on, you always enter Set-Up, regardless of how is defined.
- If a key is programmed to act as a modifier key, it operates as a modifier with any combination of , , or .
- If a key is programmed to be a modifier key and modifier key reporting is enabled using DECSMKR, the key sends the VT sequence for the left modifier key when there is more than one.
- combinations such as are local keyboard extensions and cannot be reprogrammed by DECPFK. The key acts as a modifier. The function can be moved to another key, but must still send the Break.
- Use of the Define Key Editor to redefine keys on the numeric keypad affects only the Num Lock off state of these keys. When Num Lock is engaged, these keys will always send their factory default ASCII numerals (and related characters) intended for numeric input. The Num Lock behavior of these keys cannot be reprogrammed. (This Num Lock behavior does not apply to numeric keypad mode on the VT keyboard or PC keyboard in VT style.)
- The toggle Num Lock function can be assigned to any single key combination. Although the Num Lock state modifies other keys, the toggle Num Lock function is not a modifier key. This means modifier combinations of can be assigned to any other function or user-defined sequence.
- Use of the numeric keypad to compose characters by entering their decimal code in combination with or (held down) should continue to work regardless of any reprogramming of keys on the numeric keypad, unless such reprogramming directly conflicts with use of the keypad in this manner. Example: A numeric keypad key has been defined as or .
- Function keys also work in VT100 mode.

2.8.3 Save Key Definitions

To save your key definitions so they will be available the next time you turn the power on, select the **Save key definitions** menu item from the **Keyboard** menu.

This action field on the keyboard menu (Figure 2-17) causes the **Define key** modifications to be saved to nonvolatile memory independently from any other Set-Up features. Key definitions are saved on a first-come first-served basis and are limited by the total amount of nonvolatile memory available.

This feature cannot be invoked by a host control function.

2.8.4 Recall Key Definitions

This action field causes previously saved **Define key** modifications to be recalled from nonvolatile memory independently from any other Set-Up features.

2.8.5 Lock Key Definitions

The **Lock key definitions** menu item operates as a check box. When key definitions are locked, they cannot be reprogrammed from the host.

2.8.6 Caps Lock Function

This function allows you to enable the Lock or Caps Lock key to do the following:

- Caps lock Lock alpha keys on main keypad in uppercase setting.
- Shift lock Lock alpha and numeric keys on main keypad in shifted setting.
- Reverse lock Lock numeric keys in shifted setting, but lock alpha keys in lowercase setting.

2.8.7 Keyclick, Warning Bell, and Margin Bell Volume

The volume of these settings can be set to high, low, or off, with **high** as the default.

2.8.8 Keyboard Encoding

The **Keyboard encoding** menu allows you to select from the following:

- Character (ASCII) The keyboard uses normal ANSI/ISO character encoding.
- Scancode The keyboard transmits a scancode that represents the physical position of the key pressed within the keypad array.
- Key position The keyboard transmits key position codes for each down transition. This menu allows alternate keyboard layouts to be supported by application software.

This feature corresponds to the DECKPM (key position mode) control function described in Chapter 5, ANSI Control Functions.

Terminal Set-Up

2.8 Keyboard Menu

2.8.9 Auto Repeat

The **Auto repeat** feature selects whether keys begin auto repeating if still held down after a delay interval. The repeat rate is the number of "keystrokes" per second, not characters per second. Changes to this field take effect immediately.

This is a user-preference feature. When it is unlocked, this feature can be invoked by the DECARM control function.

2.8.10 Data Processing Keys

This feature corresponds to the DECKBUM control function described in Chapter 5, ANSI Control Functions. Changes to this field take effect immediately.

2.8.11 Application Cursor Keys

This feature corresponds to the DECCKM control function described in Chapter 5, ANSI Control Functions. This feature cannot be saved in NVM and is reset to the factory default setting by DECSTR. This feature cannot be locked. Changes to this field take effect immediately.

2.8.12 Application Keypad Mode

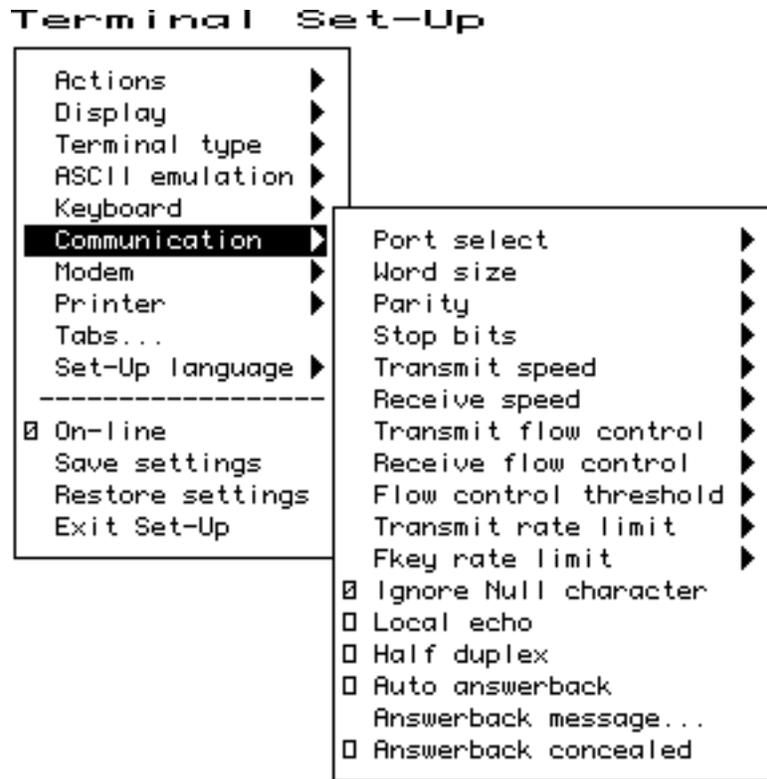
This feature selects whether the numeric keypad sends ASCII numerals or application function sequences. It corresponds to the DECKPNM, DECKPAM, and DECNKM control functions described in Chapter 5, ANSI Control Functions.

This field is not stored in NVR. This field is reset to the power-up setting when a soft reset occurs (Reset Session or receipt of DECSTR).

This field is not a user-preference feature. It cannot be locked. Changes to this field take effect immediately so you can use the keypad to enter an Answerback message.

2.9 Communication Menu

Figure 2-20 Communication Menu



Several of the Communication features shown in Figure 2-20 are self-explanatory and correspond directly to control functions listed in Table 2-7. These functions are described in Chapter 5, ANSI Control Functions.

Terminal Set-Up

2.9 Communication Menu

Table 2-7 Communication Features and Control Functions

| Set-Up Feature | Control Function |
|-----------------------------|------------------|
| Comm port select | DECPS |
| Comm word size | DECPP |
| Comm parity | DECPP |
| Comm stop bits | DECPP |
| Comm transmit speed | DECSCS |
| Comm receive speed | DECSCS |
| Comm transmit flow control | DECSFC |
| Comm receive flow control | DECSFC |
| Comm flow control threshold | DECSFC |
| Transmit rate limit | DECXRLM, DECTRL |
| Fkey rate limit | DECXRLM, DECTRL |
| Ignore Null character | DECNULM |
| Local echo | SRM |
| Half duplex | DECHDPXM |
| Auto answerback | DECAAM |
| Answerback message | DECLANS |
| Answerback concealed | DECCANSM |

2.9.1 Port Select

This selection enables the cable configuration at the back of the terminal as follows:

- S1=comm1 print=comm2
 - S1=comm1 print=parallel
 - S1=comm2 print=comm1
 - S1=comm2 print=parallel

2.9.2 Word Size

The communication word size can be **8 bits** (default) or 7 bits.

2.9.3 Parity

You can select any of the following parity checks:

- None
 - Even
 - Odd
 - Even, unchecked
 - Odd, unchecked
 - Mark
 - Space

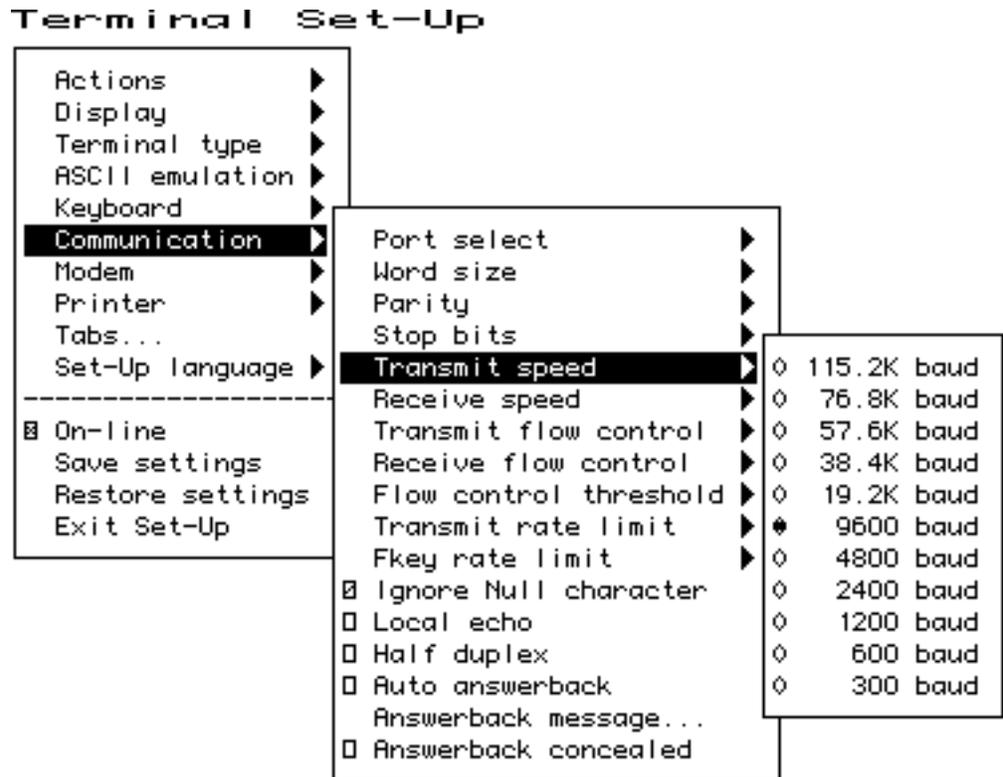
2.9.4 Stop Bits

For communication, **1** (default) or 2 stop bits can be enabled.

2.9.5 Transmit Speed

The communication **Transmit speed** is set to 9600 baud. You can select transmit speeds from the menu shown in Figure 2–21.

Figure 2–21 Communication Transmit Speed Menu



2.9.6 Receive Speed

Like the communication **Transmit speed**, you can select the **Receive speed** from 300 to 115.2K baud. The default receive speed matches the transmit speed selection.

2.9.7 Transmit Flow Control

The **Transmit flow control** method can be one of the following:

- None
- XON/XOFF
- DSR (Data Send Ready)
- Both

Note

When an ASCII emulation is selected, the default **Transmit flow control** is **None**.

Terminal Set-Up

2.9 Communication Menu

2.9.8 Receive Flow Control

The **Receive flow control** method can be one of the following:

- None
- XON/XOFF or XPC
- DTR (Data Transmit Ready)
- Both

2.9.9 Flow Control Threshold

You can set the **Flow control threshold** to Low (64 characters) or to High (768 characters). The default is **64**.

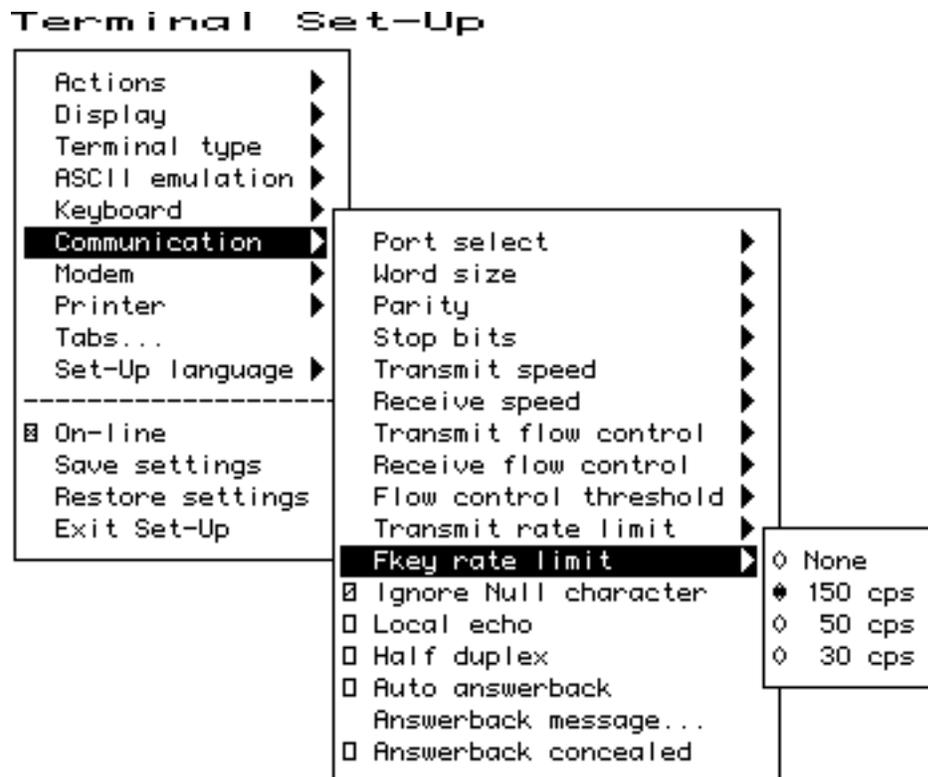
2.9.10 Transmit Rate Limit, Fkey Rate Limit

The **Transmit rate limit** choice limits the character rate from the keyboard to between 30 and 150 characters per second (selectable with fairly uniform separation), regardless of baud rate. This is fast enough to allow any keystroke to auto repeat at 30 Hz (baud rate permitting). The default is **150**.

This feature allows you to limit the transmit rate from the terminal so as to reduce the interrupt burden on the operating system.

You can select a different transmit rate for graphic keys and function keys using **Fkey rate limit**. The F keys transmit more than 1 byte per key press. This function may be selected through the DECFRLM and DECTRL control function. Refer to Chapter 5, ANSI Control Functions, for details.

Figure 2–22 Communication Fkey Rate Limit Menu



2.9.11 Ignore Null Character

When this menu item is selected, the terminal ignores received NUL control codes.

2.9.12 Local Echo

With **Local echo** enabled, most characters sent from the keyboard to the host are also displayed on the screen. The answerback message and XON/XOFFs are not echoed locally. Everything else is.

This feature corresponds to the SRM control function described in Chapter 5, ANSI Control Functions.

Note

Local echo is different from the "Local" setting of **On-line** in the main menu of the Set-Up directory. **Local echo** causes keystrokes to be echoed on the screen, but it does not direct keyboard input to the ANSI parser, which also updates the screen. **Local echo** is temporarily disabled when the terminal is in either Local mode or Local Controller mode, because the keyboard input is already being redirected to the screen through the parser or to the printer.

2.9.13 Half Duplex

You can enable or disable **Half duplex** communication. The default is **disabled**. Half duplex communication is available only on the Comm1 communications port. If communication is set for the Comm2 port, this feature is disabled (dimmed).

2.9.14 Auto Answerback

This item is used to enable or disable **Auto answerback** on power-up or upon connection. The factory default is **disabled**.

2.9.15 Answerback Message

The **Answerback message . . .** menu item invokes a dialog box with a 30-character limit. All characters that can be generated by the keyboard are legal in this field (including primary and secondary keyboard language characters). As such, no errors are reported, except when trying to enter more than 30 characters. In this case, the bell rings (if enabled), and no more characters are accepted. The factory default message is no message at all (a blank field). Only a single Answerback message is saved in the NVR. The last session from which a **Save settings** is performed overwrites this single Answerback message.

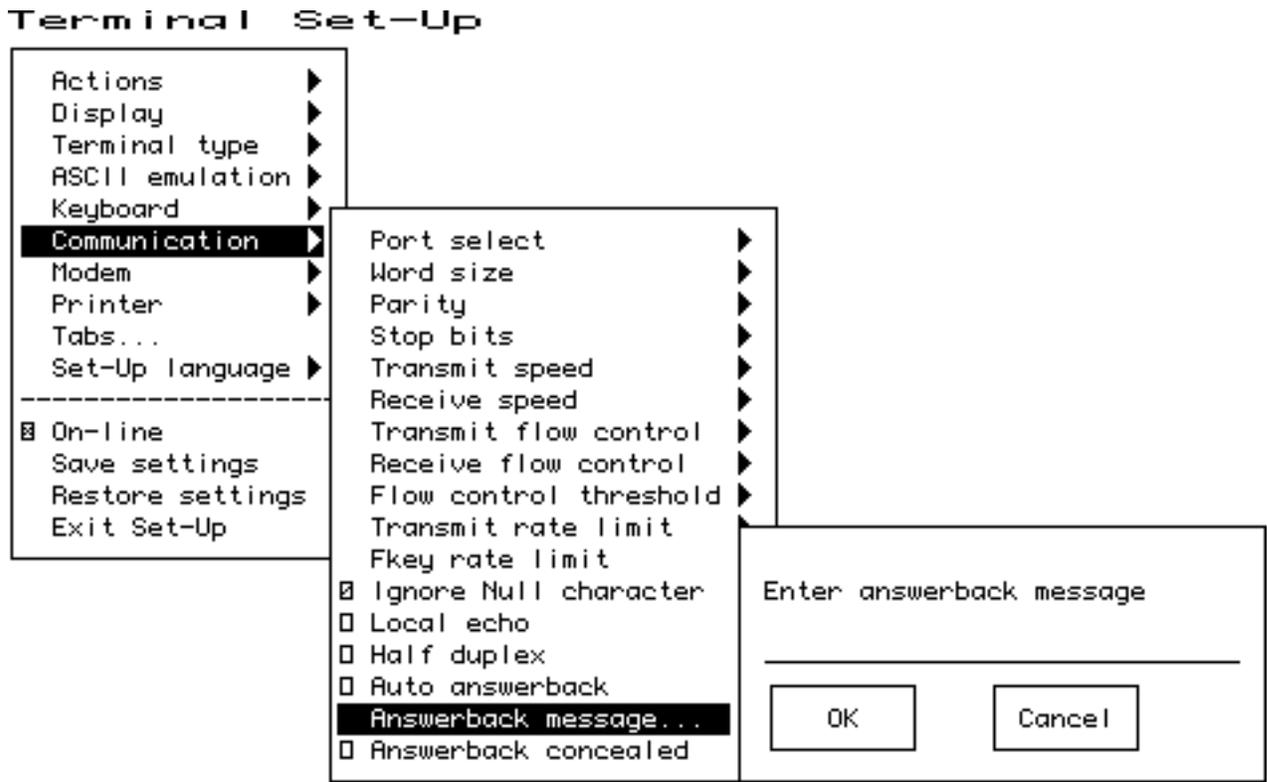
When this feature is selected, a dialog box is displayed with a reverse video text entry area 30 characters long. If an Answerback message is currently defined, the message is displayed in the text entry area. The **<X|** or **Delete** key can then be used to delete backwards and enter a new Answerback message.

If the Answerback message is concealed, the cursor is displayed in the first position of the text entry area. In this case, the existing Answerback message does not need to be deleted before entering a new message.

Terminal Set-Up

2.9 Communication Menu

Figure 2–23 Communication Answerback Dialog Box



The Answerback message can be up to 30 characters in length. Control characters are displayed using the CRM font. Pressing `Return` enters a return character in the Answerback message. Pressing `↓` with the highlighting cursor in the Answerback text field moves to the OK button.

The current Answerback message is displayed in the answerback dialog box unless **Answerback concealed** is selected. In this case, the previous Answerback message is not shown. Choosing the OK button to enter a new Answerback message clears the Answerback concealed check box.

2.9.16 Answerback Concealed

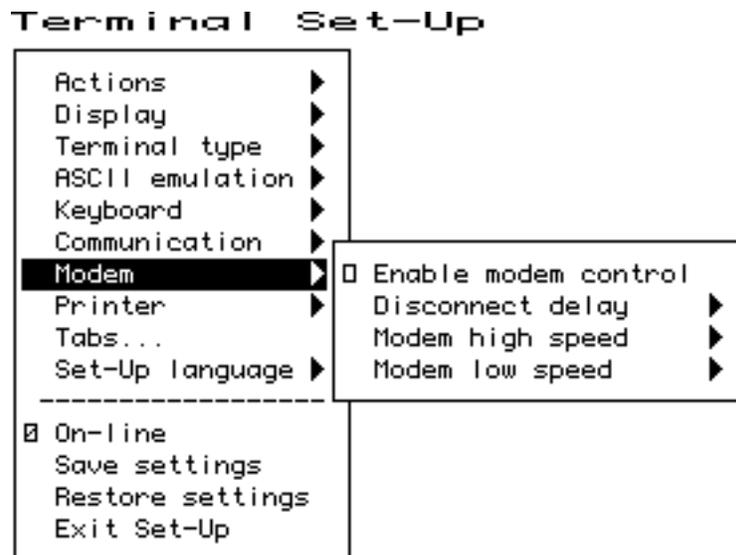
Changes to this field take effect immediately. The factory default is **disabled**.

If disabled, the Answerback message is visible in Set-Up. If enabled, the message is not visible and the text "<concealed>" replaces the message. The only way to return this field to disabled (visible) is to enter a new message.

2.10 Modem Menu

You can select several modem features using the menu shown in Figure 2–24.

Figure 2–24 Modem Menu



2.10.1 Enable Modem Control

The field allows you to select whether the additional hardware control signals at the interface connector are used for modem control. Modem control disabled is also referred to as "Data leads only." Refer to Chapter 9, Communications, for details on modem control signals.

This feature corresponds to DECMCM in Chapter 5, ANSI Control Functions.

2.10.2 Disconnect Delay

When modem control is enabled, the **Disconnect delay** feature determines the time allowed before the terminal disconnects from the communications line when the received line signal detect (RLSD) is lost. Disconnect delay is in effect only when RLSD (CD) is lost. If DSR is lost, the terminal performs a disconnect immediately. The following selections are available:

- 2 seconds
- 60 ms
- No disconnect

All countries except the United Kingdom should use a delay of 2 seconds. The 60 ms delay is for use in the United Kingdom.

If the VT510 detects a loss of carrier and you selected No disconnect, the VT510 ignores RLSD (CD) after the beginning of the connection.

If you try to disconnect and reconnect the line, the VT510 checks if RLSD is asserted before granting the connection. Once it is connected, the terminal ignores the loss of carrier.

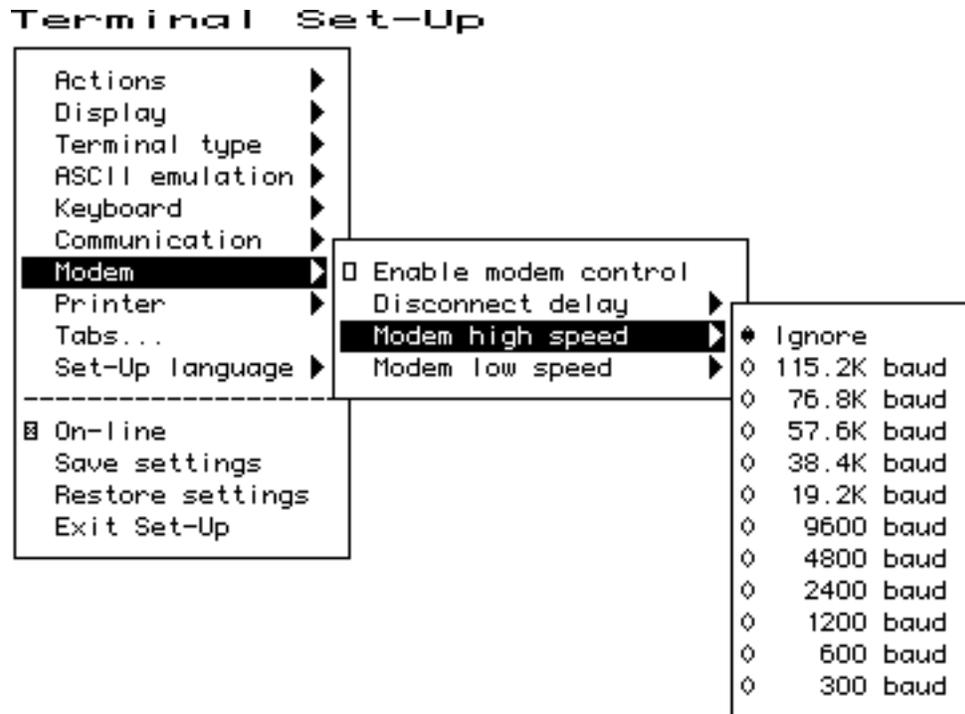
You can select disconnect delay through Set-Up or through control function DECSDDT. Refer to Chapter 9, Communications, for details on the connect and disconnect process.

Terminal Set-Up

2.10 Modem Menu

2.10.3 Modem High Speed

Figure 2-25 Modem High Speed Menu



When modem control is enabled, the speed indicator signal (SI) from the modem may be used to select the communication rate. This feature sets the communication rate to be used when the speed indicator line is "on." Selecting Ignore causes the terminal to use its regular transmit and receive speeds as it would when modem control is disabled.

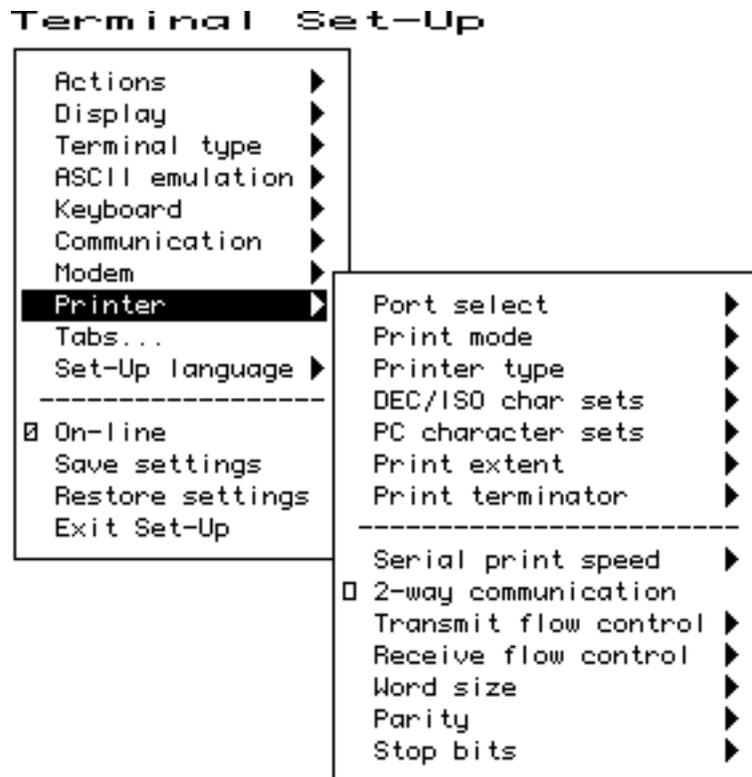
This feature can be invoked by DECSCS.

2.10.4 Modem Low Speed

These selections are the same as the modem high speed selections shown in Figure 2-25. When modem control is enabled, the speed indicator (SI) signal from the modem may be used to select the communication rate. This feature sets the communication rate to be used when the speed indicator line is "off." Selecting Ignore causes the terminal to use its regular transmit and receive speed as it would when modem control is disabled. This feature can be invoked by DECSCS.

2.11 Printer Menu

Figure 2–26 Printer Menu



Printer features shown in Figure 2–26 correspond to the control functions listed in Table 2–8. These functions are described in Chapter 5, ANSI Control Functions and Chapter 10, Printer Port.

2.11.1 Port Select

The **Port select** menu is the same one that appears in the **Communication** menu. You can select the cable connections from either menu.

- S1=comm1 print=comm2
- S1=comm1 print=parallel
- S1=comm2 print=comm1
- S1=comm2 print=parallel

2.11.2 Print Mode

The **Print mode** menu allows you to select the printer operating mode as follows:

- Normal
- Autoprint
- Controller

Terminal Set-Up

2.11 Printer Menu

Note

We recommend that you do not save the Controller mode selection in NVR because this may result in a "hung" terminal if the printer does not have DTR asserted.

Local echo is temporarily disabled when the terminal is in either Local mode or Local Controller mode, because the keyboard input is already being redirected to the screen through the parser or to the printer.

Table 2–8 Printer Features and Control Functions

| Set-Up Feature | Control Function |
|-----------------------|------------------|
| Port select | DECPS |
| Print mode | MC |
| Printer type | DECPRTT |
| DEC/ISO char sets | DECPDECD |
| PC character sets | DECPPCS |
| Print extent | DECPEX |
| Print terminator | DECPFF |
| Serial print speed | DECSCS |
| 2-way communication | MC |
| Transmit flow control | DECSCFC |
| Receive flow control | DECSCFC |
| Word size | DECPP |
| Parity | DECPP |
| Stop bits | DECPP |

2.11.3 Printer Type

You can select the printer type as follows:

- DEC ANSI
 - IBM ProPrinter
 - DEC + IBM

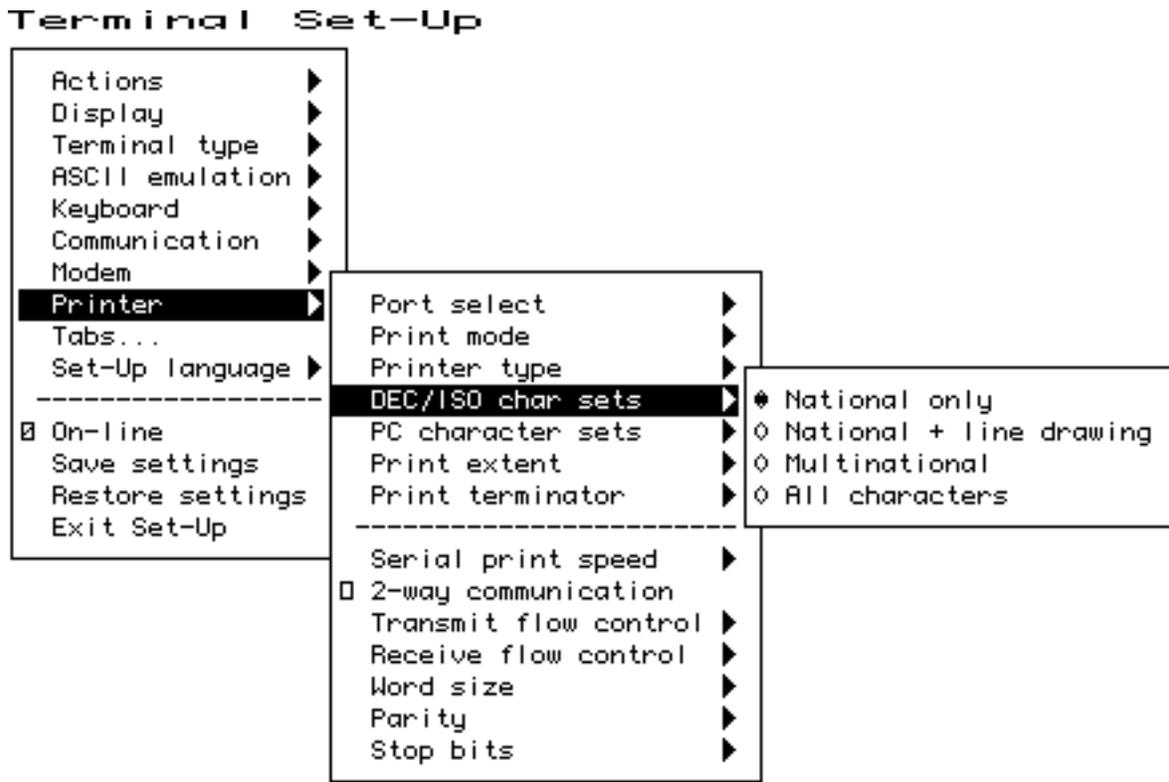
2.11.4 DEC/ISO Character Sets

On the international versions of the terminal, you can enable the character set categories shown in Figure 2–27.

2.11.5 PC Character Sets

On the international versions of the terminal, you can enable the character set categories shown in Figure 2–28. The numbers in parentheses refer to standard PC code pages.

Figure 2-27 DEC/ISO Character Sets Menu



2.11.6 Print Extent

This selection allows you to print a **full page** or just the scroll region.

2.11.7 Print Terminator

The print terminator can be **None** or FF (form feed).

2.11.8 Serial Print Speed

Like the **Communication** menu speed selection (see Figure 2-21), you can select the serial printer speed from 300 to 115.2K baud. The default is **4800** baud.

2.11.9 2-Way Communication

This item allows you to enable and disable bidirectional communications on the printer port. The default is 2-way communication **disabled**.

Terminal Set-Up

2.11 Printer Menu

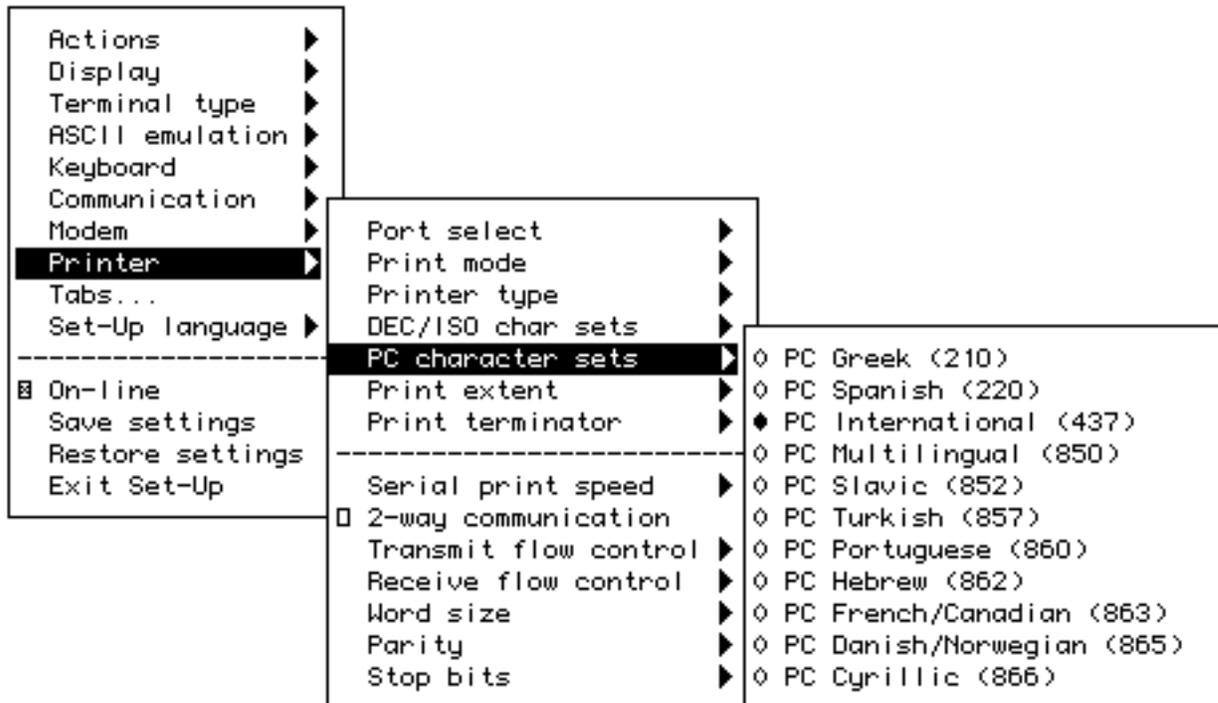
2.11.10 Transmit Flow Control

The printer transmit flow control method can be one of the following:

- None
- XON/XOFF
- DSR (Data Send Ready)
- Both

Figure 2–28 PC Character Sets Menu

Terminal Set-Up



2.11.11 Receive Flow Control

The printer receive flow control method can be one of the following:

- None
- XON/XOFF
- DTR (Data Terminal Ready)
- Both

2.11.12 Word Size

The printer word size can be **8 bits** (default) or 7 bits.

2.11.13 Parity

You can select any of the following parity checks to the printer:

- None
- Even
- Odd
- Mark
- Space

2.11.14 Stop Bits

For the printer, 1 (default) or 2 stop bits can be enabled.

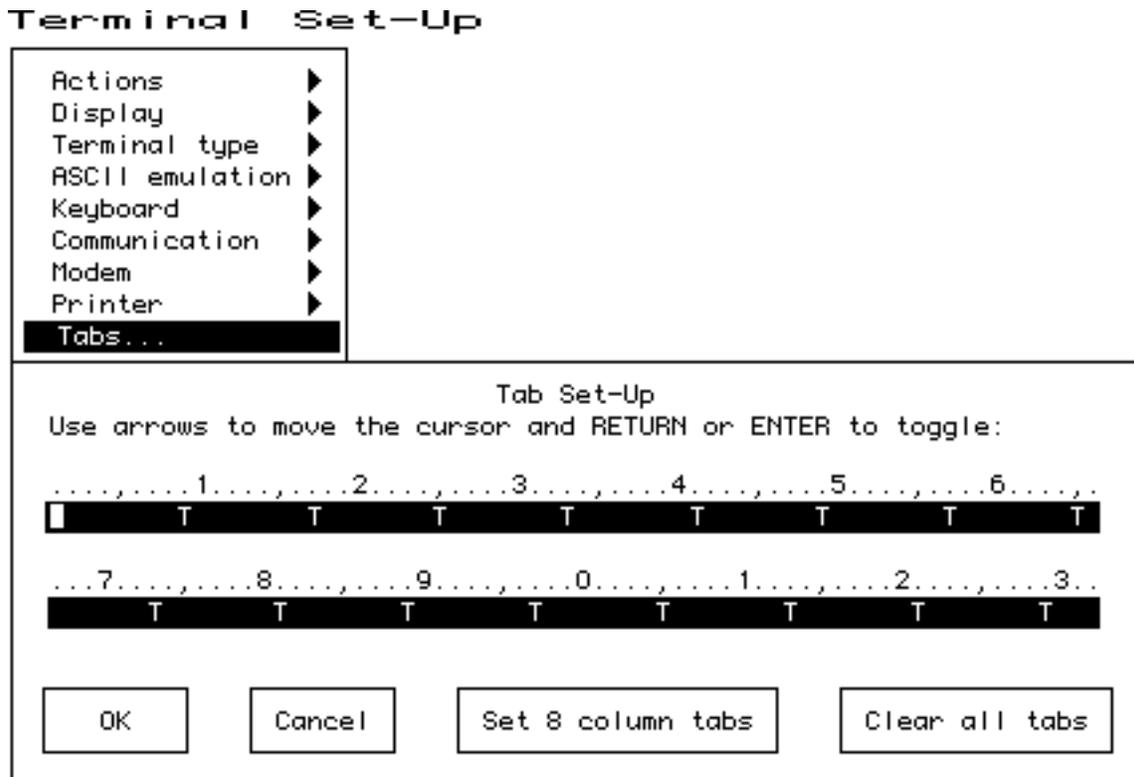
2.12 Tabs . . .

The **Tabs . . .** menu item is used to invoke the Tab Set-Up dialog box, displaying a 132-column tab ruler. Figure 2-29 shows that tab stops are indicated by the letter T.

The highlighting cursor is initially displayed over the entire tab field. The normal character cursor appears in column 1 of the tab field.

The and keys move the cursor within the tab field. Pressing advances the cursor to the next tab stop in the tab field (if any). The character cursor automatically wraps between the end of the first row and the beginning of the second row in the tab field.

Figure 2-29 Tab Set-Up Dialog Box



The labeled buttons allow you to clear all tabs or to set 8-column tabs directly. To set individual tabs:

1. Position the cursor in the desired column.
2. Press to set or clear a tab in that column.

Tab setting can also be invoked by the HTS and DECST8C control functions.

Terminal Set-Up

2.13 Default All Modes

2.13 Default All Modes

Table 2–9 lists the default for each feature in the Set-up Menu.

Table 2–9 Default All Modes

| From Set-up Menu . . . | Set-Up Feature | Default |
|--------------------------|--------------------------|--------------------|
| Display ▷ | Columns per page | 80 |
| | Clear on change | On |
| | Screen background | Dark |
| | Cursor display | Block, Blink, On |
| | Auto wrap | Off |
| | New line mode | Off |
| | Status display | Local status |
| | Scrolling mode | Slow smooth |
| | CRT Saver | On |
| | Show control characters | Off |
| Terminal Type ▷ | Emulation mode | WYSE 160/60 Native |
| ASCII Emulation ▷ | Data lines | 24 |
| | Character cell | 10 × 16 |
| | Pages | 1 × lines |
| | Attribute | Char |
| | Write protect attributes | Dim |
| | Page edit | Off |
| | Received CR | CR |
| | Recognize DEL | Off |
| | Enhance | On |
| | Autoscroll | On |
| | Autopage | Off |
| | Send ACK | On |
| | Auto Answerback | Off |
| | Font load | On |
| | Block mode | Off |
| | Block end | US/CR |
| | Keyboard ▷ | Keyboard language |
| Caps lock function | | Caps lock |
| Keyclick volume | | High |
| Warning bell volume | | High |
| Margin bell | | Off |
| Keyboard encoding | | Character (ASCII) |
| | Auto repeat | On |

(continued on next page)

Table 2–9 (Cont.) Default All Modes

| From Set-up Menu . . . | Set-Up Feature | Default |
|---------------------------|------------------------|--------------------------|
| Communication ▷ | Port select | S1=comm1, print=parallel |
| | Word size | 8 bits |
| | Parity | None |
| | Stop bits | 1 |
| | Transmit speed | 9600 baud |
| | Receive speed | Transmit speed |
| | Transmit flow control | None |
| | Receive flow control | XON/XOFF or XPC |
| | Flow control threshold | Low (64) |
| | Transmit rate limit | 150 cps |
| | Fkey rate limit | 150 cps |
| | Auto answerback | Off |
| | Answerback concealed | Off |
| | Printer ▷ | Port select |
| Print mode | | Normal |
| Set-Up Language ▷ | | English |
| Tabs . . . ▷ | | Set 8 column tabs |

3.1 Introduction

To enhance productivity, the VT510 provides three local functions that can be used at any time the terminal is powered up, even when the terminal is not connected to a host. These functions are:

- Calculator
- Clock
- Character Set Tables

This chapter describes these programs and their interaction with the terminal.

The local functions can be accessed through Set-Up or through a user-programmable key combination. Chapter 2, Terminal Set-Up, describes how to invoke these programs and how to assign a key combination to a program. When one of these programs is invoked, the screen is partially obscured by that program. Pressing **Ctrl/Z**, **F10** (**Exit**), or **ESC** exits the current program and reveals the entire screen contents.

3.2 Calculator

You can enable the **Calculator** function in Set-Up by pressing **Caps Lock** **Alt/F12** if you are not in an ASCII emulation mode.

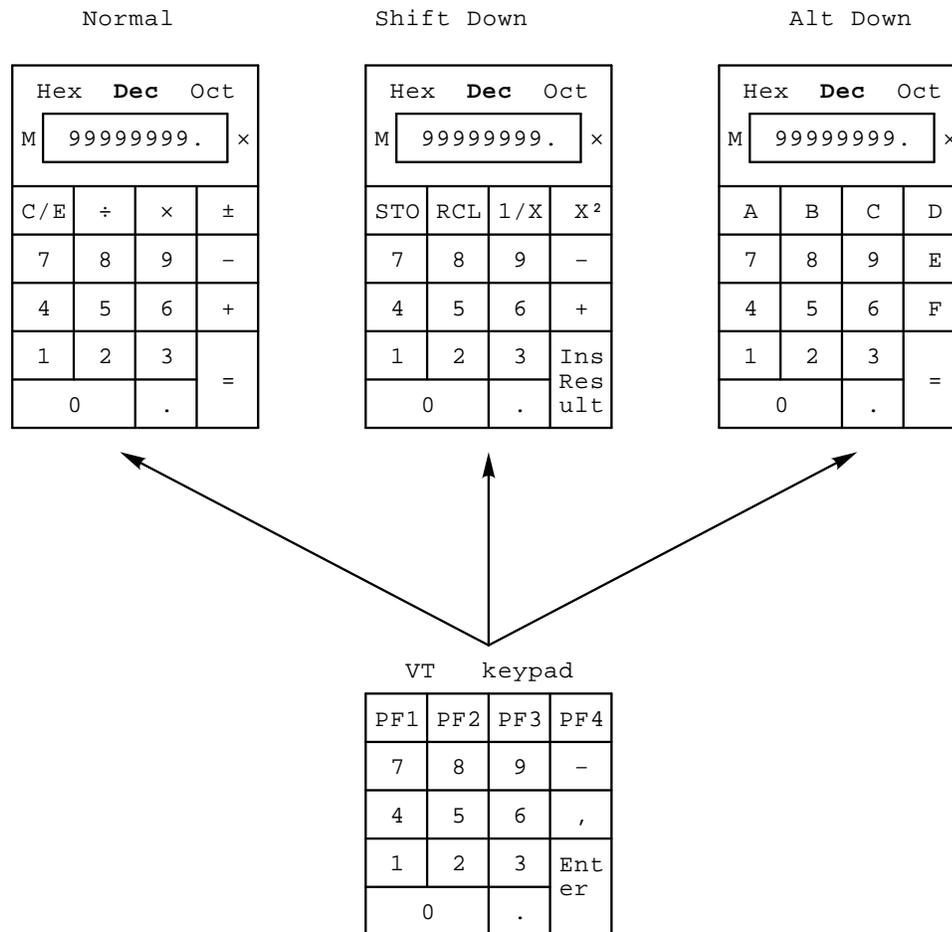
When you select the Calculator function, the terminal displays a simple calculator. See the leftmost layout in Figures 3-1 and 3-2. The keypad keys map directly to the calculator keys. The layout depends on whether a VT or Enhanced PC keyboard is attached, and whether a modifier key (**Shift** or **Alt**) is currently held down.

When a keypad key is pressed, the corresponding key is highlighted (shown in reverse video) on the screen. If a modifier key is pressed down, the display changes to show the new keypad assignment. See the two rightmost layouts in Figures 3-1 and 3-2. All keys not associated with the calculator are ignored.

Desktop Features

3.2 Calculator

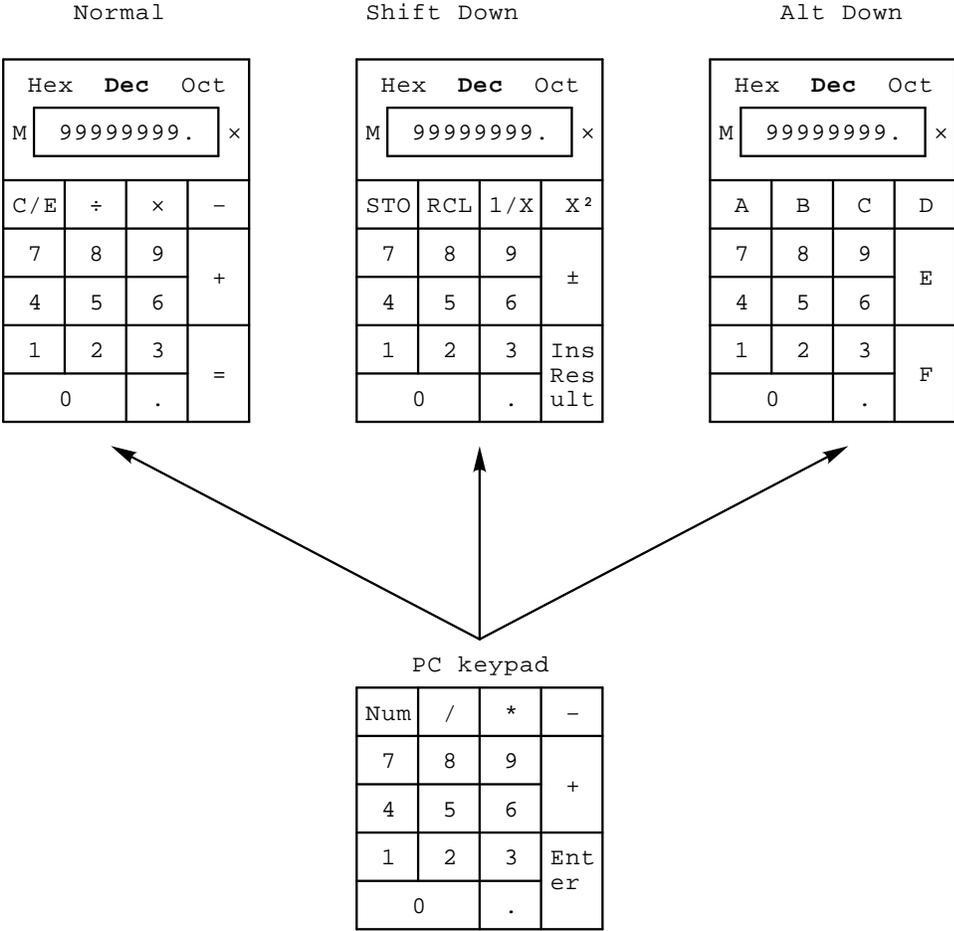
Figure 3–1 Calculator with VT Keyboard Layout



In addition to the numbers on the numeric keypad, you can use the following keys with the calculator:

| Key | Function |
|-----------------------------------|--|
| [H], [O], or [D] | Select hexadecimal, octal, or decimal modes, respectively. |
| Arrow keys | Move the position of the calculator on the screen. |
| [Shift] | Changes the keypad display to allow you to select [STO], [RCL], [1/x], [X ²], and Insert Result ([Shift/Enter]). |
| [Alt] | Changes the keypad display to hexadecimal and allows you to select keys [A] through [F] on the numeric keypad. |
| [C/E] | Clears the entry. |
| [STO] | Stores the number from the display in memory. |
| [RCL] | Recalls the number from memory and places it in the display. |
| [Shift/Enter] (Insert Results) | Inserts the result at the current cursor position after exiting the calculator feature. |

Figure 3–2 Calculator with PC Keyboard Layout



Some keys on the main keypad can also be used for calculator functions:

| Main Keypad Key | Calculator Function |
|--------------------------------------|--|
| <input type="button" value="+"/> | <input type="button" value="."/> (VT keyboard); <input type="button" value="+"/> (PC keyboard) |
| <input type="button" value="-"/> | <input type="button" value="-"/> |
| <input type="button" value="*"/> | <input type="button" value="×"/> |
| <input type="button" value="/"/> | <input type="button" value="÷"/> |
| <input type="button" value="="/> | same as <input type="button" value="Enter"/> |
| <input type="button" value="."/> | <input type="button" value="."/> |
| <input type="button" value="<X"/> | <input type="button" value="C/E"/> |

Desktop Features

3.2 Calculator

While the calculator is on the screen, all other terminal operations are suspended. The first time the calculator is invoked after the terminal is powered on, the display and memory registers contain 0. The display is eleven characters wide: eight characters are used to display the number's digits, one is used for the decimal point, one for the leading sign bit, and the one in the rightmost position is left blank.

The calculator allows the user to add, subtract, multiply, and divide real numbers in the range [-99,999,999. through +99,999,999.]. While one of these operations is in progress, the calculator displays the corresponding symbol [+ - × ÷] to the right of the display. (See the × in the figures.) You can also compute the reciprocal or the square of a number by pressing the $\boxed{1/X}$ or $\boxed{X^2}$ keys, respectively.

All calculator math operations have equal priority except 1/X and X². If a result is wider than the display, then a rounded number will be displayed. The nonrounded result will continue to be used in subsequent calculations.

The calculator has a memory register in which an intermediate result can be stored. When you press \boxed{STO} , you replace the content of this register with the number in the display. When you press \boxed{RCL} , you place the number from memory in the display. If any value is stored in memory, the calculator displays the letter M to the left of the display.

The number in the display (usually the last result) can be inserted at the current cursor position by pressing $\boxed{\text{Shift/Enter}}$ (Insert Result), which exits the calculator and transmits the data to the host.

The calculator can also be used with hexadecimal and octal numbers in addition to the default (decimal). The \boxed{H} , \boxed{O} , or \boxed{D} keys put the calculator in hexadecimal, octal, or decimal modes, respectively. The current mode is in plain text and the other two modes are displayed with the dim attribute. In hexadecimal mode, the numbers A through F are entered by holding down $\boxed{\text{Alt}}$ and typing the corresponding keypad key. See Figures 3-1 and 3-2. The decimal point cannot be used in the hexadecimal or octal modes, and any fractional part is truncated in these two modes.

3.3 Clock

The current time is displayed in the status line, if this feature is enabled. If the 12-hour format is selected, an A or P is displayed after the minutes.

The **Clock** function allows the current time to be set, the hourly chime to be enabled or disabled, and the alarms to be set and armed or disarmed. The current time can also be set from the host through an escape sequence. When the clock function is selected, the window shown in Figure 3-3 is displayed on the screen.

Figure 3–3 Clock Function

| | | |
|---|-------------------------------------|---|
| Time | <input type="text" value="12:34P"/> | <input type="checkbox"/> 24 hour format |
| <input checked="" type="checkbox"/> Alarm1 | <input type="text" value="12:00"/> | <input type="text" value="Message 1"/> |
| <input type="checkbox"/> Alarm2 | <input type="text" value="12:00"/> | <input type="text" value="Message 2"/> |
| <input type="checkbox"/> Hourly chime | | |
| <input type="checkbox"/> Request time at power-up | | |

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The following keys have these functions:

| Key(s) | Function |
|--|---|
| <input type="button" value="↓"/> and <input type="button" value="Tab"/> | Move the cursor to the next text field or check box. |
| <input type="button" value="↑"/> and <input type="button" value="Shift/Tab"/> | Move the cursor to the previous text field or check box. |
| <input type="button" value="←"/> and <input type="button" value="→"/> | Move the cursor inside a text field. |
| <input type="button" value="Return"/> and <input type="button" value="Enter"/> | Toggle the state of the check box. |
| <input type="button" value="←"/> and <input type="button" value="→"/> | Move the cursor inside the current input field. To change the contents of a field, type in the new information. |
| <input type="button" value="A"/> or <input type="button" value="P"/> | If the 24-hour time format is selected, these keys are ignored. If the 12-hour time format is selected, sets the time to either AM or PM. |

You do not need to type the colon (:) character in the time field; the cursor skips over that character position. The check boxes next to the alarms are used to enable or disable the alarms. When an alarm time comes due and the alarm is enabled, the terminal sounds the alarm for 5 seconds or until you type any key.

The terminal also flashes "Alarm1" or "Alarm2" in the error line and the corresponding message associated with the alarm. The maximum size of the alarm messages is 20 characters. When the alarm is cleared (either by typing a key or after the 5 second timeout), the error line also disappears, revealing the status line if it was enabled.

If the hourly chime check box is enabled, the terminal emits a double beep every hour on the hour.

The state of the alarms, the alarm times, and the alarm messages are saved in NVM if the user chooses **Save settings** from Set-Up.

Desktop Features

3.4 Character Set Tables

3.4 Character Set Tables

When you select **Show character sets**, the current character set is shown on the screen. Nonprinting characters are shown in control representation mode wherever possible. The following keys have these functions:

| Key(s) | Function |
|--|--|
| Arrow keys | Highlight (reverse video) any character in the table. The corresponding 8-bit code is displayed in hexadecimal, decimal, octal and binary modes. |
| <input type="text" value="Shift/Enter"/> | Inserts the highlighted character at the current cursor position. Note that this only works with the current character set. |
| <input type="text" value="Next Screen"/> and <input type="text" value="Prev Screen"/> or <input type="text" value="Page Up"/> and <input type="text" value="Page Down"/> | Cycle through the available character sets. |
| <input type="text" value="Shift/L"/> | Displays the line drawing character set. |
| <input type="text" value="Shift/T"/> | Displays the technical character set. |

ASCII terminal emulations support the character sets listed in Table 3–1. They do not support any 8-bit or ISO standard character sets.

Table 3–1 ASCII Emulation Character Sets

| Emulation Mode | Character Set |
|--------------------|---------------------------------|
| WYSE 160/60 Native | Native/WY-50+ |
| WYSE 160/60 PCTerm | PC Multilingual (Code Page 850) |
| WYSE 50+, 150/120 | Native/WY-50+ |
| TVI 950, 925, 910+ | Native/WY-50+ |
| ADDS A2 | Native/WY-50+ |

Part II

VT510 ANSI Mode

This part includes the following chapters:

- Chapter 4, ANSI Control Functions Summary
- Chapter 5, ANSI Control Functions
- Chapter 6, SCO Console Emulation
- Chapter 7, Character Sets
- Chapter 8, Keyboard Processing
- Chapter 9, Communications
- Chapter 10, Printer Port

ANSI Control Functions Summary

4.1 Introduction

This chapter provides a general description of ANSI escape and control sequences, defining control characters, control functions, escape sequences, and device control strings. This chapter provides information on working with 7- and 8-bit environments and the conventions used in each, and it describes the **Show control characters** Set-Up feature. In addition, this chapter provides summary tables of the ANSI control functions.

4.2 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 **Show control characters** from the **Display** Set-Up menu. 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 4-1 lists the C0 control characters the VT510 recognizes. Table 4-2 lists the C1 control characters the VT510 recognizes. You can also code C1 control characters as 7-bit escape sequences. Table 4-3 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 4-1 C0 (7-Bit) Control Characters Recognized

| Name | Mnemonic Column/Row | Function |
|---------|------------------------|---|
| Null | NUL 0/0 | NUL has no function (ignored by the terminal). |
| Enquiry | ENQ 0/5 | Sends the answerback message. (Communications Set-Up) |
| Bell | BEL 0/7 | Sounds the bell tone if the bell is enabled in Keyboard Set-Up. |
| BS | BS 0/8 | Moves the cursor one character position to the left. If the cursor is at the left margin, no action occurs. |

(continued on next page)

ANSI Control Functions Summary

4.2 Control Characters

Table 4–1 (Cont.) C0 (7-Bit) Control Characters Recognized

| Name | Mnemonic Column/Row | Function |
|-----------------------------|-------------------------|---|
| Horizontal tab | HT 0/9 | 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. |
| 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. |
| Shift in (locking shift 0) | SI (LS0) 0/15 | Maps the G0 character set into GL. You designate G0 by using a select character set (SCS) sequence. |
| Device control 1 (XON) | DC1 1/1 | Also known as XON. If XON/XOFF flow control is enabled in Communications Set-Up, DC1 clears DC3 (XOFF). This action causes the VT510 to continue sending characters. |
| Device control 3 (XOFF) | DC3 1/3 | Also known as XOFF. If XON/XOFF flow control is enabled in Communications Set-Up, DC3 causes the VT510 to stop sending characters. The terminal cannot resume sending characters until it receives a DC1 control character. |
| Cancel | CAN 1/8 | Immediately cancels an escape sequence, control sequence, or device control string in progress. In this case, the VT510 does not display any error character. |
| Substitute | SUB 1/10 | Immediately cancels an escape sequence, control sequence, or device control string in progress, and displays a reverse question mark as 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. |

ANSI Control Functions Summary 4.2 Control Characters

Table 4–2 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. |
| 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. |
| 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. |
| Device control string | DCS 9/0 | Introduces a device control string that uses 8-bit characters. A DCS control string is used for loading function keys or a soft character set. |
| Start of string | SOS 9/8 | Ignored. |
| VT identification | DECID 9/10 | Makes the terminal send its device attributes response to the host (same as an ANSI device attributes (DA) sequence). Programs should use the ANSI DA sequence instead. If the printer is in controller mode, the terminal sends the sequence to the printer. |
| Control sequence introducer | CSI 9/11 | Introduces a control sequence that uses 8-bit characters. |
| 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 VT510 ignores all following characters until it receives a SUB, ST, or any other C1 control character.

ANSI Control Functions Summary

4.2 Control Characters

Table 4-3 8-Bit Control Characters and Their 7-Bit Equivalents

| Name | 8-Bit Character | 7-Bit Sequence | |
|-----------------------------|----------------------|---------------------------|--|
| Index | IND 8/4 | ESC D 1/11 4/4 | |
| Next line | NEL 8/5 | ESC E 1/11 4/5 | |
| 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 | |
| Start of string | SOS 9/8 | ESC X 1/11 5/8 | |
| VT identification | DECID 9/10 | ESC Z 1/11 5/10 | |
| Control sequence introducer | CSI 9/11 | ESC [1/11 5/11 | |
| String terminator | ST 9/12 | 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 | |

4.3 Control Functions

You use control functions to make the terminal perform special actions in your applications. 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.

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.

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 some manufacturers, for specific families of products. ANSI sequences and private sequences follow ANSI and ISO standards for control functions.

In this manual, control functions created for the VT 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 a 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.

4.3.1 Sequence Format

This manual shows escape and control sequences in their 8-bit format. You can also use equivalent 7-bit sequences (Table 4–3).

The 8-bit format uses the C0 and C1 control characters and ASCII characters from the 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.

4.3.2 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 1/11 | I 2/0 to 2/15 | F 3/0 to 7/14 |
| Escape character | 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.

ANSI Control Functions Summary

4.3 Control Functions

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 |

4.3.3 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 2/25 | 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 VT parameters follow. The terminal interprets VT parameters according to ANSI X3.64 and ISO 6429.

The VT510 processes two types to parameters, numeric and selective.

4.3.3.1 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.

4.3.3.2 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 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.

4.3.4 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 | 2/0 | 4/0 | ***** | 9/12 |
| | to | to | to | | |
| | 3/15 | 3/15 | 3/15 | | |
| 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.

ANSI Control Functions Summary

4.3 Control Functions

P...P are *parameter characters* received after DCS. The use of parameter characters in a device control string is a Digital extension to the ANSI syntax. According to ANSI standards, any elements included after DCS are part of the data string.

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 “Section 4.3.3” 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 9/0 | 0 3/0 | ! 2/1 | u 7/5 | % 2/5 | 5 3/5 | ST 9/12 |
| Device control string introducer | Para- meter | Inter- mediate | Final | Data string | | String terminator |

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

4.3.5 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 VT510 interprets the characters following CAN as usual.
- You can send SUB (1/10) to cancel a sequence in progress. The VT510 interprets the characters following SUB as usual.

The VT510 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.

4.3.6 7-Bit Code Extension 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 code extension. The 7-bit code extension 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 Code Extension Escape Sequence | |
|-------------------------------|---|------------------|
| CSI 9/11 | ESC 1/11 | [5/11 |
| SS3 8/15 | ESC 1/11 | O 4/15 |
| IND 8/4 | ESC 1/11 | D 4/4 |
| DCS 9/0 | ESC 1/11 | P 5/0 |

In general, you can use the 7-bit code extension 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 40₁₆ or 64₁₀ less than the code 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 40₁₆ 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.

4.4 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 VT level 4 or PC TERM mode. When the terminal operates in VT level 1 mode or VT52 mode, you are limited to working in a 7-bit environment.)

The following sections describe conventions that apply in VT level 4.

4.4.1 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 code extensions, 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 ASCII character set in GL and the current user-preferred character set in GR. You select the user-preferred set in the **Terminal type, VT default character set** Set-Up menu. This mapping assumes the current terminal mode is VT level 4.

ANSI Control Functions Summary

4.4 Working with 7-Bit and 8-Bit Environments

4.4.2 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 code extensions before sending them to the application. To convert C1 characters, you use the DECSCL commands.)

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

Note

In VT level 4, 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.

4.5 Show Control Characters

The VT510 lets you display control characters as graphic characters, when you want to debug your applications. With this mode enabled, the terminal does not perform all control functions.

To enable this mode, use the **Display** Set-Up menu and enable the checkbox for **Show control characters**; or you can use the **control representation mode (CRM)** control sequence. (You cannot select this mode with an escape sequence.)

In VT level 4 mode

The terminal temporarily loads a special graphic character set into C0, GL, C1, and GR. Figures 4-1 and 4-2 shows this special set, called the display controls font. The terminal uses this font to display control characters on the screen.

In VT level 1 or VT52 mode

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 emulations.)

When displaying 36 or more lines on the screen

When you display 36 or more lines on the screen (DECSNLS), the terminal uses a smaller font to display control characters. The smaller font represents each control character as a two-character symbol instead of a three-character symbol. Figures 4-1 and 4-2 show what the control characters look like when displaying 24 or 25 lines on the screen. Table 4-4 shows the abbreviation for the control characters in the smaller font.

ANSI Control Functions Summary

4.5 Show Control Characters

Table 4–4 Control Character Displayed on Screen

| Control Character in Large Font | Control Character in Small Font | Name |
|------------------------------------|------------------------------------|-----------------------------|
| NUL | NL | Null |
| SOH | SH | Start of heading |
| STX | SX | Start of text |
| ETX | EX | End of text |
| EOT | ET | End of transmission |
| ENQ | EN | Enquire |
| ACK | AK | Acknowledge |
| BEL | BL | Bell |
| BS | BS | Backspace |
| HT | HT | Horizontal tab |
| LF | LF | Line feed |
| VT | VT | Vertical tab |
| FF | FF | Form feed |
| CR | CR | Carriage return |
| SO | SO | Shift out |
| SI | SI | Shift in |
| DLE | DE | Data link escape |
| DC1 | D1 | Device control 1 (XON) |
| DC2 | D2 | Device control 2 |
| DC3 | D3 | Device control 3 (XOFF) |
| DC4 | D4 | Device control 4 |
| NAK | NK | Negative acknowledge |
| SYN | SY | Synchronous idle |
| ETB | EB | End of transmission block |
| CAN | CA | Cancel |
| EM | EM | End of medium |
| SUB | SB | Substitute |
| ESC | EC | Escape |
| FS | FS | Field separator |
| GS | GS | Group separator |
| RS | RS | Record separator |
| US | US | Unit separator |
| IND | IN | Index |
| NEL | NE | Next line |
| SSA | SA | Start selected area |
| ESA | EA | End selected area |
| HTS | HS | Horizontal tab set |
| HTJ | HJ | Horizontal tab with justify |
| VTS | VS | Vertical tab set |
| PLD | PD | Partial line down |
| PLU | PU | Partial line up |
| RI | RI | Reverse index |
| SS2 | S2 | Single shift 2 |

(continued on next page)

ANSI Control Functions Summary

4.5 Show Control Characters

Table 4–4 (Cont.) Control Character Displayed on Screen

| Control Character in Large Font | Control Character in Small Font | Name |
|------------------------------------|------------------------------------|-----------------------------|
| SS3 | S3 | Single shift 3 |
| DCS | DC | Device control string |
| PU1 | P1 | Private use 1 |
| PU2 | P2 | Private use 2 |
| STS | SS | Set transmit state |
| CCH | CC | Cancel character |
| MW | MW | Message waiting |
| SPA | SP | Start protected area |
| EPA | EP | End protected area |
| CSI | CS | Control sequence introducer |
| ST | ST | String terminator |
| OSC | OS | Operating system command |
| PM | PM | Private message |
| APC | AP | Application program command |
| NS | NS | No-break space |

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.

ANSI Control Functions Summary

4.5 Show Control Characters

Figure 4–1 Show Control Characters Font (Left Half)

| Column | | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---------|-------------|-------------|---------------|--------------|-------------|--------------|--------------|---------------|-----------------|
| b8 Bits | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| b7 | | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 |
| b6 | | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 |
| b5 | | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
| Row | b4 b3 b2 b1 | | | | | | | | |
| 0 | 0 0 0 0 | NUL 0000 | DLO 201610 | SP 403220 | 0 604830 | @ 1006440 | P 1208050 | ' 1409660 | p 16011270 |
| 1 | 0 0 0 1 | SOH 1111 | DC1 211711 | ! 413321 | 1 614931 | A 1016541 | Q 1218151 | a 1419761 | q 16111371 |
| 2 | 0 0 1 0 | STX 2222 | DC2 221812 | " 343422 | 2 505032 | B 1026642 | R 1228252 | b 1429862 | r 16211472 |
| 3 | 0 0 1 1 | ETX 3333 | DC3 231913 | # 433523 | 3 635133 | C 1036743 | S 1238353 | c 1439963 | s 16311573 |
| 4 | 0 1 0 0 | EOT 4444 | DC4 242014 | \$ 443624 | 4 645234 | D 1046844 | T 1248454 | d 14410064 | t 16411674 |
| 5 | 0 1 0 1 | ENQ 5555 | NAK 252115 | % 453725 | 5 655335 | E 1056945 | U 1258555 | e 14510165 | u 16511775 |
| 6 | 0 1 1 0 | ACK 6666 | SYN 262216 | & 463826 | 6 665436 | F 1067046 | V 1268656 | f 14610266 | v 16611876 |
| 7 | 0 1 1 1 | BEL 7777 | ETB 272317 | ' 473927 | 7 675537 | G 1077147 | W 1278757 | g 14710367 | w 16711977 |
| 8 | 1 0 0 0 | BS 1088 | CAN 302418 | (504028 | 8 705638 | H 1107248 | X 1308858 | h 15010468 | x 17012078 |
| 9 | 1 0 0 1 | HT 1199 | EM 312519 |) 514129 | 9 715739 | I 1117349 | Y 1318959 | i 15110569 | y 17112179 |
| 10 | 1 0 1 0 | LF 1210A | ? 32261A | * 52422A | : 72583A | J 112744A | Z 132905A | j 1521066A | z 1721227A |
| 11 | 1 0 1 1 | VT 1311B | ESC 33271B | + 53432B | ; 73593B | K 113754B | [133915B | k 1531076B | { 1731237B |
| 12 | 1 1 0 0 | FF 1412C | FS 34281C | , 54442C | < 74603C | L 114764C | \ 134925C | l 1541086C | 1741247C |
| 13 | 1 1 0 1 | CR 1513D | GS 35291D | - 55452D | = 75613D | M 115774D |] 135935D | m 1551096D | } 1751257D |
| 14 | 1 1 1 0 | SO 1614E | RS 36301E | . 56462E | > 76623E | N 116784E | ^ 136945E | n 1561106E | ~ 1761267E |
| 15 | 1 1 1 1 | SI 1715F | US 37311F | / 57472F | ? 77633F | O 117794F | _ 137955F | o 1571116F | D_T 1771277F |



Key

| | | | |
|-----------|-----|----------------|-------------------------|
| Character | ESC | 33 27 1B | Octal Decimal Hex |
|-----------|-----|----------------|-------------------------|

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ANSI Control Functions Summary

4.5 Show Control Characters

Figure 4-2 Show Control Characters Font (Right Half)

| 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | Column | Row |
|-------------------------------------|-------------------------------------|-------------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-------------------------------------|-----|
| 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 b4 b3 b2 b1 | |
| 8 ₀ 200 128 80 | D _{CS} 220 144 90 | N _{SP} 240 160 A0 | ° 260 176 B0 | À 300 192 C0 | Ð 320 208 D0 | à 340 224 E0 | ÿ 360 240 F0 | 0 0 0 0 | 0 |
| 8 ₁ 201 129 81 | P _{U1} 221 145 91 | ì 241 161 A1 | ± 261 177 B1 | Á 301 193 C1 | Ñ 321 209 D1 | á 341 225 E1 | ÿ 361 241 F1 | 0 0 0 1 | 1 |
| 8 ₂ 202 130 82 | P _{U2} 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 |
| 8 ₃ 203 131 83 | S _{TS} 223 147 93 | í 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 |
| I _{ND} 204 132 84 | C _{RH} 224 148 94 | œ 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 |
| N _{EL} 205 133 85 | M _W 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 |
| S _{SA} 206 134 86 | S _{PA} 226 150 96 | ı 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 |
| E _{SA} 207 135 87 | E _{PA} 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 |
| H _{TS} 210 136 88 | 9 ₈ 230 152 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 |
| H _{TJ} 211 137 89 | 9 ₉ 231 153 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 |
| V _{TS} 212 138 8A | 9 _A 232 154 9A | à 252 170 AA | ó 272 186 BA | Ê 312 202 CA | Ú 332 218 DA | ê 352 234 EA | ú 372 250 FA | 1 0 1 0 | 10 |
| P _{LD} 213 139 8B | C _{SI} 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 |
| P _{LU} 214 140 8C | S _T 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 |
| R _I 215 141 8D | O _{SC} 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 |
| S _{S2} 216 142 8E | P _M 236 158 9E | ® 256 174 AE | ¾ 276 190 BE | Î 316 206 CE | ÿ 336 222 DE | î 356 238 EE | ÿ 376 254 FE | 1 1 1 0 | 14 |
| S _{S3} 217 143 8F | A _{PC} 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 |



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4.6 ANSI Control Function Tables

The tables in this section summarize the ANSI Control Functions for ANSI-compatible VT mode and PCTerm mode. Default conditions are in boldface type. Chapter 5 describes all the ANSI control functions in alphabetical order by mnemonic.

Table 4–5 lists the text processing control functions; Table 4–6, the reports control functions; Table 4–7, the terminal management control functions; Table 4–8, the keyboard processing control functions; and Table 4–9, the communications control functions. In these tables, the word “same” signifies the same control sequences as in the VT510 column.

Table 4–5 Text Processing Control Functions

| Active Position and Cursor | Control Function | | | | Mnemonic |
|--------------------------------------|---|-------|-------|--|----------|
| | VT510 | VT420 | VT100 | | |
| Auto Resize Mode | | n/a | n/a | | DECARSM |
| Set (enable): | CSI ? 98 h | | | | |
| Reset (disable): | CSI ? 98 I | | | | |
| Backspace | BS | same | same | | BS |
| Carriage Return | CR | same | same | | CR |
| Cursor Backward | CSI <i>Pc</i> D | same | same | | CUB |
| Cursor Backward Tabulation | CSI <i>Pn</i> Z | n/a | n/a | | CBT |
| Cursor Down | CSI <i>Pl</i> B | same | same | | CUD |
| Cursor Forward | CSI <i>Pc</i> C | same | same | | CUF |
| Cursor Horizontal Absolute | CSI <i>Pn</i> G | n/a | n/a | | CHA |
| Cursor Horizontal Forward Tab | CSI <i>Pn</i> I | n/a | n/a | | CHT |
| Cursor Information Report | DCS 1\$u D.....D ST | same | n/a | | DECCIR |
| Cursor Next Line | CSI <i>Pn</i> E | n/a | n/a | | CNL |
| Cursor Previous Line | CSI <i>Pn</i> F | n/a | n/a | | CPL |
| Cursor Position | CSI <i>Pl</i> ; <i>Pc</i> H | same | same | | CUP |
| Cursor Position Report | CSI 6 n | same | same | | CPR |
| (Also see DECCIR, DECXCPR, and DSR.) | | | | | |
| Response: | CSI <i>Pl</i> ; <i>Pc</i> R | | | | |
| <i>Pl</i> No. of lines | | | | | |
| <i>Pc</i> No. of columns | | | | | |
| Cursor Up | CSI <i>Pl</i> A | same | same | | CUU |
| Extended Cursor Position Report | CSI ? 6 n | same | n/a | | DECXCPR |
| Response: | CSI <i>Pl</i> ; <i>Pc</i> ; <i>Pp</i> R | | | | |
| <i>Pl</i> Line | | | | | |
| <i>Pc</i> Column | | | | | |
| <i>Pp</i> Page | | | | | |
| Form Feed | FF | same | same | | FF |
| Horizontal Tab | HT | same | same | | HT |
| Horizontal/Vertical Position | CSI <i>Pl</i> ; <i>Pc</i> f | same | same | | HVP |
| <i>Pl</i> No. of lines to move to | | | | | |
| <i>Pc</i> No. of columns to move to | | | | | |
| Horizontal Position Absolute | CSI <i>Pn</i> ‘ | same | same | | HPA |
| Horizontal Position Relative | CSI <i>Pn</i> a | same | same | | HPR |
| Line Feed | LF | same | same | | LF |
| Line Feed/New Line Mode | | same | same | | LNLM |
| Set (NL): | CSI 20 h | | | | |
| Reset (LF): | CSI 20 I | | | | |

(continued on next page)

ANSI Control Functions Summary

4.6 ANSI Control Function Tables

Table 4–5 (Cont.) Text Processing Control Functions

| Active Position and Cursor | Control Function | | | | Mnemonic |
|---------------------------------------|--------------------|-------|-------|--|----------|
| | VT510 | VT420 | VT100 | | |
| Next Line | ESC E | same | same | | NEL |
| No clear screen on column change | | n/a | n/a | | DECNCSM |
| Do not clear: | CSI ? 95 h | | | | |
| Clear screen: | CSI ? 95 I | | | | |
| Restore Cursor | ESC 8 | same | same | | DECRC |
| Restore Saved Cursor (SCO) | CSI u | n/a | n/a | | SCORC |
| Right-to-Left Copy | | n/a | n/a | | DECRLCM |
| Set: | CSI ? 96 h | | | | |
| Reset: | CSI ? 96 I | | | | |
| Right-to-Left Mode | | n/a | n/a | | DECRLM |
| Set: | CSI ? 34 h | | | | |
| Reset: | CSI ? 34 I | | | | |
| Save Cursor | ESC 7 | same | same | | DECSC |
| Save Cursor Position (SCO) | CSI s | n/a | n/a | | SCOSC |
| Set Cursor Style | CSI <i>Ps</i> SP q | n/a | n/a | | DECSCUSR |
| <u><i>Ps</i></u> | | | | | |
| none,0,1 Blinking block | | | | | |
| 2 Steady block | | | | | |
| 3 Blinking underline | | | | | |
| 4 Steady underline | | | | | |
| Select Set-Up Language | CSI <i>Ps</i> p | n/a | n/a | | DECSSL |
| <u><i>Ps</i></u> | | | | | |
| none,0,1 English | | | | | |
| 2 French | | | | | |
| 3 German | | | | | |
| 4 Spanish | | | | | |
| 5 Italian | | | | | |
| Show Control Character Mode | | same | same | | CRM |
| Set (show): | CSI 3 h | | | | |
| Reset (interpret): | CSI 3 I | | | | |
| Text Cursor Enable Mode | | same | n/a | | DECTCEM |
| Set (visible): | CSI ? 25 h | | | | |
| Reset (invisible): | CSI ? 25 l | | | | |
| Vertical Line Position Absolute | CSI <i>Pn</i> d | n/a | n/a | | VPA |
| Vertical Line Position Relative | CSI <i>Pn</i> e | n/a | n/a | | VPA |
| Vertical Tab | VT | same | same | | VT |
| Vertical Autowrap | | same | n/a | | DECAWM |
| Set (enable): | CSI ? 7 h | | | | |
| Reset (disable): | CSI ? 7 I | | | | |
| <hr/> | | | | | |
| Horizontal Tabs—Set/Clear | | | | | |
| Set Horizontal Tab | ESC H | same | same | | HTS |
| Set Tab at every 8 columns | CSI ? 5 W | n/a | n/a | | DECST8C |
| Clear Tabs | CSI <i>Ps</i> g | same | same | | TBC |
| <u><i>Ps</i></u> | <u>Clear . . .</u> | | | | |
| none, 0 tab at cursor | | | | | |
| 3 all tabs | | | | | |

(continued on next page)

ANSI Control Functions Summary 4.6 ANSI Control Function Tables

Table 4–5 (Cont.) Text Processing Control Functions

| Margins and Scrolling | Control Function | | | | Mnemonic |
|---|--|------------------|-------|--|----------|
| | VT510 | VT420 | VT100 | | |
| Back Index | ESC 6 | same | n/a | | DECBI |
| Forward Index | ESC 9 | same | n/a | | DECFI |
| Index | ESC D | same | same | | IND |
| Origin Mode | | same | same | | DECOM |
| | Set (in margins): | CSI ? 6 h | | | |
| | Reset (upper-left): | CSI ? 6 l | | | |
| Reverse Index | ESC M | same | same | | RI |
| Scrolling Mode | | same | same | | DECSCLM |
| | Set (smooth): | CSI ? 4 h | | | |
| | Reset (jump): | CSI ? 4 l | | | |
| Set Left and Right Margin | CSI <i>Pl</i> ; <i>Pr</i> s | same | same | | DECSLRM |
| <i>Pl</i> | Left column margin (default = 1) | | | | |
| <i>Pr</i> | Right column margin (default = 80 or 132 , depending on page width) | | | | |
| Set Scroll Speed | CSI <i>Ps</i> SP p | n/a | n/a | | DECSSCLS |
| <i>Ps</i> | | | | | |
| none , 0, | Smooth 2 | | | | |
| 1, 2, 3 | | | | | |
| 4, 5, 6, | Smooth 4 | | | | DECSCLM |
| 7, 8 | | | | | |
| 9 | Jump | | | | |
| Set Top and Bottom Margin | CSI <i>Pt</i> ; <i>Pb</i> r | same | same | | DECSTBM |
| <i>Pt</i> | Top margin (default = 1) | | | | |
| <i>Pb</i> | Bottom margin (default = lines per screen) | | | | |
| Page Arrangement and Size ¹ | | | | | |
| Column Mode | | same | same | | DECCOLM |
| | Set (132 columns): | CSI ? 3 h | | | |
| | Reset (80 columns): | CSI ? 3 l | | | |
| Set Columns per Page | CSI <i>Ps</i> \$ | same | n/a | | DECSCPP |
| <i>Ps</i> | Set each page to . . . | | | | |
| 0 or 80 | 80 columns | | | | |
| 132 | 132 columns | | | | |
| Set Lines Per Page | CSI <i>Pn</i> t | same | same | | DECSLPP |
| Vertical Split Screen | | same | n/a | | DECVSSM |
| | Set (enable): | CSI 69 h | | | |
| | Reset (disable): | CSI 69 l | | | |

¹The page size can be 24, 25, 36, 42, 48, 52, and 72 lines with 80 or 132 columns.

(continued on next page)

ANSI Control Functions Summary

4.6 ANSI Control Function Tables

Table 4–5 (Cont.) Text Processing Control Functions

| Page Movement | Control Function | | | | Mnemonic |
|--|-----------------------------------|--------------|--------------|--|----------|
| | VT510 | VT420 | VT100 | | |
| Next Page <i>Pn</i> Number of pages to move (0 or 1 = 1 page) | CSI <i>Pn</i> U | same | same | | NP |
| Preceding Page <i>Pn</i> Number of pages to move (0 or 1 = 1 page) | CSI <i>Pn</i> V | same | same | | PP |
| Page Position Absolute | CSI <i>Pn</i> SP P | same | same | | PPA |
| Page Position Backward | CSI <i>Pn</i> SP R | same | same | | PPB |
| Page Position Relative | CSI <i>Pn</i> SP Q | same | same | | PPR |
| WINDOW MANAGEMENT | | | | | |
| Coupling Mode | | | | | |
| Page Cursor Coupling Set: Reset: | CSI ? 64 h CSI ? 64 l | same | n/a | | DECPCCM |
| Vertical Cursor Coupling Set: Reset: | CSI ? 61 h CSI ? 61 l | same | n/a | | DECVCCM |
| Display Extent | | | | | |
| Request Displayed Extent | CSI " v | same | n/a | | DECRQDE |
| Report Displayed Extent | CSI <i>Ph;Pw;Pml;Pmt;Pmp;</i> " w | same | n/a | | DECRPDE |
| Select number of lines per screen | CSI <i>Pn</i> * | same | same | | DECSNLS |
| Pan Direction | | | | | |
| Pan Down | CSI <i>P/S</i> | same | same | | SD |
| Pan Up | CSI <i>P/T</i> | same | same | | SU |
| Audible and Visual Attributes | | | | | |
| Bell | BEL | same | same | | BEL |
| Double Height Line Top | ESC # 3 | same | same | | DECDHLT |
| Double Height Line Bottom | ESC # 4 | same | same | | DECDHLB |
| Single Width Line | ESC # 5 | same | same | | DECSWL |
| Double Width Line | ESC # 6 | same | same | | DECDWL |
| Screen Mode – Light/Dark Set (light background): Reset (dark background): | CSI ? 5 h CSI ? 5 l | same same | same same | | DECSCNM |

(continued on next page)

ANSI Control Functions Summary 4.6 ANSI Control Function Tables

Table 4–5 (Cont.) Text Processing Control Functions

| Audible and Visual Attributes (Cont.) | Control Function | | | |
|---|---|-------|-------|----------|
| | VT510 | VT420 | VT100 | Mnemonic |
| Select Graphic Rendition ² | CSI <i>Ps</i> ; <i>Ps</i> m | same | same | SGR |
| <u><i>Ps</i></u> Attribute | | | | |
| 0 All attributes off | | | | |
| 1 Bold | | | | |
| 4 Underline | | | | |
| 5 Blinking | | | | |
| 7 Negative image | | | | |
| 8 Invisible image | | | | |
| 10 ASCII char set (SCO only) ³ | | | | |
| 11 Map 00-7F (SCO only) | | | | |
| 12 Map 80-FF (SCO only) | | | | |
| 22 Bold off | | | | |
| 24 Underline off | | | | |
| 25 Blinking off | | | | |
| 27 Negative image off | | | | |
| 28 Invisible image off | | | | |
| <hr/> | | | | |
| GRAPHIC CHARACTER SETS | | | | |
| Assign User-Preference Supp Set | DCS <i>Ps</i> ! u <i>Dscs</i> ST | same | n/a | DECAUPSS |
| <u><i>Ps</i></u> | | | | |
| 0 94-Character Set | | | | |
| 1 96-Character Set | | | | |
| <u><i>Dscs</i></u> Default 94-Character Set | <u><i>Dscs</i></u> Default 96-Character Set | | | |
| % 5 DEC Supplemental | A ISO Latin-1 Supplemental | | | |
| " ? DEC Greek | B ISO Latin-2 Supplemental | | | |
| " 4 DEC Hebrew | F ISO Greek Supplemental | | | |
| % 0 DEC Turkish | H ISO Hebrew Supplemental | | | |
| & 4 DEC Cyrillic | L ISO Latin-Cyrillic | | | |
| < User-preferred supplemental | M ISO Latin-5 Supplemental | | | |
| | < User-preferred supplemental | | | |
| Display PC Characters (SCO) | ESC xx | n/a | n/a | |
| Select Character Set | ESC I <i>Dscs</i> | same | n/a | SCS |
| <u><i>I</i></u> 94-Character G-set | <u><i>I</i></u> 96-Character G-set | | | |
| (G0 | - G1 | | | |
|) G1 | . G2 | | | |
| * G2 | / G3 | | | |
| + G3 | | | | |
| <u><i>Dscs</i></u> Default 94-Character Set | <u><i>Dscs</i></u> Default 96-Character Set | | | |
| & 4 Cyrillic (DEC) | A ISO Latin-1 Supplemental | | | |
| A British/U.K. NRCS | B ISO Latin-2 Supplemental | | | |
| <u><i>Dscs</i></u> Default 94-Character Set | <u><i>Dscs</i></u> Default 96-Character Set | | | |
| 5 or C Finnish NRCS | F ISO Greek Supplemental | | | |

²The ANSI mode supports Bold, Blink, Underline, and Reverse graphic renditions.

³See SGR—Select Graphic Rendition in Chapter 5.

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ANSI Control Functions Summary

4.6 ANSI Control Function Tables

Table 4–5 (Cont.) Text Processing Control Functions

| GRAPHIC CHARACTER SETS | | | | |
|------------------------|---------------------------------|---|-----------------------------|--|
| R | French NRCS | H | ISO Hebrew Supplemental | |
| 9 or Q | French Canadian NRCS | M | ISO Latin-5 Supplemental | |
| K | German NRCS | L | ISO Latin-Cyrillic | |
| " ? | Greek (DEC) | < | User-preferred Supplemental | |
| " > | Greek NRCS | | | |
| <u>Dscs</u> | <u>Default 94-Character Set</u> | | | |
| " 4 | Hebrew (DEC) | | | |
| % = | Hebrew NRCS | | | |
| Y | Italian NRCS | | | |
| ‘, E, or 6 | Norwegian/Danish NRCS | | | |
| % 6 | Portuguese NRCS | | | |
| & 5 | Russian NRCS | | | |
| % 3 | SCS NRCS | | | |
| Z | Spanish NRCS | | | |
| 7 or H | Swedish NRCS | | | |
| = | Swiss NRCS | | | |
| % 0 | Turkish (DEC) | | | |
| % 2 | Turkish NRCS | | | |
| 0 | DEC Special Graphic | | | |
| % 5 | DEC Supplemental | | | |
| > | DEC Technical Character Set | | | |
| < | User-preferred Supplemental | | | |

| Supplemental Character Set | Control Function | | | | Mnemonic |
|---|--------------------|-------|-------|--|-----------|
| | VT510 | VT420 | VT100 | | |
| National Replacement Character Set Mode | | same | n/a | | DECNRCM |
| Set (National): (7-bit characters) | CSI ? 42 h | | | | |
| Reset (Multinational): (8-bit characters) | CSI ? 42 I | | | | |
| Request User-Preference Supplemental Set | CSI & u | same | n/a | | DECRQUPSS |
| Response: | DEC Ps ! u Dscs ST | | | | See |
| Parameters: | | | | | DECAUPSS |
| Send Control Character to Host | | | | | |
| 7-bit controls | ESC SP F | n/a | n/a | | S7C1T |
| 8-bit controls | ESC SP G | n/a | n/a | | S8C1T |
| Single Shift 2 | ESC N | same | same | | SS |
| Single Shift 3 | ESC O | same | same | | SS |

(continued on next page)

ANSI Control Functions Summary 4.6 ANSI Control Function Tables

Table 4–5 (Cont.) Text Processing Control Functions

| EDITING AND TEXT PROCESSING | VT510 | Control Function | | | Mnemonic |
|--|--------------------------------------|------------------|------------|--------------|----------|
| | | VT420 | VT100 | | |
| Delete Character <i>Pn</i> Number of characters to delete (default = 1). | CSI <i>Pn</i> P | same | same | DCH | |
| Delete Column <i>Pn</i> Number of columns to delete (default = 1). | CSI <i>Pn</i> ' ~ | same | n/a | DECDC | |
| Delete Line <i>Pn</i> Number of lines to delete (default = 1). | CSI <i>Pn</i> M | same | same | DL | |
| Erase Character <i>Pn</i> Number of characters to erase (<i>Pn</i> = 0 or 1 (default) = 1 character). | CSI <i>Pn</i> X | same | n/a | ECH | |
| Erase in Display <i>Ps</i> Erase from . . . 0 Cursor to end of display 1 Top of display through cursor 2 Top to bottom of display | CSI <i>Ps</i> J | same | same | ED | |
| Erase in Line <i>Ps</i> Erase from . . . 0 Cursor to end of line 1 Start of line through cursor 2 Start to end of line | CSI <i>Ps</i> K | same | same | EL | |
| Insert Character Insert Column <i>Pn</i> Number of columns to insert (default = 1). <i>Pn</i> Number of lines to insert (default = 1). | CSI <i>Pn</i> @ CSI <i>Pn</i> ' } | same same | n/a n/a | ICH DECIC | |
| Insert Line <i>Pn</i> Number of lines to insert (default = 1). | CSI <i>Pn</i> L | same | same | IL | |
| Insert/Replacement Mode Set (insert): Reset (replace): | CSI 4 h CSI 4 l | same | same | IRM | |
| Select Character Attribute ⁴ <i>Ps</i> <u>Meaning</u> 0 DECSED and DECSEL can erase characters. 1 DECSED and DECSEL cannot erase characters. 2 Same as 0. | CSI <i>Ps</i> " q | same | n/a | DECSCA | |
| Selective Erase in Display <i>Ps</i> Erase from . . . 0 Cursor to end of display 1 Top of display through cursor 2 Top to bottom of display | CSI ? <i>Ps</i> J | same | n/a | DECSED | |

⁴DECSCA does not affect visual character attributes set by the select graphic rendition (SGR) function.

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ANSI Control Functions Summary

4.6 ANSI Control Function Tables

Table 4–5 (Cont.) Text Processing Control Functions

| EDITING AND TEXT PROCESSING | | VT510 | VT420 | VT100 | Mnemonic |
|---|------------------------------|--|--------------------|-------|-------------------|
| Selective Erase in Line | | CSI ? <i>Ps</i> K | same | n/a | DECSEL |
| <u><i>Ps</i></u> | Erase from . . . | | | | |
| 0 | Cursor to end of line | | | | |
| 1 | Start of line through cursor | | | | |
| 2 | Start to end of line | | | | |
| <hr/> | | | | | |
| Rectangle Area Processing | | | | | |
| Change Attribute in Rectangle | | CSI <i>Pt;Pl;Pb;Pr; Ps1;...Psn</i> \$ r | same | n/a | DECCARA |
| <u><i>Ps</i></u> | <u>Attribute</u> | | | | |
| 0 | Off | | | | |
| 1 | Bold | <i>Pt</i> | Top line | | |
| 4 | Underline | <i>Pl</i> | Left column | | |
| 5 | Blink | <i>Pb</i> | Bottom line | | |
| 7 | Negative image | <i>Pr</i> | Right column | | |
| 22 | No bold | | | | |
| 24 | No underline | | | | |
| 25 | No blink | | | | |
| 27 | Positive image | | | | |
| Copy Rectangular Area | | CSI <i>Pts;Pls;Pbs;Prs;Pps;Ptd;Pld;Ppd</i> \$v | same | n/a | DECCRA |
| | <u>Source</u> | | <u>Destination</u> | | |
| <i>Pts</i> | Top line border | <i>Ptd</i> | Top line border | | |
| <i>Pls</i> | Left column border | <i>Pld</i> | Left column border | | |
| <i>Pbs</i> | Bottom line border | <i>Ppd</i> | Page number | | |
| <i>Prs</i> | Right column border | | | | |
| <i>Pps</i> | Page number | | | | |
| Erase Rectangular Area | | CSI <i>Pt;Pl;Pb;Pr</i> \$ z | same | n/a | DECERA |
| Fill Rectangular Area | | CSI <i>Pch; Pt;Pl;Pb;Pr</i> \$ x | same | n/a | DECFRA |
| <i>Pch</i> | Character | | | | |
| Reverse Attribute in Rectangle | | CSI <i>Pt;Pl;Pb;Pr Ps1;...Psn</i> \$ t | same | n/a | DECRARA |
| <u><i>Ps</i></u> | <u>Reverse Attributes</u> | | | | |
| 0 | All | | | | |
| 1 | Bold | | | | |
| 4 | Underline | | | | |
| 5 | Blink | | | | |
| 7 | Negative image | | | | |
| Select Attribute and Change Extent Mode | | CSI <i>Ps</i> * x | same | n/a | DECSACE |
| Selective Erase Rectangular Area | | CSI <i>Pt;Pl;Pb;Pr</i> \$ { | same | n/a | DECSERA |
| Memory Checksum Report or DSR-Memory Checksum | | CSI ? 63; <i>Pid</i> n | same | n/a | DECKSR or DSR-Mem |
| Response: | | DCS <i>Pid</i> ! ~ <i>D...D</i> ST | | | |
| Request Checksum of Rect Area | | CSI <i>Pid;Pp;Pt;Pl;Pb;Pr</i> * y | same | n/a | DECRQCRA |
| Response: | | DCS <i>Pid</i> ! ~ <i>D...D</i> ST | | | |

ANSI Control Functions Summary 4.6 ANSI Control Function Tables

Table 4–6 Reports Control Functions

| Macros | Control Function | | | | Mnemonic |
|---|--|-------|-------|--|---------------------|
| | VT510 | VT420 | VT100 | | |
| Define Macro | DCS <i>Pid;Pdt;Pen ! z D...D ST</i> | | | | |
| DSR - Macro Space | CSI ? 62 n | same | n/a | | DECDMAC |
| Invoke Macro | CSI <i>Pid * z</i> | same | n/a | | DSR-MSR |
| Macro Space Report | CSI <i>Pn * {</i> | same | n/a | | DECINVM |
| | $Pn = \frac{\text{number of bytes}}{16}$ | | | | DECMSR, DSR-MSR |
| Reports | | | | | |
| DSR - Data Integrity Report | CSI ? 75 n | same | n/a | | DSR-Data |
| Response: | CSI ? <i>Ps</i> n | | | | |
| $\frac{Ps}{70}$ | <u>Meaning</u> Ready, no power loss or comm errors. | | | | |
| 71 | Malfunction, comm error. | | | | |
| 73 | No reported data loss since last power up. | | | | |
| Presentation State Report (See DECRQPSR.) | | n/a | n/a | | DECPSR |
| Report Mode (DECRPM) (See Report Mode (ANSI) below.) | | same | n/a | | DECRPM |
| Request Mode (ANSI) | CSI <i>Pa \$ p</i> | same | n/a | | DECRQM ¹ |
| Request Mode (DEC) | CSI ? <i>Pd \$ p</i> | same | n/a | | DECRQM |
| Request Presentation State Report | CSI <i>Ps \$ w</i> | same | n/a | | DECRQPSR |
| $\frac{Ps}{0}$ | <u>Report Requested</u> Error, restore ignored. | | | | |
| 1 | Cursor information report (DECCIR) | | | | |
| 2 | Tab stop report (DECTABSR) | | | | |
| Report Selection or Setting (See DECRQSS.) | | same | n/a | | DECRPSS |
| Request Selection or Setting | | same | n/a | | DECRQSS |
| Request (DECRQSS): | DCS \$ <i>q D...D ST</i> | | | | |
| Report (DECRPSS): | DCS <i>Ps \$ r D...D ST</i> | | | | |

¹A DECRQM sequence can only ask about one mode at a time. When the terminal is set to VT52 mode, DECRQM provides no report.

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ANSI Control Functions Summary

4.6 ANSI Control Function Tables

Table 4–6 (Cont.) Reports Control Functions

| Setting Control Sequence | Final Characters | Mnemonic |
|----------------------------------|------------------|-----------|
| Select Active Status Display | \$ } | DECSASD |
| Select Attribute Change Extent | * x | DECSACE |
| Set Character Attribute | " q | DECSCA |
| Set Conformance Level | " p | DECSCL |
| Set Columns Per Page | \$ | DECS CPP |
| Set Lines Per Page | t | DECSLPP |
| Set Number of Lines per Screen | * | DECSNLS |
| Set Status Line Type | \$ ~ | DECSSDT |
| Set Left and Right Margins | s | DECSLRM |
| Set Top and Bottom Margins | r | DECS TBM |
| Set Graphic Rendition | m | SGR |
| Select Set-Up Language | p | DECSSL |
| Select Printer Type | \$ s | DECS PRTT |
| Select Refresh Rate | " t | DECS RFR |
| Select Digital Printed Data Type |) p | DECS DPT |
| Select ProPrinter Character Set | * p | DECS PPCS |
| Select Communication Speed | * r | DECS CS |
| Select Communication Port | * u | DECS CP |
| Set Scroll Speed | SP p | DECS SCLS |
| Set Cursor Style | SP q | DECS CURS |
| Set Key Click Volume | SP r | DECS KCV |
| Set Warning Bell Volume | SP t | DECS WBV |
| Set Margin Bell Volume | SP u | DECS MBV |
| Set Lock Key Style | SP v | DECS LCK |
| Select Flow Control Type | * s | DECS FC |
| Select Disconnect Delay Time | \$ q | DECS DDT |
| Set Transmit Rate Limit | " u | DECS TRL |
| Set Port Parameter | + w | DECS PP |

| Reports (Cont.) | Control Function | | | Mnemonic |
|-------------------------------|---|-------|-------|----------|
| | VT510 | VT420 | VT100 | |
| Request Terminal State Report | | same | n/a | DECRQTSR |
| Request: | CSI 1 \$ u | | | |
| Reply to Host: | DCS 1 \$ s D...D ST | | | |
| <u>Effects</u> | | | | |
| DDD1 | DECRLM, DECHEBM, and DEHCCEM are set. | | | DDD1 |
| DDD2 | DECRLM is reset. ASCII is designated in G1. | | | DDD2 |
| DDD3 | ASCII is designated in G0. | | | DDD3 |
| Restore Presentation State | DCS <i>Ps</i> \$ t D...D ST | same | n/a | DECRSPS |
| <u><i>Ps</i></u> | <u>Data String Format</u> | | | |
| 0 | Error, restore ignored. | | | |
| 1 | Selects the format of the cursor information report (DECCIR). | | | |
| 2 | Selects the format of the tab stop report (DECTABSR). | | | |

(continued on next page)

ANSI Control Functions Summary 4.6 ANSI Control Function Tables

Table 4–6 (Cont.) Reports Control Functions

| Reports (Cont.) | Control Function | | | |
|---|-----------------------------|------------------------------|-----------|-----------------------------|
| | VT510 | VT420 | VT100 | Mnemonic |
| <i>D...D</i> Data string of tab stops or cursor position. | | | | |
| Restore Terminal State | DCS <i>Ps \$ p D...D ST</i> | same | n/a | DECRSTS |
| <i>Ps</i> Data String Format | | | | |
| <u>0</u> Error, restore ignored. | | | | |
| 1 Selects the format of the terminal state report (DECTSR). | | | | |
| <i>D...D</i> Data string of restored information. | | | | |
| Report Mode (ANSI) | CSI <i>Pa; Ps \$ y</i> | same | n/a | |
| or (DEC) | CSI ? <i>Pd; Ps \$ y</i> | same | n/a | |
| Reset Mode | CSI <i>P1.....Pn l</i> | same | same | RM |
| Set Mode | CSI <i>P1.....Pn h</i> | same | same | SM |
| Mode Description | ANSI Mode | DEC Mode | | |
| | <i>Pa</i> | <i>Mnemonic</i> ² | <i>Pd</i> | <i>Mnemonic</i> <i>Mode</i> |
| Guarded area transfer | 1 | GATM * | ?1 | DECCKM Cursor keys |
| Keyboard action | 2 | KAM | ?2 | DECANM ANSI/VT52 |
| Control representation | 3 | CRM | ?3 | DECCOLM Column |
| Insert/replace | 4 | IRM | ?4 | DECSCLM Scrolling |
| Status reporting transfer | 5 | SRTM * | ?5 | DECSCNM Screen |
| | | | ?6 | DECOM Origin |
| Vertical editing | 7 | VEM * | ?7 | DECAWM Autowrap |
| Horiz editing | 10 | HEM * | ?8 | DECARM Autorepeat |
| Positioning unit | 11 | PUM * | | |
| Send/receive | 12 | SRM | | |
| Format effector action | 13 | FEAM * | | |
| Format effector transfer | 14 | FETM * | | |
| Multiple area transfer | 15 | MATM * | | |
| Transfer termination | 16 | TTM * | | |
| Selected area transfer | 17 | SATM * | | |
| Tabulation stop | 18 | TSM * | ?18 | DECPFF Print form |
| Editing boundary | 19 | EBM * | ?19 | DECPEX Print extent |
| Linefeed/New line | 20 | LNМ | | |
| Text cursor enable | | | ?25 | DECTCEM |
| Right-to-left | | | ?34 | DECRLM |
| Hebrew keyboard map | | | ?35 | DECHEBM |
| Hebrew encoding | | | ?36 | DEHCEM |
| NRCS characters | | | ?42 | DECNRCM |
| Greek/N.A. | | | ?57 | DECNAKB |
| Horiz cursor coupling | | | ?60 | DEHCCM * |
| Vertical cursor coupling | | | ?61 | DECVCCM |
| Page cursor coupling | | | ?64 | DECPCCM |
| Numeric keypad | | | ?66 | DECNKM |
| Backarrow key | | | ?67 | DECBKM |
| Keyboard usage | | | ?68 | DECKBUM |
| Vertical split screen | | | ?69 | DECVSSM |
| Transmit rate limiting | | | ?73 | DECXRLMM |
| No clear screen | | | ?95 | DECNCSCM |

²The * means this mode is always Reset in the terminal and cannot be changed.

(continued on next page)

ANSI Control Functions Summary

4.6 ANSI Control Function Tables

Table 4–6 (Cont.) Reports Control Functions

| Mode Description (Cont.) | | DEC Mode | | |
|------------------------------------|--|-----------|----------|------|
| | | <i>Pd</i> | Mnemonic | Mode |
| Right-to-left copy | | ?96 | DECRLCM | |
| CRT save | | ?97 | DECCRTSM | |
| Auto resize | | ?98 | DECARSM | |
| Modem control | | ?99 | DECMCM | |
| Auto answerback | | ?100 | DECAAM | |
| Conceal answerback | | ?101 | DECCANSM | |
| Null | | ?102 | DECNULM | |
| Half-duplex | | ?103 | DECHDPXM | |
| Enable secondary keyboard language | | ?104 | DECESKM | |
| Overscan | | ?106 | DECOSCNM | |

| Set/Reset Parameters | ANSI Mode | DEC Mode |
|----------------------|-----------|----------|
| | <i>Ps</i> | |
| Not recognized | 0 | same |
| Set | 1 | same |
| Reset | 2 | same |
| Set permanently | 3 | same |
| Reset permanently | 4 | same |

| Reports (Cont.) | Control Function | | | | Mnemonic |
|---|----------------------------|-------|-------|--|----------|
| | VT510 | VT420 | VT100 | | |
| Set Mode/Reset Mode (See also DECRQM.) | | | | | SM/RM |
| Send/Receive Mode (Local Echo) | | same | same | | SRM |
| Set (Local echo off): | CSI 12 h | | | | |
| Reset (Local echo on): | CSI 12 l | | | | |
| Tabulation Stop Report <i>D...D</i> Column numbers of tab stops. | DCS @ \$ u <i>D...D</i> ST | same | n/a | | DECTABSR |
| Terminal State Report (See DECRQTSR.) | | same | n/a | | DECTSR |

ANSI Control Functions Summary 4.6 ANSI Control Function Tables

Table 4-7 Terminal Management Control Functions

| Purpose | Control Function | | | | Mnemonic |
|---|--|-------|-------|---------------|-------------------------|
| | VT510 | VT420 | VT100 | | |
| CRT Save Mode Set (enable CRT saver): | CSI ? 97 h | n/a | n/a | | DECCRTSM |
| Reset (disable CRT saver): | CSI ? 97 l | | | | |
| Device Attributes Response: | CSI c or CSI 0 c CSI ? <i>Psc</i> ; <i>PS1</i> ; ... <i>Psn</i> c | same | same | | DA1 |
| (See Primary Device Attributes (DA1).) | | | | | |
| Secondary Device Attributes VT Response: | CSI > c or CSI > 0 c CSI > 61; <i>Pv</i> ; 0 c | same | same | | DA2 |
| PC Response: | CSI > 61; <i>Pv</i> ; 1 c | | | | |
| (See Secondary Device Attributes (DA2).) | | | | | |
| Tertiary Device Attributes | CSI = c or CSI = 0 c | same | same | | DA3 |
| Device Status Report – ANSI: | CSI <i>Ps</i> n | same | same | | DSR |
| – DEC: | CSI ? <i>Ps</i> n | same | same | | DSR |
| Enter/Exit PCTerm Mode or Select ASCII characters or scancodes | CSI ? <i>Ps1</i> ; <i>Ps2</i> r | same | n/a | | DECPCTERM |
| <u><i>Ps1</i></u> | <u>VT Emulation Mode</u> | | | | <u>SCO Console Mode</u> |
| none, 0 | VT Mode | | | | ASCII characters |
| 1 | PCTerm Mode | | | | Scancodes |
| <u><i>Ps2</i></u> | <u>Character Set</u> | | | | <u><i>Ps2</i></u> |
| 210 | PC Greek | | | none,0 | <u>Character Set</u> |
| 220 | PC Spanish | | | 1 | No Change |
| 437 | PC International | | | 2 | PC Multilingual |
| 850 | PC Multilingual | | | 3 | PC International |
| 852 | PC Slavic (Latin 2) | | | 4 | PC Danish/Norwegian |
| 857 | PC Turkish | | | 5 | PC Spanish |
| 860 | PC Portuguese | | | 6 | PC Portuguese |
| 862 | PC Hebrew | | | 7 | DEC Supplemental |
| 863 | PC French-Canadian | | | | ISO Latin 1 |
| 865 | PC Danish | | | | |
| 866 | PC Cyrillic | | | | |
| Identify Device | ESC Z | n/a | same | | DECID ¹ |
| Invoke Confidence Test ² | CSI 4 ; <i>Ps</i> ; ... ; <i>Ps</i> y | same | n/a | | DECTST |
| <u><i>Ps</i></u> | <u>Test</u> | | | | |
| 0 | "All Tests" (1,2,3,6) | | | | |
| 1 | Power-Up Self Test | | | | |
| 2 | RS-232 Port Data Loopback | | | | |
| 3 | Printer Port Loopback | | | | |
| 4 | Speed Select and Indicator | | | | |
| 5 | Reserved - No action | | | | |
| 6 | Modem Loopback Test | | | | |
| 7 | EIA-423 Port Loopback | | | | |
| 8 | Parallel Port Loopback | | | | |
| 9 | Repeat other tests | | | | |
| Overscan Mode | | n/a | n/a | | DECOSCNM |
| Set (enable overscan): ³ | CSI ? 106 h | | | | |
| Reset (disable overscan): | CSI ? 106 l | | | | |

¹DECID may not be supported; use primary device attributes (DA1) instead.

² "ESC # 8" invokes the Screen Alignment test. DECTST causes a disconnect; therefore, it should not be used in conjunction with a modem.

³ Overscan and 72 Hz refresh rate cannot co-exist when the terminal is set to 42 or 53 lines per screen. Refer to DECSNLS—Set Lines Per Screen for details.

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ANSI Control Functions Summary

4.6 ANSI Control Function Tables

Table 4–7 (Cont.) Terminal Management Control Functions

| Purpose | Control Function | | | |
|--------------------------------------|-------------------------------------|--|---------------------------|----------------------|
| | VT510 | VT420 | VT100 | Mnemonic |
| Primary Device Attributes | CSI c or CSI 0 c | same | same | DA1 |
| | <u>Model</u> | <u>Response to DA1</u> | | |
| | North American | CSI ? 64;1;2;7;8;9;15;18;21;44;45;46 c | | |
| | World-Wide | CSI ? 64;1;2;7;8;9;12;15;18;21;23;24;42;44;45;46 c | | |
| <u>Ext</u> | <u>Description</u> | <u>Ext</u> | <u>Description</u> | |
| 1 | 132 columns | 18 | Windowing capability | |
| 2 | Printer port extension | 21 | Horizontal scrolling | |
| 4 | Sixel extension | 23 | Greek extension | |
| 6 | Selective erase | 24 | Turkish extension | |
| 7 | DRCS | 42 | ISO Latin 2 character set | |
| 8 | UDK | 44 | PCTerm | |
| 9 | NRCS | 45 | Soft key map | |
| 12 | SCS extension | 46 | ASCII emulation | |
| 15 | Technical character set | | | |
| Report Terminal Unit ID | DCS ! <i>D...D</i> ST | same | n/a | DECRPTUI |
| Reset to Initial state | ESC c | same | same | RIS |
| Secondary Device Attributes | CSI > c or CSI > 0 c | same | n/a | DA2 |
| | <u>Keyboard</u> | <u>Response</u> | | |
| | VT keyboard | CSI > 61; <i>Pv</i> ; 0 c | | |
| | PC keyboard | CSI > 61; <i>Pv</i> ; 1 c | | |
| <i>Pv</i> | Firmware version | | | |
| Secure Reset | ESC [<i>Pr</i> + p | same | n/a | DECSR |
| Secure Reset Confirmation | ESC [<i>Pr</i> * q | same | same | DECSRC |
| Select Conformance (Operating) Level | CSI 6 <i>Ps1</i> ; <i>Ps2</i> ; " p | same | same | DECSCL |
| <u><i>Ps1</i></u> | <u>Level Selected</u> | <u><i>Ps2</i></u> | <u>Data Bits</u> | |
| none,0,1 | 1 - VT100 | none, 0, 2 | 8-bit controls | |
| 2,3,4 | 4 - VT510 | 1 | 7-bit controls | |
| Select Refresh Rate ³ | CSI <i>Ps</i> " t | n/a | n/a | DECSRFR |
| <u><i>Ps</i></u> | <u>Cursor Style</u> | | | |
| 1 | 50 Hz | | | |
| 2 | 60 Hz | | | |
| none | ≥ 70 Hz | | | |
| 0 or 3 | | | | |
| Select Terminal ID ⁴ | CSI <i>Ps</i> , q | same | same | DECTID |
| <u><i>Ps</i></u> | <u>ID Type</u> | <u>Response to DECTID</u> | | <u>Terminal Type</u> |
| 0 | VT100 | ESC [? 1; 2 c | | VT100 |
| 1 | VT101 | ESC [? 1; 0 c | | VT101 |
| 2 | VT102 | ESC [? 6 c | | VT102 |
| 5 | VT220 | CSI ? 62; 1; 2; 7; 8 c | | VT220 North American |
| | | CSI ? 62; 1; 2; 7; 8; 9 c | | VT220 International |
| 7 | VT320 | CSI ? 63; 1; 2; 7; 8 c | | VT320 North American |
| | | CSI ? 63; 1; 2; 7; 8; 9 c | | VT320 International |
| 9 | VT420 | CSI ? 64; 1; 2; 7; 8; 9; 15; 18; 21 c | | VT420 North American |
| | | CSI ? 64; 1; 2; 7; 8; 9; 15; 18; 21 c | | VT420 International |
| 10 | VT510 | Refer to DA1 for response. | | |
| Soft Terminal Reset | CSI ! p | same | n/a | DECSTR |
| Terminal Mode Emulation | CSI <i>Ps</i> SP ~ | n/a | n/a | DECTME |

³ Overscan and 72 Hz refresh rate cannot co-exist when the terminal is set to 42 or 53 lines per screen. Refer to DECSNLS—Set Lines Per Screen for details.

⁴DECTID has no effect when the terminal is in VT52 mode.

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ANSI Control Functions Summary 4.6 ANSI Control Function Tables

Table 4–7 (Cont.) Terminal Management Control Functions

| Purpose | Control Function | | | |
|--|---|-------|-------|----------|
| | VT510 | VT420 | VT100 | Mnemonic |
| <u><i>Ps</i></u> none, 0 or 1 | <u>Terminal Mode</u> VT510 (VT Level 4) | | | |
| 2 | VT100 | | | |
| 3 | VT52 | | | |
| 4 | VT420 PCTerm | | | |
| 5 | WYSE 60/160 | | | |
| 6 | WYSE 60/160 PCTerm | | | |
| 7 | WYSE 50+ | | | |
| 8 | WYSE 150/120 | | | |
| 9 | TVI 950 | | | |
| 10 | TVI 925 | | | |
| 11 | TVI 910+ | | | |
| 12 | ADDS A2 | | | |
| 13 | SCO Console | | | |
| Exit ANSI (VT52) Mode | ESC < | same | same | DECANM |
| Status Display Extension Functions | | | | |
| Select Active Status Display | CSI <i>Ps</i> \$ } | same | n/a | DECSASD |
| <u><i>Ps</i></u> 0 | <u>Send data to . . .</u> Main display only | | | |
| 1 | Status line only | | | |
| Select Status Display Type | | n/a | n/a | SDT |
| Select Status Display (Line) Type | CSI <i>Ps</i> \$ ~ | n/a | n/a | DECSSDT |
| <u><i>Ps</i></u> 0 | <u>Status Line Selected</u> No status line | | | |
| 1 | Indicator status line | | | |
| 2 | Host-writable status line | | | |
| Desktop Features Control Functions | | | | |
| Load Time of Day | CSI <i>Ps1</i> ; <i>Ps2</i> , p | n/a | n/a | DECLTOD |
| <i>Ps1</i> | Hour (decimal number between 00 and 23) | | | |
| <i>Ps2</i> | Minutes (decimal number between 00 and 59) | | | |

ANSI Control Functions Summary

4.6 ANSI Control Function Tables

Table 4–8 Keyboard Processing Control Functions

| Keyboard Function | Control Function | | | | Mnemonic |
|---|--|-------------------------------|-------------------------------------|--|----------|
| | VT510 | VT420 | VT100 | | |
| Autorepeat Mode | | same | same | | DECARM |
| Set (repeat): | CSI ? 8 h | | | | |
| Reset (disabled): | CSI ? 8 l | | | | |
| Backarrow Key Mode | | same | same | | DECBKM |
| Set (backspace): | CSI ? 67 h | | | | |
| Reset (delete): | CSI ? 67 l | | | | |
| Copy Key Default | DCS " z D...D ST | n/a | n/a | | DECCKD |
| D...D | Key-s/Key-d;Key-s/Key-d...; | | | | |
| Key-s | Source key | | | | |
| Key-d | Destination key | | | | |
| Cursor Keys Mode | | same | same | | DECCKM |
| Set (application): | CSI ? 1 h | | | | |
| Reset (cursor): | CSI ? 1 l | | | | |
| Define Function Key (SCO) | ESC Q <i>F_n string</i> | n/a | n/a | | SCODFK |
| Device Status Report (keyboard status) | | | | | DSR |
| Request Keyboard Report: | CSI ? 26 n | same | same | | |
| Reply to Keyboard Request: | CSI ? 27 ; <i>P_n; P_{st}; P_{typ}</i> n | same | same | | |
| | | | | | |
| <u><i>P_n</i></u> | <u>Keyboard Language (VT/PC)</u> | <u><i>P_n</i></u> | <u>Keyboard Language (VT or PC)</u> | | |
| 0 | Unknown | 15 | Spanish | | |
| 1 | North American | 16 | Portuguese | | |
| 2 | British | 19 | Hebrew | | |
| 3 | Belgian (Flemish) | 22 | Greek | | |
| 4 | French Canadian | 28 | Canadian English | | |
| 5 | Danish | 29 | Turkish Q/Turkish | | |
| 6 | Finnish | 30 | Turkish F/Turkish | | |
| 7 | German/German | 31 | Hungarian | | |
| 8 | Dutch | 33 | Slovak | | |
| 9 | Italian | 34 | Czech | | |
| 10 | Swiss French | 35 | Polish | | |
| 11 | Swiss German | 36 | Romanian | | |
| 12 | Swedish | 38 | SCS | | |
| 13 | Norwegian | 39 | Russian | | |
| 14 | French | 40 | Latin American | | |
| | | | | | |
| <u><i>P_{st}</i></u> | <u>Keyboard Status</u> | <u><i>P_{typ}</i></u> | <u>Keyboard Type</u> | | |
| 0 | Keyboard Ready | 4 | LK450 | | |
| 3 | No Keyboard | 5 | PCXAL | | |
| 8 | Keyboard Busy | | | | |
| Down-line Load | DCS <i>P_{fn}; P_{cn}; P_e; P_{cmw}; P_{ss}; P_u; P_{cmh}; P_{css}</i> { <D _{scs} ><sixel-font-patterns> ST | same | n/a | | DECDDL |
| Extended Keyboard Report | APC : <i>ppp mm</i> ST | same | n/a | | DECEKBD |
| Enable Local Functions | CSI <i>P_{f1};P_{c1};...P_{fn};P_{cn}</i> + q | | n/a | | DECELF |
| Enable Secondary Keyboard Language Mode | | same | n/a | | DECESKM |
| Set (secondary): | CSI ? 104 h | | | | |
| Reset (primary): | CSI ? 104 l | | | | |
| Function Key | CSI <i>P_{s1}; P_{s2}</i> ~ | same | n/a | | DECFNK |

(continued on next page)

ANSI Control Functions Summary 4.6 ANSI Control Function Tables

Table 4–8 (Cont.) Keyboard Processing Control Functions

| Keyboard Function | Control Function | | | | Mnemonic |
|---|----------------------------------|-------------------|-------|-------------------------------------|----------|
| | VT510 | VT420 | VT100 | | |
| <i>Ps1</i> Function key | | | | | |
| <i>Ps2</i> Modifier | | | | | |
| Hebrew Encoding Mode ¹ | | same | n/a | | DECHEM |
| | Set (8-bit char): | CSI ? 36 h | | | |
| | Reset (7-bit char): | CSI ? 36 l | | | |
| Hebrew Keyboard Map Mode | | same | n/a | | DECHEBM |
| | Set (Hebrew keyboard): | CSI ? 35 h | | | |
| | Reset (North American): | CSI ? 35 l | | | |
| Keyboard Action Mode | | same | same | | KAM |
| | Set (lock): | CSI 2 h | | | |
| | Reset (unlock): | CSI 2 l | | | |
| Keypad Application Mode | ESC = | same | same | | DECKPAM |
| Keyboard Language Selection | CSI <i>Ps1</i> ; <i>Ps2</i> SP } | same | n/a | | DECKBD |
| <u><i>Ps1</i> Keyboard Type</u> | | | | | |
| 1,0 | VT keyboard layout | | | | |
| 2 | Enhanced PC keyboard layout | | | | |
| <u><i>Ps2</i> Keyboard Language (VT/PC)</u> | | <u><i>Ps2</i></u> | | <u>Keyboard Language (VT or PC)</u> | |
| none, | North American | 15 | | Spanish | |
| 0 or 1 | | 16 | | Portuguese | |
| 2 | British | 19 | | Hebrew | |
| 3 | Belgian | 22 | | Greek | |
| 4 | French Canadian | 28 | | Canadian English | |
| 5 | Danish | 29 | | Turkish Q/Turkish | |
| 6 | Finnish | 30 | | Turkish F/Turkish | |
| 7 | German | 31 | | Hungarian | |
| 8 | Dutch | 33 | | Slovak | |
| 9 | Italian | 34 | | Czech | |
| 10 | Swiss French | 35 | | Polish | |
| 11 | Swiss German | 36 | | Romanian | |
| 12 | Swedish | 38 | | SCS | |
| 13 | Norwegian | 39 | | Russian | |
| 14 | French | 40 | | Latin American | |
| Keypad Numeric Mode | ESC > | same | same | | DECKPNM |
| Key Position Mode | | same | n/a | | DECKPM |
| | Set (key position): | CSI ? 81 h | | | |
| | Reset (char codes): | CSI ? 81 l | | | |
| Keyboard Usage Mode | | same | n/a | | DECKBUM |
| | Set (data processing): | CSI ? 68 h | | | |
| | Reset (typewriter): | CSI ? 68 l | | | |
| Local Function Key Control | CSI Pk1; Pf1; Pk2; Pf2...* } | | | | |
| | | same | n/a | | DECLFKC |
| <u><i>Pk</i> Function</u> | <u>VT Keyboard</u> | | | <u>Enhanced PC Keyboard</u> | |
| 1 | Hold | F1 | | Scroll Lock | |
| 2 | Print | F2 | | Print Screen | |
| 3 | Set-Up | F3 | | Cap Lock/Print Screen | |

¹ DECHEM is opposite in action to DECNRCM; that is, setting DECHEM has the same result as resetting DECNRCM.

(continued on next page)

ANSI Control Functions Summary

4.6 ANSI Control Function Tables

Table 4–8 (Cont.) Keyboard Processing Control Functions

| Keyboard Function | Control Function | | | Mnemonic |
|---|---------------------------------|-------|-------|-----------|
| | VT510 | VT420 | VT100 | |
| Locking Shift | | | | LS |
| LSO Map G0 into GL | SI | same | same | |
| LS1 Map G1 into GL | SO | same | same | |
| LS1R Map G1 into GR | ESC ~ | same | n/a | |
| LS2 Map G2 into GL | ESC n | same | n/a | |
| LS2R Map G2 into GR | ESC } | same | n/a | |
| LS3 Map G3 into GL | ESC o | same | n/a | |
| LS3R Map G3 into GR | ESC | same | n/a | |
| North American/Greek Selection | | same | n/a | DECNAKB |
| Set (North American): | CSI ? 57 h | | | |
| Reset (Greek keyboard): | CSI ? 57 l | | | |
| Numeric Keypad Mode | | same | n/a | DECNKM |
| Set (application): | CSI ? 66 h | | | |
| Reset (numeric): | CSI ? 66 l | | | |
| Program Alphanumeric Key | DCS " y D...D ST | n/a | n/a | DECPAK |
| Program Function Key | DCS " x D...D ST | n/a | n/a | DECPFK |
| Program Key Action | CSI <i>Ps</i> + z | n/a | n/a | DECPKA |
| <u><i>Ps1</i></u> <u>Program Key Action</u> | | | | |
| none,0 None | | | | |
| 1 Lock Keys and Modifiers | | | | |
| 2 Restore Factory Defaults | | | | |
| 3 Recall Key Definitions | | | | |
| Program Key Free Memory Report ² | CSI <i>Ps1</i> ; <i>Ps2</i> + y | n/a | n/a | DECPKFMR |
| <u><i>Ps1</i></u> Total memory (bytes) | | | | |
| <u><i>Ps2</i></u> Free memory | | | | |
| Program Key Free Memory Inquiry | CSI + x | n/a | n/a | DECRQPKFM |
| Response: DECPKFMR | | | | |
| Request Key Type | CSI <i>Ps</i> , u | n/a | n/a | DECRQKT |
| Report Key Type | CSI <i>Ps1</i> ; <i>Ps2</i> , v | n/a | n/a | DECRPKT |
| Report Function Key Definition | DCS " } D...D ST | n/a | n/a | DECRPFK |
| Report Modifiers/Key State | DCS " ~ D...D ST | n/a | n/a | DECRPAK |
| Set Key Click Volume | CSI <i>Ps</i> SP r | same | n/a | DECSKCV |
| <u><i>Ps</i></u> <u>Volume</u> | | | | |
| 1 Off | | | | |
| 2,3,4 Low | | | | |
| none,0, High | | | | |
| 5,6,7,8. | | | | |
| Set Lock Key Style | CSI <i>Ps</i> SP v | n/a | n/a | DECSLCK |
| <u><i>Ps</i></u> <u>Lock Style</u> | | | | |
| none,0,1 Caps Lock | | | | |
| 2 Shift Lock | | | | |
| 3 Reverse Lock | | | | |
| Num Lock Mode | | same | same | DECNUMLK |
| Set: | CSI ? 108 h | | | |
| Reset: | CSI ? 108 l | | | |
| Caps Lock Mode | | same | same | DECCAPSLK |
| Set: | CSI ? 109 h | | | |
| Reset: | CSI ? 109 l | | | |

²The VT510 reports this sequence upon receiving DECRQPKFM from the host. See reference for limitations.

(continued on next page)

ANSI Control Functions Summary 4.6 ANSI Control Function Tables

Table 4–8 (Cont.) Keyboard Processing Control Functions

| Keyboard Function | Control Function | | | |
|---|----------------------------------|-------|-------|----------|
| | VT510 | VT420 | VT100 | Mnemonic |
| Keyboard LEDs Host Indicator Mode | | same | same | DECKLHIM |
| Set: | CSI ? 110 h | | | |
| Reset: | CSI ? 110 I | | | |
| Load LEDs | CSI <i>Ps</i> q | n/a | n/a | DECLL |
| <i>Ps</i> | Volume | | | |
| 0 | Clear all LEDs | | | |
| 1 | Light Num Lock | | | |
| 2 | Light Caps Lock | | | |
| 3 | Light Scroll Lock | | | |
| 21 | Extinguish Num Lock | | | |
| 22 | Extinguish Caps Lock | | | |
| 23 | Extinguish Scroll Lock | | | |
| Set Margin Bell Volume | CSI <i>Ps</i> SP u | same | n/a | DECSMBV |
| <i>Ps</i> | Volume | | | |
| none,0,1 | Off | | | |
| 2,3,4 | Low | | | |
| 5,6,7,8 | High | | | |
| Select Modifier Key Reporting (See reference.) | CSI <i>Pm1;Pfl...Pmn;Pfn</i> + r | same | n/a | DECSMKR |
| Set Warning Bell Volume | CSI <i>Ps</i> SP t | n/a | n/a | DECSWBV |
| <i>Ps</i> | Volume | | | |
| 1 | Off | | | |
| 2,3,4 | Low | | | |
| none,0, | High | | | |
| 5,6,7,8 | | | | |

(continued on next page)

ANSI Control Functions Summary

4.6 ANSI Control Function Tables

Table 4–8 (Cont.) Keyboard Processing Control Functions

| User-Defined Keys | | Control Function | | | Mnemonic |
|--------------------------------|---|--|-------|-------|----------|
| | | VT510 | VT420 | VT100 | |
| User Defined Keys | | DCS <i>Ps1</i> ; <i>Ps2</i> ; <i>Ps3</i> <i>D...D</i> ST | same | n/a | DECUDK |
| <u><i>Ps1</i></u> | Clear . . . | | | | |
| none,0 | All UDKs before loading new values | | | | |
| 1 | Old UDKs only when redefined; load new UDK values. | | | | |
| <u><i>Ps2</i></u> | Lock . . . | | | | |
| none,0 | UDKs against future redefinition | | | | |
| 1 | Don't lock the UDKs against future redefinition. | | | | |
| <u><i>Ps3</i></u> | Define . . . | | | | |
| none, 0 | Shifted function key | | | | |
| 1 | Unshifted function key | | | | |
| 2 | Shifted function key | | | | |
| 3 | Alt unshifted function key | | | | |
| 4 | Alt shifted function key | | | | |
| <i>D...D</i> | <i>Key1/St1/Dir;Key2/St2/Dir;.....Keyn/Stn/Dir;</i> | | | | |
| <i>Stn</i> | Sequence user-defined key (UDK) | | | | |
| <u><i>Keyn</i></u> | <u>VT Keyboard</u> | <u>PC Keyboard</u> | | | |
| 11 | F1 | F1 | | | |
| 12 | F2 | F2 | | | |
| 13 | F3 | F3 | | | |
| 14 | F4 | F4 | | | |
| 15 | F5 | F5 | | | |
| 17 | F6 | F6 | | | |
| 18 | F7 | F7 | | | |
| 19 | F8 | F8 | | | |
| 20 | F9 | F9 | | | |
| 21 | F10 | F10 | | | |
| 23 | F11 | F11 | | | |
| 24 | F12 | F12 | | | |
| 25 | F13 | | | | |
| 26 | F14 | | | | |
| 28 | F15 | | | | |
| 29 | F16 | | | | |
| 31 | F17 | | | | |
| 32 | F18 | | | | |
| 33 | F19 | | | | |
| 34 | F20 | | | | |
| <u><i>Dir</i></u> | <u>Direction³</u> | | | | |
| 0,none | Normal | | | | |
| 1 | Local | | | | |
| 2 | Remote | | | | |
| DSR - User-Defined Key Request | | | same | n/a | DSR-UDK |
| | Request UDK lock: | CSI ? 25 n | | | |
| | Reply to UDK locked status: | CSI ? 20 n | | | |
| | Reply to UDK unlocked status: | CSI ? 21 n | | | |

³See DECPFK for direction definitions.

ANSI Control Functions Summary 4.6 ANSI Control Function Tables

Table 4–9 Communications Control Functions

| Printer Port Function | Control Function | | | | Mnemonic |
|---|-------------------------------|------------------|---------------------------------------|--|-----------|
| | VT510 | VT420 | VT100 | | |
| DSR - Printer Port Report | | same | same | | DSR-Print |
| Request: | CSI ? 15 n | | | | |
| Response: | CSI ? <i>Ps</i> n | | | | |
| <u><i>Ps</i></u> | <u>Printer . . .</u> | | | | |
| 10 | Ready | | | | |
| 11 | Not ready | | | | |
| 13 | Off line | | | | |
| 18 | Busy | | | | |
| 19 | On another session. | | | | |
| Media Copy - Send Screen Data through Host Port | CSI 2 i | n/a | n/a | | - |
| Media Copy - Start/Stop Printer-to-Host Session | | | | | MC |
| ANSI: | CSI <i>Pa</i> i | same | same | | |
| DEC: | CSI ? <i>Pd</i> i | same | CSI ?8i | | |
| ANSI Mode | | DEC Mode | | | |
| <u><i>Pa</i></u> | <u>Function</u> | <u><i>Pd</i></u> | <u>Function</u> | | |
| 0,none | Print page | 1 | Print cursor line | | |
| 4 | Reset printer controller mode | 4 | Reset autoprnt mode | | |
| 5 | Set printer controller mode | 5 | Set autoprnt mode | | |
| 6 | Start printer to host session | 8 | Stop printer to host session | | |
| 7 | Stop printer to host session | 9 | Start printer to host session | | |
| | | 10 | Print composed main display | | |
| | | 11 | Print all pages | | |
| | | 18 | Assign printer to active host session | | |
| | | 19 | Accept printer commands from sessions | | |
| Print Extent Mode | | same | same | | DECPEX |
| Set (entire page): | CSI ? 19 h | | | | |
| Reset (scroll region): | CSI ? 19 I | | | | |
| Print Form Feed Mode | | same | same | | DECPFF |
| Set (FF): | CSI ? 18 h | | | | |
| Reset (no FF): | CSI ? 18 I | | | | |
| Select Digital Printed Data Type ¹ | CSI <i>Ps</i>) p | n/a | n/a | | DECSDP |
| <u><i>Ps</i></u> | <u>Printed Data Type</u> | | | | |
| none,0,1 | Print National Only | | | | |
| 2 | National and Line Drawing | | | | |
| 3 | Print Multinational | | | | |
| 4 | Print All Characters | | | | |
| Select Printer Type | CSI <i>Ps</i> \$ s | n/a | n/a | | DECSPRTT |
| <u><i>Ps</i></u> | <u>Printer Type</u> | | | | |
| none,0,1 | DEC ANSI | | | | |
| 2 | IBM ProPrinter | | | | |
| 3 | DEC + IBM | | | | |

¹ This sequence takes effect only when a ProPrinter or Digital printer with ProPrinter emulation mode is attached.

(continued on next page)

ANSI Control Functions Summary

4.6 ANSI Control Function Tables

Table 4–9 (Cont.) Communications Control Functions

| Printer Port Function | Control Function | | | | Mnemonic |
|---|---------------------------------|------------|---------------------|--|----------|
| | VT510 | VT420 | VT100 | | |
| Select ProPrinter Character Set | CSI <i>Pn</i> * p | n/a | n/a | | DECSPPCS |
| <i>Pn</i> | Printer | | | | |
| 210 | PC Greek | | | | |
| 220 | PC Spanish | | | | |
| 437 | PC International | | | | |
| 850 | PC Multilingual | | | | |
| 852 | PC Slavic (Latin 2) | | | | |
| 857 | PC Turkish | | | | |
| 860 | PC Portuguese | | | | |
| 862 | PC Hebrew | | | | |
| 863 | PC French-Canadian | | | | |
| 865 | PC Danish | | | | |
| 866 | PC Cyrillic | | | | |
| Start/stop printer; see Media Copy. | | | | | |
| DEC Printers with ProPrinter Emulation | | | | | |
| Enter/Return from IBM ProPrinter Emulation Mode | | n/a | n/a | | DECIPEM |
| Enter: | CSI ? 58 h | | | | |
| Return: | CSI ? 58 l | | | | |
| Terminal Synchronization | | | | | |
| Auto Answerback Mode | | same | same | | DECAAM |
| Set: | CSI ? 100 h | | | | |
| Reset: | CSI ? 100 I | | | | |
| Conceal Answerback Message Mode | | n/a | n/a | | DECCANSM |
| Set: | CSI ? 101 h | | | | |
| Reset: | CSI ? 101 I | | | | |
| Communication Port | CSI <i>Ps1</i> ; <i>Ps2</i> * u | n/a | n/a | | DECSCP |
| Communication Speed | CSI <i>Ps1</i> ; <i>Ps2</i> * r | n/a | n/a | | DECSCS |
| <i>Ps1</i> | Comm Line | <i>Ps2</i> | Communication Speed | | |
| none,0,1 | Host Transmit | none,0 | Use default speed. | | |
| 2 | Host Receive | 1 | 300 | | |
| 3 | Printer | 2 | 600 | | |
| 4 | Modem Hi | 3 | 1200 | | |
| 5 | Modem Lo | 4 | 2400 | | |
| | | 5 | 4800 | | |
| | | 6 | 9600 | | |
| | | 7 | 19200 | | |
| | | 8 | 38400 | | |
| | | 9 | 57600 | | |
| | | 10 | 76800 | | |
| | | 11 | 115200 | | |

(continued on next page)

ANSI Control Functions Summary 4.6 ANSI Control Function Tables

Table 4–9 (Cont.) Communications Control Functions

| Terminal Synchronization (cont.) | Control Function | | | | Mnemonic |
|--------------------------------------|---|------------------------|--|--|----------|
| | VT510 | VT420 | VT100 | | |
| <u>Communication Line</u> | <u>Default Communication Speed</u> | | | | |
| Host Transmit | 9600 | | | | |
| Host Receive | Receive=transmit | | | | |
| Printer | 4800 | | | | |
| Modem Hi | Ignore | | | | |
| Modem Lo | Ignore | | | | |
| Device Control 1 (XON) | DC1 | same | same | | |
| Device Control 3 (XOFF) | DC3 | same | same | | |
| Disconnect Delay Time | CSI <i>Ps</i> \$ q | same | same | | DECSDDT |
| <u><i>Ps</i></u> | <u>Delay Time</u> | | | | |
| 1 | None | | | | |
| 2 | 60 ms | | | | |
| none,0,3 | 2 s | | | | |
| Flow Control | CSI <i>Ps1</i> ; <i>Ps2</i> ; <i>Ps3</i> ; <i>Ps4</i> * s | n/a | n/a | | DECSFC |
| <u><i>Ps1</i></u> | <u>Port Type</u> | <u><i>Ps3</i></u> | <u>Flow Control Type</u> | | |
| none,0,1 | Comm Port | none, 0 or 1 | XON/XOFF or XPC (for receive only) | | |
| 2 | Printer Port | 2 | DTR | | |
| | | 3 | Both | | |
| | | 4 | None | | |
| <u><i>Ps2</i></u> | <u>Transmit or Receive</u> | <u><i>Ps4</i></u> | <u>Flow Control Threshold</u> | | |
| 1,0 or none | Transmit | none 0 or 1 | Low (64) | | |
| 2 | Receive | 2 | High (768) | | |
| 3 | Transmit and Receive | | | | |
| Half-Duplex Mode | | n/a | n/a | | DECHDPXM |
| Set: | CSI ? 103 h | | | | |
| Reset: | CSI ? 103 I | | | | |
| Load Answerback Message ² | DCS <i>Ps</i> v D...D ST | n/a | n/a | | DECLANS |
| Load Banner Message | DCS <i>Ps</i> r D...D ST | n/a | n/a | | DECLBAN |
| <u><i>Ps1</i></u> | <u>Printer Port</u> | | | | |
| 1 | Parallel port | | | | |
| 2 | Comm1 | | | | |
| 3 | Comm2 | | | | |
| <u><i>Ps2</i></u> | <u>Session 1</u> | | | | |
| 1 | Comm1 | | | | |
| 2 | Comm2 | | | | |
| Modem Control Mode | | n/a | n/a | | DECMCM |
| Set: | CSI ? 99 h | | | | |
| Reset: | CSI ? 99 I | | | | |
| Null Mode | | n/a | n/a | | DECNULM |
| Set (ignore NUL): | CSI ? 102 h | | | | |
| Reset (accept NUL): | CSI ? 102 I | | | | |

² The answerback data string may consist of from 0 to 30, 7- or 8-bit characters, which are hex pairs in the 3/0 through 3/9 (0 through 9) range, 4/1 through 4/6 (A through F) range, and 6/1 through 6/6 (A through F) range. Pressing Ctrl/Break or receiving an ENQ code causes the VT510 to transmit the answerback message.

(continued on next page)

ANSI Control Functions Summary

4.6 ANSI Control Function Tables

Table 4–9 (Cont.) Communications Control Functions

| Terminal Synchronization (cont.) | Control Function | | | Mnemonic |
|---|--|--|---|----------|
| | VT510 | VT420 | VT100 | |
| Set Port Parameters | CSI <i>Ps1</i> ; <i>Ps2</i> ; <i>Ps3</i> ; <i>Ps4</i> + w | n/a | n/a | DECSPPP |
| <u><i>Ps1</i></u> none , 0 or 1 2 | <u>Port</u> Comm Port Printer Port | <u><i>Ps3</i></u> none , 0 or 1 2 3 4† 5† 6 7 | <u>Parity</u> No parity Even Odd Even Odd, unchecked Mark Space | |
| <u><i>Ps2</i></u> 1,0 or none 2 | <u>Data</u> 8 bits 7 bits | | | |
| <u><i>Ps4</i></u> none , 0 or 1 2 | <u>Stop Bit</u> 1 bit 2 bits | | | |
| Set Transmit Rate Limit | CSI <i>Ps1</i> ; <i>Ps2</i> " u | n/a | n/a | DECSTRL |
| <u><i>Ps</i></u> none , 0 or 1 2 3 | <u>Key Type</u> All keys Graphic key Function key | | | |
| <u><i>Ps</i></u> none ,0,1 2 3 | <u>Characters Per Second</u> 150 cps 50 cps 30 cps | | | |
| Transmit Rate Limiting Mode | | same | n/a | DECXRLM |
| | Set (limited): Reset (unlimited): | CSI ? 73 h CSI ? 73 I | | |

† Not available for the printer port. If specified in the sequence to configure the printer port, the Ps3 value is ignored.

ANSI Control Functions

This chapter describes the ANSI escape and control sequences in detail, whereas the previous chapter provides only a brief summary of these sequences.

Each command in this chapter is formatted in such a way that you can refer to the command by either the mnemonic, name, or control function.

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.

Format

| | | |
|------|-----|--------------|
| ESC | SP | <i>Final</i> |
| 1/11 | 2/0 | *** |

Parameters

Final

indicates the ANSI conformance level for the subsequent data exchange.

| Final | ANSI Conformance Level |
|----------|------------------------|
| L | Level 1 |
| M | Level 2 |
| N | Level 3 |

Description

ANSI conformance levels represent an agreement between the sender and receiver for compatible data exchange. The control function:

1. Acts as an *announcer* for the data exchange that follows between the terminal and application software.
2. Selects which character sets the terminal uses by default in the data exchange.

ANSI Conformance Levels

The VT510 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.

Notes

- If the terminal is reset, turned off, or changed with a set conformance level (DECSCL) sequence, then the software must send another announcer sequence to the terminal. Otherwise, the terminal uses the default character sets (ASCII in GL, DEC Supplemental or ISO Latin-1 supplemental in GR).

CBT—Cursor Backward Tabulation

Move the active position *n* tabs backward.

Default: 1.

Format

| | | |
|------------|----------------------|----------|
| CSI | <i>P_n</i> | Z |
| 9/11 | 3/ <i>n</i> | 5/10 |

Parameters

P_n

is the number of active position tabs to move backward.

Description

The active position is moved to the character position corresponding to the *n*-th preceding horizontal tabulation stop. If an attempt is made to move the active position past the first character position on the line, then the active position stays at column one.

CHA—Cursor Horizontal Absolute

Move the active position to the *n*-th character of the active line.

Default: 1.

Format

| | | |
|------------|----------------------|----------|
| CSI | <i>P_n</i> | G |
| 9/11 | 3/ <i>n</i> | 4/7 |

Parameters

P_n

is the number of active positions to the *n*-th character of the active line.

Description

The active position is moved to the *n*-th character position of the active line.

CHT—Cursor Horizontal Forward Tabulation

CHT—Cursor Horizontal Forward Tabulation

Move the active position n tabs forward.

Default: 1.

Format

| | | |
|------|--------|-----|
| CSI | P_n | I |
| 9/11 | 3/ n | 4/9 |

Parameters

P_n

is the number of active position tabs to move forward.

Description

The active position is moved to the character position corresponding to the following n -th horizontal tabulation stop.

CNL—Cursor Next Line

Move the cursor to the next line.

Default: 1.

Format

| | | |
|------|--------|-----|
| CSI | P_n | E |
| 9/11 | 3/ n | 4/5 |

Parameters

P_n

is the active position to the first character of the n -th following line.

Description

The active position is moved to the first character of the n -th following line.

CPL—Cursor Previous Line

Move the cursor to the preceding line.

Default: 1.

Format

| | | |
|------------|-------------|----------|
| CSI | <i>Pn</i> | F |
| 9/11 | 3/ <i>n</i> | 4/6 |

Parameters

Pn

is the number of active position moved to the first character of the n-th preceding line.

Description

The active position is moved to the first character of the n-th preceding line.

CPR—Cursor Position Report

The host asks the terminal for a cursor position report.

Format

| | | | |
|------------|----------|----------|--------------------------|
| CSI | 6 | n | |
| 9/11 | 3/6 | 6/14 | Request cursor position. |

| | | | | | |
|------------|-------------|----------|-------------|----------|-------------------------|
| CSI | <i>Pl</i> | ; | <i>Pc</i> | R | |
| 9/11 | 3/ <i>n</i> | 3/11 | 3/ <i>n</i> | 5/2 | Report cursor position. |

Parameters

Pl

indicates what line the cursor is on.

Pc

indicates what column the cursor is at.

CRM—Show Control Character Mode

CRM—Show Control Character Mode

Enable or disable control characters to be displayed.

Default: Interpret

Format

| | | | |
|------------|----------|----------|-------------------------------------|
| CSI | 3 | h | Set: show control character. |
| 9/11 | 3/3 | 6/8 | |
| CSI | 3 | I | Reset: interpret control character. |
| 9/11 | 3/3 | 6/12 | |

Description

When CRM mode is set, all characters (graphic or control) are displayed in the CRM font. All control functions are displayed as graphic characters. No control functions are executed, except LF, FF, and VT, which are represented in the CRM font before a CRLF (new line) is executed. XOFF (DC3) and XON (DC1) are used for flow control (if enabled). DC1 and DC3 are displayed after execution.

This function affects data received in the data stream following the change to CRM mode. Characters already displayed are not affected. Entering Control Representation mode temporarily causes G0 and GL to be loaded with ASCII. G2 and GR are loaded with user-selected Supplemental Graphic characters if in 8-bit Multinational Character mode.

Notes on CRM

- CRM mode works in all VT terminal modes.
- NUL is displayed and is not useful as a fill character.
- CRM mode overrides Printer Controller mode. When in CRM, Printer Controller mode is temporarily off.
- In local mode and CRM (or local echo and CRM), CSI sequences may be represented as either ESC Fe sequences (such as *ESC j*) or as C1 controls. Conversely, C1 controls may be represented as either C1 controls or as ESC Fe sequences.
- In CRM mode, auto-wrap always occurs at the right margin. Sending a sequence or disabling auto-wrap in Set-Up is ignored.
- Terminal Device Protocol commands are not affected if Control Representation mode is entered.

CUB—Cursor Backward

This control function moves the cursor to the left by a specified number of columns. The cursor stops at the left border of the page.

Format

| | | |
|------------|-------------|----------|
| CSI | <i>Pn</i> | D |
| 9/11 | 3/ <i>n</i> | 4/4 |

Parameters

Pn
is the number of columns to move the cursor to the left.

CUD—Cursor Down

This control function moves the cursor down a specified number of lines in the same column. The cursor stops at the bottom margin. If the cursor is already below the bottom margin, then the cursor stops at the bottom line.

Format

| | | |
|------------|-------------|----------|
| CSI | <i>Pn</i> | B |
| 9/11 | 3/ <i>n</i> | 4/2 |

Parameters

Pn
is the number of lines to move the cursor down.

CUF—Cursor Forward

CUF—Cursor Forward

This control function moves the cursor to the right by a specified number of columns. The cursor stops at the right border of the page.

Format

| | | |
|------------|----------------------|----------|
| CSI | <i>P_n</i> | C |
| 9/11 | 3/ <i>n</i> | 4/3 |

Parameters

P_n
is the number of columns to move the cursor to the right.

CUP—Cursor Position

This control function moves the cursor to the specified line and column. The starting point for lines and columns depends on the setting of origin mode (DECOM). CUP applies only to the current page.

Format

| | | | | |
|------------|-------------|----------|-------------|----------|
| CSI | <i>Pl</i> | ; | <i>Pc</i> | H |
| 9/11 | 3/ <i>n</i> | 3/11 | 3/ <i>n</i> | 4/8 |

Parameters

Pl
is the number of the line to move to. If *Pl* is 0 or 1, then the cursor moves to line 1.

Pc
is the number of the column to move to. If *Pc* is 0 or 1, then the cursor moves to column 1.

CUU—Cursor Up

Moves the cursor up a specified number of lines in the same column. The cursor stops at the top margin. If the cursor is already above the top margin, then the cursor stops at the top line.

Format

| CSI | <i>Pn</i> | A |
|------|-------------|-----|
| 9/11 | 3/ <i>n</i> | 4/1 |

Parameters

Pn
is the number of lines to move the cursor up.

DA1—Primary Device Attributes

DA1—Primary Device Attributes

In this DA exchange, the host asks for the terminal's architectural class 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 architectural class and basic attributes to the host. This response depends on the terminal's current operating VT level.

Response from North American Terminal

| | | | | | | | | | |
|------------|----------|----------|----------|----------|------------|----------|------------|------------|----------|
| CSI | ? | 6 | 4 | ; | <i>Ps1</i> | ; | ... | <i>Psn</i> | c |
| 9/11 | 3/15 | 3/6 | 3/4 | 3/11 | 3/n | 3/11 | ... | 3/n | 6/3 |

Response from International Terminal

| | | | | | | | | | |
|------------|----------|----------|----------|----------|------------|----------|------------|------------|----------|
| CSI | ? | 6 | 4 | ; | <i>Ps1</i> | ; | ... | <i>Psn</i> | c |
| 9/11 | 3/15 | 3/6 | 3/4 | 3/11 | 3/n | 3/11 | ... | 3/n | 6/3 |

Parameters

Ps1 ; . . . Psn

reports different device attributes between the North American terminal and the international terminal.

The value of the first parameter is encoded so a simple range check can be performed to determine the basic service class and level of the device. The VT510 is a level 4 terminal so its service class code is 64. The following extensions to level 4 are provided:

| Ps | Meaning |
|----|---|
| 1 | 132 columns |
| 2 | Printer port |
| 4 | Sixel |
| 6 | Selective erase |
| 7 | Soft character set (DRCS) |
| 8 | User-defined keys (UDKs) |
| 9 | National replacement character sets (NRCS) (International terminal only) |
| 12 | Yugoslavian (SCS) |
| 15 | Technical character set |
| 18 | Windowing capability |
| 21 | Horizontal scrolling |
| 23 | Greek |
| 24 | Turkish |
| 42 | ISO Latin-2 character set |
| 44 | PCTerm |
| 45 | Soft key map |
| 46 | ASCII emulation |

Primary DA Example

Here is a typical primary DA exchange.

| Exchange | Sequence | Meaning |
|---|--|---|
| Request (Host to VT510) | CSI c or CSI 0 c | The host asks for the terminal's architectural class code and supported extensions. |
| Response—N.A. (VT510 to host) | CSI ? 64; 1; 2; 7; 8; 9; 15; 18; 21; 44; 45; 46 c | The terminal is a class 4 device (64) and supports the Ps parameters listed above. |
| Response— International (VT510 to host) | CSI ? 64; 1; 2; 7; 8; 9; 12; 15; 18; 21; 23; 24; 42; 44; 45; 46 c | The terminal is a class 4 device (64) and supports the Ps parameters listed above. |

DA2—Secondary Device Attributes

DA2—Secondary Device Attributes

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 or 9/11 3/14 3/0 6/3

Terminal Response

The terminal with a VT keyboard uses the following sequence to respond:

CSI > **6 1 ; Pv ; 0 c** DA2R for terminal
9/11 3/14 3/6 3/1 3/11 3/n 3/11 3/0 6/3 with STD keyboard.
CSI > **6 1 ; Pv ; 1 c** DA2R for terminal
9/11 3/14 3/6 3/1 3/11 3/n 3/11 3/1 6/3 with PC keyboard.

Parameters

61

indicates the identification code of the terminal for the secondary device attributes command.

Pv

indicates the version level of the firmware implementing the terminal management functions, for example, editing, as shown in the following table.

| Pv | Version |
|-----------|-----------------------------|
| 10 | V1.0 (released version 1.0) |
| 20 | V2.0 (released version 2.0) |

Secondary DA Example

The following is a typical secondary DA exchange:

| Exchange | Sequence | Meaning |
|--------------------------------|---|---|
| Request (Host to VT510) | CSI > c or CSI > 0 c | The host asks for the terminal's identification, firmware version, current hardware options. |
| Response (VT510 to host) | CSI > 61; 20; 1 c | The terminal identifies itself as a VT510 that uses version 2.0 firmware, and has a PC keyboard option. |

DA3—Tertiary Device Attributes

In this DA exchange, the host asks for the terminal unit identification code. This ID code serves as a way to identify each terminal in a system. The unit ID code is preset at the factory.

Host Request

The host uses the following sequence to send this request:

```
CSI = c or CSI = 0 c
9/11 3/13 6/3 9/11 3/13 3/0 6/3
```

Terminal Response

The terminal responds by sending a report terminal unit ID (DECRPTUI) control string to the host. DECRPTUI is available in VT Level 4 mode only.

```
DCS ! | D...D ST
9/0 2/1 7/12 ... 9/12
```

Parameters

D...D

is the unit ID of the terminal, consisting of four hexadecimal pairs. The first pair represents the manufacturing site code. This code can be any hexadecimal value from 00 through FF.

The last three hexadecimal pairs are the terminal ID number. This number is unique for each terminal manufactured at that site.

Tertiary DA Example

Here is a typical tertiary DA exchange.

| Exchange | Sequence | Meaning |
|--|---|---|
| Request (Host to Terminal) | CSI = c or CSI = 0 c | The host asks for the terminal unit ID. |
| DECRPTUI Response (Terminal to host) | DCS ! 00 01 02 05 ST | The terminal was manufactured at site 00 and has a unique ID number of 125. |

DCH—Delete Character

DCH—Delete Character

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

Format

| CSI | <i>Pn</i> | P |
|------|-------------|-----|
| 9/11 | 3/ <i>n</i> | 5/0 |

Parameters

Pn

is the number of characters to delete. If *Pn* is greater than the number of characters between the cursor and the right margin, then DCH only deletes the remaining characters.

Default: *Pn* = 1.

Description

As characters are deleted, the remaining characters between the cursor and right margin move to the left. Character attributes move with the characters. The terminal adds blank spaces with no visual character attributes at the right margin. DCH has no effect outside the scrolling margins.

DDD1, DDD2, DDD3

DDD1, DDD2, and DDD3 are responses to the host for a Request Terminal State Report (DECRTSR) control function. These responses only work for a Hebrew keyboard.

Format

ESC) 1 DDD1
 1/7 2/9 3/1

ESC) B DDD2
 1/7 2/9 4/2

ESC (1 DDD3
 1/7 2/8 3/1

Description

These escape sequences have the following effects:

| Escape Sequence | Meaning |
|-----------------|--|
| DDD1 | DECRLM is set. DECHEBM is set. DECHEM is set |
| DDD2 | DECRLM is reset. ASCII is designated in G1. |
| DDD3 | ASCII is designated in G0. |

DECAAM—Set/Reset Auto Answerback Mode

DECAAM—Set/Reset Auto Answerback Mode

Selects whether the terminal automatically sends (enables) or does not send (disables) the answerback message to the host computer after a communication line connection.

Default: Auto answerback disabled.

Format

| | | | | | | |
|------------|----------|----------|----------|----------|----------|-------------------------------|
| CSI | ? | 1 | 0 | 0 | h | |
| 9/11 | 3/15 | 3/1 | 3/0 | 3/0 | 6/8 | Set: enables auto answerback. |

| | | | | | | |
|------------|----------|----------|----------|----------|----------|----------------------------------|
| CSI | ? | 1 | 0 | 0 | l | |
| 9/11 | 3/15 | 3/1 | 3/0 | 3/0 | 6/12 | Reset: disables auto answerback. |

Description

When modem control is enabled, the answerback message is sent 500 ms after the connection is made.

DECALN—Screen Alignment Pattern

This control function fills the complete screen area with a test pattern used for adjusting screen alignment. Normally, only manufacturing and service personnel would use DECALN.

Format

| | | |
|------------|----------|----------|
| ESC | # | 8 |
| 1/11 | 2/3 | 3/8 |

Notes on DECALN

DECALN sets the margins to the extremes of the page, and moves the cursor to the home position.

Also see the screen alignment in Chapter 2.

DECANM—ANSI Mode

DECANM changes the terminal to the VT52 mode of operation. In VT52 mode, the terminal acts like a VT52 terminal. This mode lets you use applications designed for the VT52 terminal.

Format

```
CSI ? 2 I
9/11 3/15 3/2 6/12
```

Description

Table 5–1 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. |

DECARM—Autorepeat Mode

DECARM—Autorepeat Mode

This control function determines whether or not keys automatically repeat their character when held down. If DECARM is set, then most keys you press for more than 0.5 seconds send a character repeatedly until you release the key.

Default: Repeat (set)

Format

CSI ? 8 h Set: keys autorepeat when pressed
9/11 3/15 3/8 6/8 for more than 0.5 seconds.

CSI ? 8 l Reset: keys do not autorepeat.
9/11 3/15 3/8 6/12

Notes on DECARM

- The following keys on the VT keyboard do not repeat:

| | | |
|---------------------|-------------------|--------|
| F1 (Hold) | F5 (Break) | Return |
| F2 (Print) | Compose Character | Lock |
| F3 (Set-Up) | Shift | Ctrl |
| F4 (Session) | Alt Function | Extend |

- The following keys on the PC keyboard do not repeat:

| | |
|-----------|--------------|
| Alt | AltGr |
| Caps Lock | Pause |
| Ctrl | Print Screen |
| Enter | Scroll Lock |
| Num Lock | Shift |

DECARSM—Set/Reset Auto Resize Mode

Enable or disable changing the lines per screen automatically when the page arrangement changes.

Default: Auto resize disabled

Format

CSI ? **9** **8** **h** Set: enable auto resize.
9/11 3/15 3/9 3/8 6/8

CSI ? **9** **8** **l** Reset: disable auto resize.
9/11 3/15 3/9 3/8 6/12

Description

When **Auto Resize** is enabled, the number of Lines/Screen changes automatically each time the page arrangement changes.

Auto Resize and **Number of lines per screen** are user features that can be locked from being redefined by the host if the **User Feature Lock** in Set-Up is enabled.

The following table indicates how the lines/screen changes when the page size changes, assuming **Auto Resize** is set.

| Page size | Lines/Screen |
|-----------|--|
| 24 | 26 (24 data lines, 1 status line, 1 blank line) |
| 25 | 26 (25 data lines, 1 status line) |
| 36 | 42 (36 data lines, 1 status line, 5 blank lines) |
| 41 | 42 (41 data lines, 1 status line) |
| 42 | 42 (42 data lines, no status line) |
| 48 | 53 (48 data lines, 1 status line, 4 blank lines) |
| 52 | 53 (52 data lines, 1 status line) |
| 53 | 53 (53 data lines, 0 status line) |
| 72 | 53 (53 data lines, 0 status line) |

DECAUPSS—Assigning User-Preferred Supplemental Sets

DECAUPSS—Assigning User-Preferred Supplemental 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.

Default: DEC Supplemental Graphic

Format

| | | | | | |
|------------|-----------|----------|----------|-------------|-----------|
| DCS | <i>Pn</i> | ! | u | <i>Dscs</i> | ST |
| 9/0 | 3/n | 2/1 | 7/5 | 3/n | 9/12 |

Parameters

Pn
represents a character set designator.

| Pn | Meaning |
|-----------|--|
| 0 | DEC, ISO Latin-1, ISO Latin-2 |
| 1 | ISO Latin-5, ISO Latin-7, ISO Cyrillic, ISO Hebrew |

Dscs
represents a character set.

| Dscs | Character Set |
|-------------|-----------------------------|
| % 5 | DEC Supplemental |
| " ? | DEC Greek |
| " 4 | DEC Hebrew |
| % 0 | DEC Turkish |
| & 4 | DEC Cyrillic |
| < | User-preferred Supplemental |
| A | ISO Latin-1 Supplemental |
| B | ISO Latin-2 Supplemental |
| F | ISO Greek Supplemental |
| H | ISO Hebrew Supplemental |
| M | ISO Latin-5 Supplemental |
| L | ISO Latin-Cyrillic |

Description

You can assign any supplemental or ISO Latin supplemental set as the standby set. See SCS—Select Character Set for more information.

After you assign a set:

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

DECAWM—Autowrap Mode

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

Format

| | | | | |
|------------|----------|----------|----------|----------------|
| CSI | ? | 7 | h | Set: autowrap. |
| 9/11 | 3/15 | 3/7 | 6/8 | |

| | | | | |
|------------|----------|----------|----------|---------------------|
| CSI | ? | 7 | l | Reset: no autowrap. |
| 9/11 | 3/15 | 3/7 | 6/12 | |

Description

If the DECAWM function is set, then 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.

If the DECAWM function is reset, then graphic characters received when the cursor is at the right border of the page replace characters already on the page.

DECBI—Back Index

This control function moves the cursor backward one column. If the cursor is at the left margin, then all screen data within the margin moves one column to the right. The column that shifted past the right margin is lost.

Available in: VT Level 4 mode only

Format

| | |
|------------|----------|
| ESC | 6 |
| 1/11 | 3/6 |

Description

DECBI adds a new column at the left margin with no visual attributes. DECBI is not affected by the margins. If the cursor is at the left border of the page when the terminal receives DECBI, then the terminal ignores DECBI.

DECBKM—Backarrow Key Mode

DECBKM—Backarrow Key Mode

This control function determines whether the $\langle x \rangle$ key works as a backspace key or delete key.

Note

To be compatible with some software, DECBKM should be reset (delete key setting).

Default: Delete key

Format

| | | | | | |
|------------|----------|----------|----------|----------|---------------------|
| CSI | ? | 6 | 7 | h | Set: backspace key. |
| 9/11 | 3/15 | 3/6 | 3/7 | 6/8 | |
| CSI | ? | 6 | 7 | l | Reset: delete key. |
| 9/11 | 3/15 | 3/6 | 3/7 | 6/12 | |

Description

If DECBKM is set, $\langle x \rangle$ works as a backspace key. When you press $\langle x \rangle$, the terminal sends a BS character to the host.

If DECBKM is reset, $\langle x \rangle$ works as a delete key. When you press $\langle x \rangle$, the terminal sends a DEL character to the host.

DECCANSM—Conceal Answerback Message Mode

Conceal the answerback message.

Default: Answerback message is not concealed

Format

| | | | | | | |
|------------|----------|----------|----------|----------|----------|-------------------------------------|
| CSI | ? | 1 | 0 | 1 | h | Conceal answerback message |
| 9/11 | 3/15 | 3/1 | 3/0 | 3/1 | 6/8 | |
| CSI | ? | 1 | 0 | 1 | l | Answerback message is not concealed |
| 9/11 | 3/15 | 3/1 | 3/0 | 3/1 | 6/12 | |

Description

| Setting | Function |
|---------------|--|
| Not concealed | The answerback message is visible in Set-Up. |
| Concealed | <p>The text "concealed" replaces the answerback message.</p> <p>The answerback message cannot be set back to "not concealed" either through a host control function or Set-Up. Only entering a new message returns this field to "not concealed."</p> <p>If the user or host requests the terminal to reset to the default setting (answerback message not concealed (CSI ? 101 l)) when the answerback message is set to "concealed," then the terminal will not reset the answerback message to "not concealed."</p> |

DECCAPSLK– Caps Lock Mode

DECCAPSLK– Caps Lock Mode

DECCAPSLK controls the state of the Caps Lock key on the PC keyboard.

Format

CSI ? 1 0 9 h Set: caps lock mode.
9/11 3/15 3/1 3/0 3/9 6/8

CSI ? 1 0 9 | Reset: caps lock mode.
9/11 3/15 3/1 3/0 3/9 6/12

DECCARA—Change Attributes in Rectangular Area

This control function lets you change the visual character attributes (bold, blink, reverse video, and underline) of a specified rectangular area in page memory. The select attribute change extent (DECSACE) control function determines whether all or some of the character positions in the rectangle are affected. DECCARA does not change the values of characters just the visual attributes of those characters.

Available in: VT Level 4 mode only

Format

CSI *Pt; Pl; Pb; Pr;* *Ps1; . . . Psn* \$ r
9/11 *area to be changed* *attributes to change* 2/4 7/2

Parameters

Pt; Pl; Pb; Pr;

define the rectangular area to be changed. A semicolon (3/11) separates parameters.

Pt

is the top-line border. *Pt* must be less than or equal to *Pb*.

Default: *Pt* = 1.

Pl

is the left-column border. *Pl* must be less than or equal to *Pr*. Default: *Pl* = 1.

Pb

is the bottom-line border.

Default: *Pb* = last line of the active page.

Pr

is the right-column border.

Default: *Pr* = last column of the active page.

Ps1; . . . Psn

select the visual character attributes to change. These values correspond to the values used in the select graphic rendition.

DECCARA—Change Attributes in Rectangular Area

| Psn | Meaning |
|----------------|--|
| 0 (default) | Attributes off (no bold, no underline, no blink, positive image) |
| 1 | Bold |
| 4 | Underline |
| 5 | Blink |
| 7 | Negative image |
| 22 | No bold |
| 24 | No underline |
| 25 | No blink |
| 27 | Positive image |

DECCARA ignores all other parameter values. When you use more than one parameter in a command, DECCARA executes them cumulatively in sequence.

Examples

The following sequence changes the video attributes of the complete screen to blink and underscore:

```
CSI ; ; ; ; 0; 4; 5; $ r
```

The following sequence turns off the blinking character attribute from position line 10, column 2 to position line 14, column 45 on the current page:

```
CSI 10; 2; 14; 45; 25 $ r
```

Notes on DECCARA

- The coordinates of the rectangular area are affected by the setting of origin mode (DECOM).
- DECCARA is not affected by the page margins.
- If the value of *Pt*, *Pl*, *Pb*, or *Pr* exceeds the width or height of the active page, then the value is treated as the width or height of that page.
- DECCARA does not change the active cursor position.
- DECCARA does not change the current rendition set by the select graphic rendition (SGR) function.
- The exact character positions affected by DECCARA depend on the current setting of the select attribute change extent (DECSACE) function.

DECCIR—Cursor Information Report (Terminal to Host)

DECCIR—Cursor Information Report (Terminal to Host)

The terminal sends this sequence in response to a request presentation state report (DECRQPSR) sequence, **CSI 1 \$ w**. DECCIR reports the status of the cursor position, including visual attributes and character protection attributes. DECCIR also reports the status of origin mode (DECOM) and the current active character sets.

Format

```
DCS  1  $  u  D ... D  ST
9/0  3/1  2/4  7/5  D ... D  9/12
```

Description

DECCIR reports all the character sets if they are assigned to one of the G0, G1, G2, or G3 sets. Refer to SCS—Select Character Set for all character set designators.

Parameters

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

Pr

is the number of the line the cursor is on.

Pc

is the 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 or blinking, currently in use for writing. To find out what attributes are set, you must convert the character to an 8-bit binary number. The bits are used as follows.

| Bit | Attribute | Bit Value |
|-----|---------------------|--|
| 8 | – | Always 0 (off). |
| 7 | – | Always 1 (on). |
| 6 | Extension indicator | 1 = another character (byte) of visual attribute data follows this one. 0 = no more attribute data. |
| 5 | – | Always 0 (off). |
| 4 | Reverse video | 0 = off. 1 = on. |

DECCIR—Cursor Information Report (Terminal to Host)

| Bit | Attribute | Bit Value |
|-----|-----------|-----------|
| 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 currently set for writing, *Srend* is the ASCII uppercase C character (01000011₂).

Satt

is one or more characters indicating any selective erase attributes currently set for writing.

To find what attributes are set, you must convert each character to an 8-bit binary number. 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 (DECSCA) | 0 = off. |
| | | 1 = on. |

Example

If the selective erase protection attribute is currently set for writing, then *Satt* is the ASCII uppercase A character (01000001₂).

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 following table to find the meaning of the 8-bit binary number:

DECCIR—Cursor Information Report (Terminal to Host)

| 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 | Autowrap | 1 = autowrap pending. 0 = autowrap 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, autowrap is pending, and a single shift 3 has been received, then *Sflag* is the ASCII uppercase M character (01001101₂).

Pgl

indicates the number of the logical character set (G0 through G3) mapped into GL.

0 = G0 is in GL. 2 = G2 is in GL.
1 = G1 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. 2 = G2 is in GR.
1 = G1 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 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 character size data follows this one. 0 = no more size data. |

DECCIR—Cursor Information Report (Terminal to Host)

| Bit | Attribute | Bit Value | |
|-----|-------------|-----------|--------------------------|
| 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:

- The ISO Latin-1 supplemental set is designated as G2 and G3.
- The ASCII set is designated as G0 and G1.
- Single shift 2 (SS2) is set.

Then Scss is the ASCII backslash \ character (01011100₂).

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.

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 set | DEC Special Graphic | DEC Supplemental Graphic | DEC Supplemental Graphic |

DECCIR—Cursor Information Report (Terminal to Host)

Example

The following is an example of a cursor information report:

```
DCS 1 $ u 1; 1; 1; @; @; @; 0; 2; @; BB%5%5 ST
```

1; 1; 1; indicates that the cursor is at row 1, column 1, on the first page.

@; @; @; indicates that (1) no visual character attributes or selective erase attributes are set for writing, (2) DECOM is reset, and (3) there is no SS2, SS3, or autowrap pending.

0; 2; indicates that G0 is mapped into GL, and G2 is in GR.

@; indicates that all character sets have 94 characters.

BB%5%5 indicates that ASCII is in G0 and G1, and 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.

DECCKD—Copy Key Default

Copies the default states of a key and its key/modifier combination to another key and its key/modifier combination.

Format

| | | | | |
|-----|-----|------|---------|------|
| DCS | " | z | D ... D | ST |
| 9/0 | 2/2 | 7/10 | D ... D | 9/12 |

Description

This control function copies the default states of a key and all its modifier combinations to another key and its modifier combinations. The source key may have been reprogrammed to perform a non-default function when copy operation is executed. Only the default states of the source key are copied.

The source key and the destination key can be two different keys or the same key. If they are different keys, then the copy operation occupies the memory space that is reserved for the operations of control functions, DECPFK, DECPAK, and DECUDK and their equivalent functions in Set-Up. (Refer to DECPFK—Program Function Key for details.) If they are the same key, then the function of the copy operation is to restore the key's default. In this state, the terminal does not allocate new memory space. The terminal frees up the space by deleting the non-default functions of the destination key and its modifier combinations.

A function key can copy the default state from a function key or a graphic key. When a graphic key's default is copied, the function key operates as a graphic key. Only the modifiers that are suitable for a graphic key operate with the key. This logic is used when a graphic key copies the default from a function key.

Multiple keys can be copied in one sequence.

The data string D...D format is:

Key-s/Key-d;Key-s/Key-d.....;

Where:

- Key-s is the keystation number of the key to be copied.
- Key-d is the keystation number of the destination key.

Once programmed, the key states are not affected by the terminal mode changes. Refer to DECPFK—Program Function Key for the list of terminal mode changes.

This function works in all the VT modes except in VT52 mode.

DECCKM—Cursor Keys Mode

DECCKM—Cursor Keys Mode

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.

Default: Cursor

Format

| | | | | |
|------------|----------|----------|----------|-----------------------------|
| CSI | ? | 1 | h | Set: application sequences. |
| 9/11 | 3/15 | 3/1 | 6/8 | |

| | | | | |
|------------|----------|----------|----------|--------------------------|
| CSI | ? | 1 | l | Reset: cursor sequences. |
| 9/11 | 3/15 | 3/1 | 6/12 | |

Description

If the DECCKM function is set, then the arrow keys send application sequences to the host.

If the DECCKM function is reset, then the arrow keys send ANSI cursor sequences to the host.

DECCKSR—Memory Checksum Report

The host asks for a memory checksum report of current text macro definitions.

Programming Tip

Enter your macro definitions, then request and save a memory checksum. After this procedure, you can request another checksum to determine if the checksum has changed.

Format

| | | | | | | | |
|------------|------------|----------|----------|------------------|------------|----------|--------------------------|
| CSI | ? | 6 | 3 | ; | <i>Pid</i> | n | Request memory checksum. |
| 9/11 | 3/15 | 3/6 | 3/3 | 3/11 | 3/n | 6/14 | |
| DCS | <i>Pid</i> | ! | ~ | <i>D . . . D</i> | ST | | Response with checksum. |
| 9/0 | 3/n | 2/1 | 7/14 | . . . | 9/12 | | |

Parameters

Pid (request)

is an optional numeric parameter that provides a label to identify the particular checksum request. The checksum report returns the label. This label lets you distinguish between multiple checksum reports.

Pid (response)

is a label indicating which DSR request the report is for.

D . . . D

is the data string consisting of four hexadecimal digits indicating the checksum. The digits can be in the range of 3/0 through 3/9 and 4/0 through 4/6.

DECCOLM—Select 80 or 132 Columns per Page

DECCOLM—Select 80 or 132 Columns per Page

There are two control functions that can set the page width to 80 or 132 columns, DECSCPP (DECSCPP—Select 80 or 132 Columns per Page) and DECCOLM.

NOTE

It is recommended 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.

Default: 80 columns

Format

| | | | | |
|------|------|-----|------|------------------------|
| CSI | ? | 3 | h | Set: 132-column font. |
| 9/11 | 3/15 | 3/3 | 6/8 | |
| CSI | ? | 3 | l | Reset: 80-column font. |
| 9/11 | 3/15 | 3/3 | 6/12 | |

Notes on DECCOLM

- DECCOLM sets the number of columns on the page to 80 or 132 and selects the corresponding 80- or 132-column font.
- If you change the DECCOLM setting, the terminal:
 - Sets the left, right, top and bottom scrolling margins to their default positions.
 - Erases all data in page memory.
- DECCOLM resets vertical split screen mode (DECLRMM) to unavailable.
- DECCOLM clears data from the status line if the status line is set to host-writable.

DECCRA—Copy Rectangular Area

This control function copies a rectangular area of characters from one section to another in page memory. The copied text retains its character values and attributes.

Available in: VT Level 4 mode only

Format

| | | | | |
|------------|---------------------------------|----------------------|-----------|----------|
| CSI | <i>Pts; Pls; Pbs; Prs; Pps;</i> | <i>Ptd; Pld; Ppd</i> | \$ | v |
| 9/11 | <i>area to be copied</i> | <i>destination</i> | 2/4 | 7/6 |

Parameters

Pts; Pls; Pbs; Prs; Pps;

define the rectangular area to be copied (the source). A semicolon (3/11) separates parameters.

Pts

is the top-line border. *Pts* must be less than or equal to *Pbs*. Default: *Pts* = 1.

Pls

is the left-column border. *Pls* must be less than or equal to *Prs*. Default: *Pls* = 1.

Pbs

is the bottom-line border.

Default: *Pbs* = the last line of the page.

Prs

is the right-column border.

Default: *Prs* = the last column of the page.

Pps

is the number of the page where the rectangular area is located.

Default: *Pps* = 1.

Ptd; Pld; Ppd;

define the destination of the copied rectangular area.

Ptd

is the top-line border.

Default: *Ptd* = 1.

Pld

is the left-column border.

Default: *Pld* = 1.

Ppd

is the number of the page.

Default: *Ppd* = 1.

DECCRA—Copy Rectangular Area

Notes on DECCRA

- If *Pbs* is greater than *Pts*, or *Pls* is greater than *Prs*, the terminal ignores DECCRA.
- The coordinates of the rectangular area are affected by the setting of origin mode (DECOM).
- DECCRA is not affected by the page margins.
- The copied text takes on the line attributes of the destination area.
- If the value of *Pt*, *Pl*, *Pb*, or *Pr* exceeds the width or height of the active page, then the value is treated as the width or height of that page.
- If a page value exceeds the number of pages available in the current page arrangement, then the value is treated as the last available page number.
- If the destination area is partially off the page, then DECCRA clips the off-page data.
- DECCRA does not change the active cursor position.

DECCRTSM—Set/Reset CRT Save Mode

Enable or disable CRT saver.

Default: Enable CRT saver.

Format

| | | | | | |
|------------|----------|----------|----------|----------|------------------------|
| CSI | ? | 9 | 7 | h | Set: enable CRT saver. |
| 9/11 | 3/15 | 3/9 | 3/7 | 6/8 | |

| | | | | | |
|------------|----------|----------|----------|----------|---------------------------|
| CSI | ? | 9 | 7 | l | Reset: disable CRT saver. |
| 9/11 | 3/15 | 3/9 | 3/7 | 6/12 | |

Description

If CRT saver is enabled and the terminal is inactive for 30 minutes (no keyboard activity or input from a host computer), then the monitor screen goes blank to prolong the life of the CRT. No data is lost when CRT saver is active. Keyboard activity or input from the host computer re-activates the monitor.

When the monitor goes blank, the keyboard LEDs flash.

DECDC—Delete Column

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

Available in: VT Level 4 mode only

Format

| | | | |
|------|-----------|-----|------|
| CSI | <i>Pn</i> | ' | ~ |
| 9/11 | 3/? | 2/7 | 7/14 |

Parameters

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

Description

As columns are deleted, the remaining columns between the cursor and the right margin move to the left. The terminal adds blank columns with no visual character attributes at the right margin. DECDC has no effect outside the scrolling margins.

DECDDL—Double-Width, Double-Height Line

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, then all characters to the right of the screen center are lost.

Format

| | | | |
|------|-----|-----|-------------|
| ESC | # | 3 | Top Half |
| 1/11 | 2/3 | 3/3 | |
| ESC | # | 4 | Bottom Half |
| 1/11 | 2/3 | 3/4 | |

Description

The following sequences make the phrase “VT510 Video Terminal” a double-height, double-width line.

ESC#3 VT510 Video Terminal

ESC#4 VT510 Video Terminal

DECDDL—Dynamically Redefinable Character Sets

DECDDL loads your soft character set into dynamically redefinable character set (DRCS) font buffers. Although the terminal has six font buffers, it only supports four buffers for soft character sets.

The terminal arranges the DRCS font buffers into sets. Each DRCS set has two font buffers: one for 80-column fonts and one for 132-column fonts. These buffers also allow you to load two different font heights or character sets in both 80- and 132-column widths.

Although the terminal allows you to use two different soft character sets at one time, it only allows you to use one DRCS set at one time.

Format

```
DCS Pfn ; Pcn ; Pe ; Pcmw ; Pss ; Pt ; Pcmh ; Pcss { Dscs Sxbp1 ; Sxbp2 ; . . . ; Sxbpn
ST
```

Description

DCS 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.

ST 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.

Parameters

Pfn; Pcn; Pe; Pcmw; Pss; Pt; Pcmh; Pcss

are *parameter characters*, separated by semicolons (3/11). Table 5–2 describes these parameters and lists their possible values. Table 5–3 describes the combinations of *Pcmw*, *Pt*, and *Pcmh* that you can use for 80- and 132-column fonts. If you use any other combinations, then the terminal ignores the DECDDL string.

{

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

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

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

NOTES

- If two downline loaded soft character sets have the same *Dscs*, then the most recently loaded set is used. The terminal looks for a matching *Dscs* in reverse load order (last loaded first).
 - If the terminal receives a DRCS control string for a given font number with a different *Dscs* (designating sequence), *Pcmh* (height) or *Pcss* (character set size), then the terminal erases the previously downline loaded set (if any) in both 80- and 132-column mode.
 - If there is no DRCS available that is compatible with the current number of lines per screen (font height), then the terminal displays a reverse question mark in place of any characters.
-

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 <i>Pcss</i> defines whether this set has 94 or 96 characters. |
| A 4/2 | If <i>Pcss</i> is 0, then A defines the soft character set as the U.K. national replacement character set. If <i>Pcss</i> is 1, then 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 <i>Pcss</i> 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

the first *S...S*
represents the sixels in Group A of the soft character.

the second *S...S*
advances the sixel pattern to Group B of the soft character.

/ (2/5)

represents the sixels in Group B of the soft character.

DECDDL—Dynamically Redefinable Character Sets

Table 5–2 DECDDL Parameter Characters

| Parameter | Name | Description |
|------------|--------------------|--|
| <i>Pfn</i> | Font number | Selects the DRCS (soft character set) to load. The previous set (if any), that you load with that font number, is erased or overwritten as specified by the control sequence. You can assign a value of 0, 1, and 2 to <i>Pfn</i> . Other values cause the terminal to ignore the entire sequence. <i>Pfn</i> = 0 defaults to the first empty font buffer, or, if none are empty, to font buffer 1. |
| <i>Pcn</i> | 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. For example, a <i>Pcn</i> value of 0 means that the first soft character is loaded into position 2/0 of the character table. A <i>Pcn</i> value of 1 means position 2/1 in the table, and so on, up to <i>Pcn</i> = 95 (position 7/15). <i>Pcn</i> is affected by the character set size. See <i>Pcss</i> below. |
| <i>Pe</i> | Erase control | Selects which characters to erase from the DRCS buffer before loading the new font. 0 = Erases all characters in the DRCS buffer with this number, width, and rendition. 1 = Erases only characters in locations being reloaded. 2 = Erases all renditions of the soft character set (normal, bold, 80-column, 132-column). |

————— **Note** —————

Erased characters are undefined (not blank). The terminal displays these characters as the error character (reverse question mark).

(continued on next page)

DECDDL—Dynamically Redefinable Character Sets

Table 5–2 (Cont.) DECDDL Parameter Characters

| Parameter | Name | Description |
|-------------|------------------------|--|
| <i>Pcmw</i> | Character matrix width | <p>Selects the maximum character cell width.</p> <p>When <i>Pss</i> specifies 80 columns, <i>Pt</i> specifies font usage full cell as follows:</p> <ul style="list-style-type: none"> 0 = 10 pixels wide for 80 columns, 6 pixels wide for 132 columns. (default). 2 = 5 × 10 pixel cell (width × height). 3 = 6 × 10 pixel cell (width × height). 4 = 7 × 10 pixel cell (width × height). 5 = 5 pixels wide. 6 = 6 pixels wide. . . . 10 = 10 pixels wide. <p>When <i>Pss</i> specifies 80 columns, <i>Pt</i> specifies font usage text as follows:</p> <ul style="list-style-type: none"> 0 = 10 pixels wide for 80 columns, 6 pixels wide for 132 columns. (default) 2 = 5 × 10 pixel cell (width × height). 3 = 6 × 10 pixel cell (width × height). 4 = 7 × 10 pixel cell (width × height). 5 = 5 pixels wide. . . . 9 = 9 pixels wide. <p>When <i>Pss</i> specifies 132 columns, <i>Pt</i> specifies font usage full cell as follows:</p> <ul style="list-style-type: none"> 0 = 10 pixels wide for 80 columns, 6 pixels wide for 132 columns. (default) 2 = 5 × 10 pixel cell (width × height). 3 = 6 × 10 pixel cell (width × height). 4 = 7 × 10 pixel cell (width × height). 5 = 5 pixels wide. 6 = 6 pixels wide. |

(continued on next page)

DECDDL—Dynamically Redefinable Character Sets

Table 5–2 (Cont.) DECDDL Parameter Characters

| Parameter | Name | Description |
|------------|---------------|---|
| | | <p>When <i>Pss</i> specifies 132 columns, <i>Pt</i> specifies font usage text as follows:</p> <p>0 = 10 pixels wide for 80 columns, 6 pixels wide for 132 columns. (default)</p> <p>2 = 5 × 10 pixel cell (width × height). 3 = 6 × 10 pixel cell (width × height). 4 = 7 × 10 pixel cell (width × height). 5 = 5 pixels wide.</p> <p>If you omit a <i>Pcmw</i> value, the terminal uses the default character width. If the <i>Pe</i> parameter is 0, <i>Pcmw</i> must be less than 10. Any <i>Pcmw</i> value over 10 is illegal. For illegal values of <i>Pcmw</i>, the terminal ignores the rest of the load sequence.</p> <p>For VT200 compatible software: Use a <i>Pcmw</i> value of 2, 3, or 4. When you use these values, the VT510 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 <i>Pcmw</i> value of 0, then the VT510 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 VT510.</p> <p>For fonts designed for the VT510: Use values 5 through 10.</p> <p>For compatibility between VT200 and VT510 terminals: Use a <i>Pcmw</i> value of 5, 6, or 7.</p> |
| <i>Pss</i> | Font set size | <p>Defines the screen width and screen height for this font.</p> <p>0,1 = 80 columns, 24 lines. (default) 2 = 132 columns, 24 lines 11 = 80 columns, 36 lines 12 = 132 columns, 36 lines 21 = 80 columns, 48 lines 22 = 132 columns, 48 lines</p> <p>For illegal values of <i>Pss</i>, the terminal ignores the rest of the load sequence.</p> <p>If the number of columns or lines/screen changes, then the terminal uses the appropriate variation of the soft set. If you try to display a DRCS character when there is no soft set defined for the current number of lines and columns, then the terminal displays the error character (reverse question mark).</p> |

(continued on next page)

DECDDL—Dynamically Redefinable Character Sets

Table 5–2 (Cont.) DECDDL Parameter Characters

| Parameter | Name | Description |
|--|-------------------------|---|
| Note | | |
| <p>For VT220 compatibility, you must use a soft font of 80 or 132 columns (not both). The VT220 allows a single font to be used for 80 and 132 columns.</p> | | |
| <p>You can load a font for any of the six sizes at any time. When a new soft set is loaded, any characters from the previous soft set are lost. Characters currently displayed from the old set become reverse question marks.</p> | | |
| <i>Pt</i> | Text or full cell | <p>Defines the font as a text font or <i>full-cell font</i>.</p> <p>0 = text. (default) 1 = text. 2 = full cell.</p> <p>Full-cell fonts can individually address all pixels in a cell. Text fonts cannot individually address all pixels. If you specify a text cell, then the terminal automatically performs spacing and centering of the characters.</p> |
| <i>Pcmh</i> | Character matrix height | <p>Selects the maximum character cell height.</p> <p>0 or omitted = 16 pixels high. (default) 1 = 1 pixel high. 2 = 2 pixels high. 3 = 3 pixels high. . . . 16 = 16 pixels high.</p> <p><i>Pcmh</i> values over 16 are illegal. If the value of <i>Pcmw</i> is 2, 3, or 4, then <i>Pcmh</i> is ignored.</p> |
| <i>Pcss</i> | Character set size | <p>Defines the character set as a 94- or 96-character graphic set.</p> <p>0 = 94-character set. (default) 1 = 96-character set.</p> <p>The value of <i>Pcss</i> changes the meaning of the <i>Pcn</i> (starting character) parameter above. If Pcss = 0 (94-character set)</p> <p>The terminal ignores any attempt to load characters into the 2/0 or 7/15 table positions.</p> |

(continued on next page)

DECDDL—Dynamically Redefinable Character Sets

Table 5–2 (Cont.) DECDDL Parameter Characters

| Parameter | Name | Description |
|-----------|---------------------------------------|------------------|
| | 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 5–3 Valid DECDDL Parameter Combinations

| Pt | Pcmw | Pcmh | Pss† |
|-----------------------------|---------|---------|--------|
| <i>80-column, 24 lines</i> | | | |
| 0 or 1 | 0 to 8 | 0 to 16 | 0 or 1 |
| 2 | 0 to 10 | 0 to 16 | 0, 1 |
| <i>132-column, 24 lines</i> | | | |
| 0 or 1 | 0 to 5 | 0 to 16 | 2 |
| 2 | 0 to 6 | 1 to 16 | 2 |
| <i>80-column, 36 lines</i> | | | |
| 0 or 1 | 0 to 8 | 0 to 10 | 11 |
| 2 | 0 to 10 | 0 to 10 | 11 |
| <i>132-column, 36 lines</i> | | | |
| 0 or 1 | 0 to 5 | 0 to 10 | 12 |
| 2 | 0 to 6 | 0 to 10 | 12 |
| <i>80-column, 48 lines</i> | | | |
| 0 or 1 | 0 to 8 | 0 to 8 | 21 |
| 2 | 0 to 10 | 0 to 8 | 21 |
| <i>132-column, 48 lines</i> | | | |
| 0 or 1 | 0 to 5 | 0 to 8 | 22 |
| 2 | 0 to 6 | 0 to 8 | 22 |

†The default values are the maximum legal values in each case.

Note

For illegal combinations of the *Pss*, *Pt*, *Pcmw*, and *Pcmh* parameters, the terminal ignores the rest of the sequence.

Table 5–4 VT510 Font Sizes

| 80 Columns | 132 Columns | Maximum Number of Lines |
|------------|-------------|---|
| 10 × 16 | 6 × 16 | 26 lines + keyboard indicator line |
| 10 × 10 | 6 × 10 | 42 lines + keyboard indicator line |
| 10 × 8 | 6 × 8 | 53 lines + keyboard indicator line |
| 10 × 13 | 6 × 13 | 26 lines + keyboard indicator line (72 Hz with overscan) |

DECDMAC—Define Macro

This device control string lets you define a macro consisting of a string of ANSI text and control functions. After you define the macro, you can execute it by using the invoke macro control function (DECINVM). The terminal processes the macro as normal input.

Available in: VT Level 4 mode only.

Programming Tip

You can find how much memory space you have available for macros by using a device status report sequence.

Format

```
DCS  Pid ; Pdt ; Pen ! z D...D ST
9/0  3/? 3/11 3/? 3/11 3/? 2/1 7/10 ... 9/12
```

Parameters

Pid

is the macro ID number. *Pid* can be any number between 0 and 63, otherwise the terminal ignores the command. If you give a macro an ID that already exists, then DECDMAC deletes the old macro definition before using the new one.

Pdt

defines how the terminal treats new macro definitions.

| Pdt | Meaning |
|--------------|---|
| 0 or omitted | DECDMAC deletes the old macro with the same ID number before defining this new macro. |
| 1 | DECDMAC deletes all current macro definitions before defining this macro. |
| Other | The terminal ignores the macro. |

Pen

selects the encoding format for the text of the macro definition.

DECDMAC—Define Macro

| Pen | Meaning |
|--------------|--|
| 0 or omitted | Uses standard ASCII characters in the macro. |
| 1 | Uses hex pairs in the macro. Each pair of characters in the macro is the hex value for a single ASCII character. |
| Other | The terminal ignores the macro. |

D...D

is the data of the control string. This data is the string of text and control functions performed when an application invokes the macro. The data can consist of ASCII text or hex pairs.

When you use ASCII text (Pen = 0 or omitted), the macro consists of the graphic characters that appear in the device control string. Only characters from positions 2/0 through 7/14 and 10/00 through 15/15 in the code table are valid.

When you use hex pairs (Pen = 1), the macro consists of pairs of hex numbers, each of which represents an ASCII character. When using hex pairs, you can also use a repeat introducer in the data string. The repeat introducer is the ! (2/1) character. The repeat introducer lets you repeat any hex pair within the definition string any number of times. You embed repeat sequences within the data string of the macro definition.

Note

If ASCII text is specified as the encoding format, then you cannot use the repeat sequence.

Notes on DECDMAC

- ! is the repeat sequence introducer. The format of the hex string with the repeat introducer is as follows:
! Pn; D...D ;
Pn is a numeric parameter that specifies the number of times to repeat the sequence. If *Pn* is omitted, then the macro repeats the sequence once.
D...D is the sequence of hex pairs to repeat *Pn* times.
A semicolon ; (3/11) separates the repeat count from the sequence of hex pairs. Another semicolon ends the sequence. If any characters are included before the first semicolon, then the terminal ignores the macro. If a string terminator is placed before the final semicolon, then the repeat string ends normally.
- The VT510 has 6 Kbytes of memory available for the storage of macros. The terminal ignores any macro definitions that cannot fit into this space.
- A reset to initial state (RIS) or secure reset (DECSR) operation clears all macro definitions. A soft terminal reset (DECSTR) has no effect on stored macro definitions.
- You can include characters from positions 0/8 through 0/13 to format the device control string, but these characters cannot be part of the macro definition.

DECDWL—Double-Width, Single-Height Line

DECDWL—Double-Width, Single-Height Line

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

Format

| | | |
|------|-----|-----|
| ESC | # | 6 |
| 1/11 | 2/3 | 3/6 |

DECEKBD—Extended Keyboard Report

This control function is a report that provides applications with more complete keystroke information. Each report consists of an ISO key position code and the current state of the eight modifier keys—pressed or released.

Format

| | | | | |
|------|------|------------|-----------|------|
| APC | : | <i>ppp</i> | <i>mm</i> | ST |
| 9/15 | 3/10 | *** | ** | 9/12 |

Parameters

ppp

is a three-character ISO key position name, for example C01. For keys that occupy more than one position in the ISO key position map, the VT510 uses the largest lower-left position. The position for the space bar is A02; Return is C13.

mm

are two ASCII hexadecimal digits that represent the state of the modifier keys.

The terminal represents the state of each modifier key as a bit in an 8-bit binary number. A bit value of 1 means the key is pressed, and a bit value of 0 means the key is not pressed. *mm* is the hexadecimal equivalent of the resulting 8-bit binary number.

The following table shows the order in which keys are represented in the binary number, and their corresponding hexadecimal values when pressed. The least significant bit represents the left Shift key. The most significant bit represents the right Compose Character key.

For example, 00000010_2 means that the right Shift key is pressed. The hexadecimal value for 00000010_2 is 02_{16} .

DECEKBD—Extended Keyboard Report

| mm | Key |
|----|---|
| 01 | left Shift (Least significant bit) |
| 02 | right Shift |
| 04 | Lock |
| 08 | Ctrl |
| 10 | left Alt Function |
| 20 | right Alt Function |
| 40 | left Compose Character |
| 80 | right Compose Character (Most significant bit) |

Description

The terminal only sends extended key position reports when key position mode (DECKPM) is set.

The terminal uses the following rules when sending extended key reports:

- A single report may contain more than one keystroke. In this case, each keystroke is separated by a slash (/). The terminal sends the control string (APC ... ST) when a modifier key changes, or to separate keystroke data from other terminal reports.
- The terminal only sends the modifier key state when it changes in the first keystroke after an APC character.
- The terminal sends repeated key position reports as a single repeat character, period (.).

Examples

The following sequence reports an a key with no modifier keys, four ⇒ keys, one ⇐ key, and a b key:

```
APC : C01 00 / B18... / B16 / B05 ST
```

The following sequence reports a left Shift key and an A key:

```
APC : B99 01 / C01 ST
```

DECELF—Enable Local Functions

DECELF—Enable Local Functions

This control function lets you enable or disable the keys used to perform several local terminal functions: cutting and pasting text, panning, and resizing windows. DECELF is useful for:

- Simplifying the keyboard for novice users
- Letting the corresponding keys send position codes to the host when key position mode (DECKPM) is set
- Disabling features that are not compatible with the application

Format

```
CSI  Pfn  ;   Pcn  ;   ...  Pfn; Pcn  +   q
9/11 3/n  3/11 3/n  3/11  ...  3/n 3/n  2/11 7/1
```

Parameters

Pfn

is a number that specifies the local function affected.

| Pfn | Local Functions Affected | Default Setting |
|-------------|---|-----------------------|
| 0 (default) | All local functions listed for 1, 2, and 3. | |
| 1 | Copy and paste keys, including F1 (Hold), Select , Remove , and Insert Here . | The keys are enabled. |
| 2 | Panning keys, including Ctrl with ↑ , ↓ , ← , or → . | The keys are enabled. |
| 3 | Window resizing keys, including: Control and Shift with ↑ or ↓ keys. | The keys are enabled. |

Pcn

controls the action of the local function specified by the corresponding *Pfn* value.

| Pcn | Meaning |
|-----|--|
| 0 | Selects the default setting of the local function. In VT mode, the default setting is enabled. In PC Term mode, the default setting is disabled. |
| 1 | Enables the local function. The associated keys perform the local function and cannot send position codes to the host. |
| 2 | Disables the local function. The associated keys do not perform the local function and may send position codes to the host. |

Description

DECELF can accept any number of parameter pairs. The terminal executes the parameters in the order in which it receives them.

DECERA—Erase Rectangular Area

This control function erases characters from the specified rectangular area in page memory. When an area is erased, DECERA replaces all character positions with the space character (2/0). DECERA erases character values and visual attributes from the specified area. DECERA does not erase line attributes.

Available in: VT Level 4 mode only

Format

| | | | | | |
|------------|-------------|------|-------------------|-----------|----------|
| CSI | <i>Pt</i> | ; | <i>Pl; Pb; Pr</i> | \$ | z |
| 9/11 | 3/ <i>n</i> | 3/11 | ***** | 2/4 | 7/10 |

Parameters

Pt, Pl, Pb, and Pr

define the rectangular area to be erased:

Pt is the top-line border. *Pt* must be less than or equal to *Pb*.

Default: *Pt* = 1.

Pl is the left-column border. *Pl* must be less than or equal to *Pr*. Default: *Pl* = 1.

Pb is the bottom-line border.

Default: *Pb* = the last line of the active page.

Pr is the right-column border.

Default: *Pr* = the last column of the active page.

Notes on DECERA

- The coordinates of the rectangular area are affected by the setting of origin mode (DECOM).
- DECERA is not affected by the page margins.
- If the value of *Pt*, *Pl*, *Pb*, or *Pr* exceeds the width or height of the active page, then the value is treated as the width or height of that page.
- DECERA does not change the active cursor position.

DECESKM—Enable Secondary Keyboard Language Mode

DECESKM—Enable Secondary Keyboard Language Mode

Select a secondary or primary keyboard language.

Format

| | | | | | | |
|------------|----------|----------|----------|----------|----------|-----------------------------|
| CSI | ? | 1 | 0 | 4 | h | Secondary keyboard mapping. |
| 9/11 | 3/15 | 3/1 | 3/0 | 3/4 | 3/8 | |
| CSI | ? | 1 | 0 | 4 | l | Primary keyboard mapping. |
| 9/11 | 3/15 | 3/1 | 3/0 | 3/4 | 6/12 | |

Description

When enabled, a secondary keyboard mapping replaces the primary keyboard mapping. To use the secondary keyboard mapping, a secondary keyboard language has to be defined. See Chapter 8 for information on secondary keyboard languages.

DECFI—Forward Index

This control function moves the cursor forward one column. If the cursor is at the right margin, then all screen data within the margins moves one column to the left. The column shifted past the left margin is lost.

Available in: VT Level 4 mode only

Format

| | |
|------------|----------|
| ESC | 9 |
| 1/11 | 3/6 |

Description

DECFI adds a new column at the right margin, with no visual attributes. DECFI is not affected by the margins. If the cursor is at the right border of the page when the terminal receives DECFI, then the terminal ignores DECFI.

DEC FNK—Function Key

The DEC FNK sequences encode the top row function keys, the six editing keypad keys, and the four cursor keys. The top row function keys, **F1** through **F20**, can be encoded in unmodified or in combination with **Shift**, **Ctrl**, and **Alt** key combinations. The six editing keypad keys (**Find**, **Insert Here**, **Remove**, **Select**, **Prev**, **Next**), can be encode unmodified or in combinations with the **Ctrl** and **Alt** keys. The four cursor keys (**←**, **↓**, **↑**, **⇒**) can be encoded with the **Alt** key.

Format

```
CSI  Ps1 ; Ps2 ~
    9/11 3/? 3/11 3/? 7/14
```

Parameters

Ps1
indicates the function keystroke.

Ps2
indicates the modifier key state.

Description

All combinations of the listed modifiers are coded as shown in Table 5–5.

Table 5–5 DEC FNK Modifiers

| Ps1 | Function Keystroke | Modifiers Coded by Default |
|-----|--------------------|---------------------------------|
| 1 | Find | Unmodified, Control, Alt |
| 2 | Insert Here | Unmodified, Control, Alt |
| 3 | Remove | Unmodified, Control, Alt |
| 4 | Select | Unmodified, Control, Alt |
| 5 | Prev | Unmodified, Alt |
| 6 | Next | Unmodified, Alt |
| 7 | ← | Alt |
| 8 | ↓ | Alt |
| 9 | ↑ | Alt |
| 10 | ⇒ | Alt |
| 11 | F1 | Unmodified, Shift, Control, Alt |
| 12 | F2 | Unmodified, Shift, Control, Alt |
| 13 | F3 | Unmodified, Shift, Control, Alt |
| 14 | F4 | Unmodified, Shift, Control, Alt |
| 15 | F5 | Unmodified, Shift, Control, Alt |
| 17 | F6 | Unmodified, Shift, Control, Alt |
| 18 | F7 | Unmodified, Shift, Control, Alt |

(continued on next page)

DECFNK—Function Key

Table 5–5 (Cont.) DECFNK Modifiers

| Ps1 | Function Keystroke | Modifiers Coded by Default |
|-----|--------------------|---------------------------------|
| 19 | F8 | Unmodified, Shift, Control, Alt |
| 20 | F9 | Unmodified, Shift, Control, Alt |
| 21 | F10 | Unmodified, Shift, Control, Alt |
| 23 | F11 | Unmodified, Shift, Control, Alt |
| 24 | F12 | Unmodified, Shift, Control, Alt |
| 25 | F13 | Unmodified, Shift, Control, Alt |
| 26 | F14 | Unmodified, Shift, Control, Alt |
| 28 | Help | Unmodified, Shift, Control, Alt |
| 29 | Do | Unmodified, Shift, Control, Alt |
| 31 | F17 | Unmodified, Shift, Control, Alt |
| 32 | F18 | Unmodified, Shift, Control, Alt |
| 33 | F19 | Unmodified, Shift, Control, Alt |
| 34 | F20 | Unmodified, Shift, Control, Alt |

| Ps2 | Modifiers in effect |
|--------------|-----------------------|
| 0 or omitted | none |
| 1 | none |
| 2 | Shift |
| 3 | Alt |
| 4 | Alt + Shift |
| 5 | Control |
| 6 | Control + Shift |
| 7 | Alt + Control |
| 8 | Alt + Control + Shift |

Notes

- **Shift** is not distinguished for the editing and numeric keypad keys by default so it does not interfere with touch typing patterns. This means that shifted keys send the same DECFNK sequence as the unshifted keys.
- The cursor keys are not available unmodified since they send standard cursor key sequences, not DECFNK sequences.
- **Ctrl** with **↑**, **↓**, **Next**, and **Prev** are used for local panning by default.
- Top row function keys **F1** through **F5** are only available when they are not used for local terminal functions.
- Shifted top row function keys **F6** through **F20** are still reserved for user-defined key sequences. The DECFNK sequences become the factory default UDK sequences for shifted **F6** through **F20**.

DECFRA—Fill Rectangular Area

This control function fills a rectangular area in page memory with a specified character. DECFRA replaces the rectangular area's character positions and attributes with the specified fill character. The fill character assumes the visual character attributes set by the last select graphic rendition (SGR) command. DECFRA does not change the current line attributes.

Available in: VT Level 4 mode only

Format

```
CSI  Pch ; Pt; Pl; Pb; Pr $ x
9/11 3/n 3/11 3/n 2/4 7/8
```

Parameters

Pch

is the decimal value of the fill character. *Pch* can be any value from 32 to 126 or from 160 to 255. If *Pch* is not in this range, then the terminal ignores the DECFRA command. The decimal value refers to the character in the current GL or GR in-use table.

Pt; Pl; Pb; Pr

define the rectangular area to be filled:

Pt is the top-line border. *Pt* must be less than or equal to *Pbs*.

Default: *Pt* = 1.

Pl is the left-column border. *Pl* must be less than or equal to *Pr*.

Default: *Pl* = 1.

Pb is the bottom-line border.

Default: *Pb* = the last line of the active page.

Pr is the right-column border.

Default: *Pr* = the last column of the active page.

Notes on DECFRA

- The coordinates of the rectangular area are affected by the setting of origin mode (DECOM).
- DECFRA is not affected by the page margins.
- If the value of *Pt*, *Pl*, *Pb*, or *Pr* exceeds the width or height of the active page, the value is treated as the width or height of that page.
- DECFRA does not change the active cursor position.

DECHDPXM—Set/Reset Half-Duplex Mode

DECHDPXM—Set/Reset Half-Duplex Mode

Enables half-/full-duplex communication.

Format

| | | | | | | |
|------------|----------|----------|----------|----------|----------|--------------------------|
| CSI | ? | 1 | 0 | 3 | h | Set to half-duplex mode. |
| 9/11 | 3/15 | 3/1 | 3/0 | 3/3 | 6/8 | |

| | | | | | | |
|------------|----------|----------|----------|----------|----------|--------------------------|
| CSI | ? | 1 | 0 | 3 | l | Set to full-duplex mode. |
| 9/11 | 3/15 | 3/1 | 3/0 | 3/3 | 6/12 | |

Description

Full-duplex mode allows simultaneously two-way communication; half-duplex mode is limited to one-way communication at any given time. Half-duplex mode is available only in an RS232 line. Refer to Chapter 9 for details about half-duplex mode communication protocol.

DECHEM—Hebrew Encoding Mode

This control function sets the terminal's character set mode to DEC (8-bit) multinational mode. On a reset, the sequence resets the terminal's character set mode to (7-bit) national mode (NRC sets).

The terminal maintains DECHEM for the main display and status line separately in the same way as it maintains National Replacement Character Set Mode (DECNRCM).

Format

| | | | | | |
|------------|----------|----------|----------|----------|-----|
| CSI | ? | 3 | 6 | h | Set |
| 9/11 | 3/15 | 3/3 | 3/6 | 6/8 | |

| | | | | | |
|------------|----------|----------|----------|----------|-------|
| CSI | ? | 3 | 6 | l | Reset |
| 9/11 | 3/15 | 3/3 | 3/6 | 6/12 | |

DECHEBM—Hebrew/N-A Keyboard Mapping

This control function sets the keyboard mapping to Hebrew/N-A and resets the mapping to North American.

Format

| | | | | | |
|------------|----------|----------|----------|----------|-------|
| CSI | ? | 3 | 5 | h | Set |
| 9/11 | 3/15 | 3/3 | 3/5 | 6/8 | |
| CSI | ? | 3 | 5 | I | Reset |
| 9/11 | 3/15 | 3/3 | 3/5 | 6/12 | |

Description

When 8-bit characters are selected, DECHEBM switches between the Group 1 and the Group 2 character set mappings. It does not affect the keyboard character set selection or the processing of received characters.

When 7-bit characters are selected or the terminal is set to VT100 mode, setting DECHEBM does the following:

- Switches keyboard map to Group 2.
- Makes DEC 7-bit Hebrew the keyboard character set.
- Causes received characters in the range of 60 to 7A (hex) to be displayed using the DEC 7-bit Hebrew when ASCII is designated or invoked and keyboard Group 2 is active.

Receiving DECHEBM does the following:

- Switches keyboard map to Group 1.
- Makes ASCII the keyboard character set.
- Causes received characters to be displayed using the graphic left (GL) table of characters in use at the time.

Note

DECHEBM is only valid when a Hebrew keyboard language is selected. Also it does not convert ASCII or Hebrew characters already on the display.

DECIC—Insert Column

DECIC—Insert Column

This control function inserts one or more columns into the scrolling region, starting with the column that has the cursor.

Available in: VT Level 4 mode only

Format

| | | | |
|------|-----------|-----|------|
| CSI | <i>Pn</i> | ' | } |
| 9/11 | 3/? | 2/7 | 7/13 |

Parameters

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

Description

As columns are inserted, the columns between the cursor and the right margin move to the right. DECIC inserts blank columns with no visual character attributes. DECIC has no effect outside the scrolling margins.

DECINVM—Invoke Macro

This control function lets you execute a stored macro. You store macros with the define macro (DECDMAC) control string. The terminal substitutes the DECINVM sequence with the contents of the macro definition and executes the macro.

Available in: VT level 4 mode only.

Format

| CSI | <i>Pid</i> | * | z |
|------|-------------|------|------|
| 9/11 | 3/ <i>n</i> | 2/10 | 7/10 |

Parameters

Pid

is the macro ID number. If the *Pid* is not associated with a particular macro, the terminal ignores the command.

Notes on DECINVM

Any functions executed with a macro invocation remain in affect after the terminal executes the macro.

Examples

Suppose you want to create a macro that clears all pages in page memory, writes the word "top" at the top of each page, and leaves the cursor on page 1.

First, you would write the string with ASCII characters as follows:

```
DCS 1 ; 0 ; 1 ! z CSI 6 SP P ! 6 ; CSI 1 ; 1 H CSI 2 J TOP
CSI 1 V ; ST
```

Then, you must convert the string into hexadecimal code because the string uses the repeat (!) character. You can only use the repeat character with hexadecimal sequences. The following example is the same string written in hex:

```
DCS 1 ; 0 ; 1 ! z 9B 36 20 50 ! 6 ; 9B 31 3B 48 9B 32 49 54
4F 50 9B 31 56 ; ST
```

To invoke the macro, use the following sequence:

```
CSI 1 * z
```

DECIPEM—Enter/Return from IBM ProPrinter Emulation Mode

DECIPEM—Enter/Return from IBM ProPrinter Emulation Mode

Exit from DEC protocol and interpret subsequent data according to the IBM ProPrinter protocol syntax. This sequence also resets IBM ProPrinter mode to its initial state.

Format

| | | | | | |
|------------|----------|----------|----------|----------|---|
| CSI | ? | 5 | 8 | h | Set: Enter ProPrinter Emulation mode. |
| 9/11 | 3/15 | 3/5 | 3/8 | 6/8 | |
| CSI | ? | 5 | 8 | l | Reset: Return from ProPrinter Emulation mode. |
| 9/11 | 3/15 | 3/5 | 3/8 | 6/12 | |

DECKBD—Keyboard Language Selection

Select a national keyboard language on either a VT keyboard or an Enhanced PC keyboard.

Format

```
CSI  Ps1  ;  Ps2  SP  }
9/11 3/n  3/  3/n  2/0 7/13
```

Parameters

Ps1

denotes a keyboard type (layout): VT or enhanced PC.

| Ps1 | Keyboard Layout |
|---------------|-----------------|
| 0, 1, or None | VT |
| 2 | Enhanced PC |

Ps2

indicates the national keyboard language.

| Ps2 | Keyboard Language (VT/PC) |
|--------------|---------------------------|
| 0, 1 or None | North American |
| 2 | British |
| 3 | Belgian (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 |
| 15 | Spanish |
| 16 | Portuguese |
| 19 | Hebrew |
| 22 | Greek |
| 28 | Canadian (English) |
| 29 | Turkish Q/Turkish |

DECKBD—Keyboard Language Selection

| Ps2 | Keyboard Language (VT/PC) |
|-----|---------------------------|
| 30 | Turkish F |
| 31 | Hungarian |
| 33 | Slovak |
| 34 | Czech |
| 35 | Polish |
| 36 | Romanian |
| 38 | SCS |
| 39 | Russian |
| 40 | Latin American |

Description

The first selective parameter, Ps1, denotes a keyboard type, VT layout or Enhanced PC keyboard layout. The second parameter, Ps2, indicates the national keyboard language.

Selecting a new keyboard language automatically initializes the keyboard character set. Refer to Chapter 8 for more details.

DECKBUM—Typewriter or Data Processing Keys

You can select whether the main keyboard keys act as data processing keys or typewriter keys by using the keyboard usage mode (DECKBUM) function.

Default: Typewriter keys

Keyboard Usage Mode (DECKBUM)

| | | | | | |
|------------|----------|----------|----------|----------|----------------------------|
| CSI | ? | 6 | 8 | h | Set: data processing keys. |
| 9/11 | 3/15 | 3/6 | 3/8 | 6/8 | |

| | | | | | |
|------------|----------|----------|----------|----------|-------------------------|
| CSI | ? | 6 | 8 | l | Reset: typewriter keys. |
| 9/11 | 3/15 | 3/6 | 3/8 | 6/12 | |

Description

If DECKBUM is set, then data processing keys send the characters on the right half of their keycaps.

If DECKBUM is reset, then data processing keys send the characters on the left half of their 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 language, then DECKBUM should always be reset (typewriter). For all other languages, you can use either mode.

DECKLHIM—Keyboard LED's Host Indicator Mode

DECKLHIM—Keyboard LED's Host Indicator Mode

DECKLHIM controls the state of the keyboard LED's host indicator mode.

Default: Reset.

Format

| | | | | | | |
|------------|----------|----------|----------|----------|----------|--|
| CSI | ? | 1 | 1 | 0 | h | Set: keyboard LED's host indicator mode. |
| 9/11 | 3/15 | 3/1 | 3/1 | 3/0 | 6/8 | |

| | | | | | | |
|------------|----------|----------|----------|----------|----------|--|
| CSI | ? | 1 | 1 | 0 | l | Reset: keyboard LED's host indicator mode. |
| 9/11 | 3/15 | 3/1 | 3/1 | 3/0 | 6/12 | |

Description

DECLL controls keyboard LEDs independently of any keyboard state. The use of LEDs for this purpose conflicts with their use as keyboard state indicators. DECKLHIM selects a mode of how the keyboard LEDs are to be used: as keyboard indicators; or host indicators. If host indicators is selected, then the DECLL sequence can be used to control the keyboard LEDs.

For DECLL to function, DECKLHIM must be set. See DECLL for the implications of using DECLL to control the keyboard LEDs independently of any keyboard state.

DECKPAM—Keypad Application Mode

DECKPAM enables the numeric keypad to send application sequences to the host. DECKPNM enables the numeric keypad to send numeric characters.

DECKPAM and DECKPNM function the same as numeric keypad mode (DECNKM).

Format

ESC = Send application sequences.
1/11 3/13

Note on DECKPAM

The setting is not saved in NVM. When you turn on or reset the terminal, it automatically selects numeric keypad mode.

DECKPM—Key Position Mode

This control function selects whether the keyboard sends character codes or key position reports to the host. DECKPM lets new applications take full control of the keyboard including single shifts, locking shifts, and compose character processing.

Default: Send character codes

Format

CSI 8 1 h Set: send key position reports.
9/11 3/8 3/1 6/8

CSI 8 1 I Reset: send character codes.
9/11 3/8 3/1 6/12

Description

If the DECKPM function is set, then all keyboard keys send extended reports that include the key position and the state of modifier keys when pressed. A *modifier key* is pressed in combination with another key to modify the code sent by that key. The Ctrl key is a modifier key.

If the DECKPM function is reset, then the keyboard keys send character codes.

Note on DECKPM

DECKPM only affects keyboard input; it does not affect how the terminal interprets data from the host.

DECKPNM—Keypad Numeric Mode

DECKPNM—Keypad Numeric Mode

DECKPNM enables the keypad to send numeric characters to the host. DECKPAM enables the keypad to send application sequences.

DECKPNM and DECKPAM function the same as numeric keypad mode (DECNKM).

Default: Send numeric keypad characters.

Format

| | | |
|------|------|---------------------------------|
| ESC | > | Send numeric keypad characters. |
| 1/11 | 3/14 | |

Description

DECKPNM enables the numeric keypad to send the characters shown on each key—number, comma, period, or minus sign. Keys PF1 to PF4 send application sequences. See DECKPAM—Keypad Application Mode for more information.

Note on DECKPNM

The setting is not saved in NVM. When you turn on or reset the terminal, it automatically selects numeric keypad mode.

DECLANS—Load Answerback Message

This sequence loads an answerback message into the terminal's memory.

Format

| DCS | Ps | v | D ... D | ST |
|-----|----|-----|---------|------|
| 9/0 | ps | 7/6 | ... | 9/12 |

Description

The answerback data string may consist of from 0 to 30, 7- or 8-bit characters, which are hex pairs in the range 3/0 - 3/9 (0 through 9), 4/1 - 4/6 (A through F), and 6/1 - 6/6 (A through F).

Once defined, the message may be stored in the non-volatile memory if **Save settings** is executed in the Set-Up.

The selective parameter denotes the encoding of the answerback message. A "1" is always used for the VT510 indicating answerback is encoded as hex pairs. The sequence is ignored if any number other than "1" is specified in the Ps field.

Pressing Ctrl/Break or receiving ENQ code causes the VT510 to transmit the answerback message. In on-line mode, the answerback message is transmitted to the appropriate host port. The answerback is not echoed in local echo and is not "sent" in local mode.

The answerback message is transmitted as keyboard data. Any speed restrictions (as set in limited transmit) apply.

DECLBAN—Load Banner Message

DECLBAN—Load Banner Message

DECLBAN loads the banner message to be displayed on the terminal screen at power up.

Format

```
DCS  Ps  r  D...D  ST
9/0  3/s  7/2  ...    9/12
```

Parameters

Ps
denotes the encoding of the message.

| Ps | Description |
|----|---|
| 0 | Zero or omitted, default to Ps=2. |
| 1 | Interprets as ASCII hexadecimal pairs. See DECLANS. |
| 2 | Loads as text in the VT default character set. |

D . . . D
is a 30-character string. If a matching *Ps* value is selected as an encoding method, then you can select to define the string by the characters in the default character set or by hexadecimal pairs.

Description

This command only loads the banner message into dynamic memory. It is necessary to do a **Save settings** in the Set-Up menu to store the banner message in NVM so that it will be displayed at power up.

The terminal displays the banner message in double size characters above the Selftest OK message.

DECLFKC—Local Function Key Control

This control function lets you select the action performed by some of the local function keys on the top row of the keyboard:

| Pk | Function | VT Keyboard | Enhanced PC Keyboard |
|----|----------|-------------|------------------------|
| 1 | Hold | F1 | Scroll Lock |
| 2 | Print | F2 | Print Screen |
| 3 | Set-Up | F3 | Caps Lock/Print Screen |

You can have the key perform its local function, send a function key sequence to the host, or do nothing.

This control function is useful for:

- Simplifying the keyboard for novice users
- Disabling features that are not compatible with the application, such as local printing

Format

```
CSI  Pk1 ; Pfn ... Pkn ; Pfn * }
9/11 3/n 3/11 3/n ... 3/n 3/11 3/n 2/10 7/13
```

Parameters

Pkn

is a number from 0 to 4 that corresponds to the local function key affected (**F1** to **F4**). A *Pkn* value of 0 means that all four keys (**F1** through **F4**) are affected.

Pfn

controls the action of the local function key specified by the corresponding *Pkn* value.

| Pfn | Meaning | VT Mode | PCTerm Mode |
|-----|--|--------------|----------------|
| 0 | Selects the default function of the key. | Local print | Scan code |
| 1 | The key performs its local function either shifted, unshifted, or with the Ctrl key. | Print | Local Print |
| 2 | The unshifted key sends its function key sequence to the host. The key sends nothing when pressed with Shift or Ctrl . | Function Key | Scan Code |
| 3 | The key is disabled. | Disabled | Does not exist |

DECLFKC—Local Function Key Control

Description

DECLFKC can accept any number of parameter pairs. The terminal executes the parameters in the order in which it receives them.

Note on DECLFKC

Applications cannot disable the **F5** (Break) key using this command. This restriction is required for secure systems, which ensures that the operator has control of the communication line.

DECLL—Load LEDs

Load the programmable LEDs on the keyboard according to its parameters.

Format

```
CSI   Ps   q
9/11  3/n  7/1
```

Parameters

Ps

selects the state of the **Num Lock**, **Caps Lock**, and **Scroll Lock** LEDs as follows:

| Ps | LED | Light Condition |
|----|-------------|-----------------|
| 0 | Num Lock | Off |
| | Caps Lock | Off |
| | Scroll Lock | Off |
| 1 | Num Lock | On |
| 2 | Caps Lock | On |
| 3 | Scroll Lock | On |
| 21 | Num Lock | Off |
| 22 | Caps Lock | Off |
| 23 | Scroll Lock | Off |

Description

DECLL controls keyboard LEDs independently of any keyboard state. The use of LEDs for this purpose conflicts with their use as keyboard state indicators. DECKLHIM selects a mode of how the keyboard LEDs are to be used: as keyboard indicators; or host indicators. If host indicators is selected, then the DECLL sequence can be used to control the keyboard LEDs.

For DECLL to function, DECKLHIM must be set.

DECLRMM—Left Right Margin Mode

This control function defines whether or not the set left and right margins (DECSLRM) control function can set margins.

Available in: VT Level 4 mode only.

Default: DECSLRM cannot set margins.

Format

| | | | | | |
|------------|----------|----------|----------|----------|-------------------------------|
| CSI | ? | 6 | 9 | h | Set: DECSLRM can set margins. |
| 9/11 | 3/15 | 3/6 | 3/9 | 6/8 | |

| | | | | | |
|------------|----------|----------|----------|----------|------------------------------------|
| CSI | ? | 6 | 9 | l | Reset: DECSLRM cannot set margins. |
| 9/11 | 3/15 | 3/3 | 3/9 | 6/12 | |

Description

When DECLRMM is set, DECSLRM can set the left and right margins. All line attributes currently in page memory for the session are set to single width, single height. The terminal ignores any sequences to change the line attributes to double width or double height (DECDDL or DECDDL).

When DECLRMM is reset, DECSLRM cannot set the left and right margins. The margins are set to the page borders for every page. The terminal can process sequences to change the line attributes to double width or double height (DECDDL or DECDDL).

DECLTOD—Load Time of Day

This sequence loads the time of day into the terminal's memory. When loaded, the time of day is displayed in the Status line if the Status line is enabled.

Format

| | | | | | |
|------------|------------|----------|------------|----------|----------|
| CSI | <i>Ps1</i> | ; | <i>Ps2</i> | , | p |
| 9/11 | 3/n | 3/11 | 3/n | 2/12 | 7/0 |

Parameters

Ps1

specifies the hour, which is a 2-digit decimal number between 00 and 23.

The default value is 8, indicating 8:00 a.m.

Ps2

specifies the minutes, which is a 2-digit decimal number between 00 and 59.

The default value is 00, indicating 8:00 a.m.

DECPCM—Set/Reset Modem Control Mode

DECPCM—Set/Reset Modem Control Mode

Enables (set) or disables (reset) modem control.

Format

| | | | | | |
|------------|----------|----------|----------|----------|---------------------------------|
| CSI | ? | 9 | 9 | h | Enable Modem Control |
| 9/11 | 3/15 | 3/6 | 3/6 | 6/8 | |
| CSI | ? | 9 | 9 | l | Disable modem control - default |
| 9/11 | 3/15 | 3/6 | 3/6 | 6/12 | |

Description

When enabled for the Comm2 connector, no data is transmitted or received unless DSR is asserted. Assertion of DSR alone is sufficient to establish a connection. Loss of DSR causes a disconnect. When DSR is not asserted, no data is transmitted, and incoming receive data is ignored. When DSR is again asserted, the communications state is re-initialized to prepare for the new connection.

When enabled for the Comm1 (25-pin EIA) connector, the terminal does not transmit unless CTS is asserted. If a connection has not been established (DSR is deasserted), RLSD is ignored. Transmission and reception may still occur if CTS is asserted. Assertion of CTS with DSR and RLSD asserted indicates a connection has been established. (CTS is checked last.)

When Modem Control is disabled, transmission and reception occur regardless of the state of the modem control signal. The terminal communicates using data leads only. DTR and RTS are always asserted except during an operator initiated disconnect sequence, or the input buffer reaches the 64-byte threshold when DTR flow control scheme is selected.

DECMSR—Macro Space Report

DECMSR is the terminal's response to a DSR from the host. DECMSR indicates the number of bytes available for macro definitions.

Format

| | | | |
|------------|------------------|----------|----------|
| CSI | <i>Pn</i> | * | { |
| 9/11 | 3/ <i>n</i> | 3/10 | 7/11 |

Parameters

Pn
$$Pn = \frac{\text{number of bytes}}{16} \text{ rounded down.}$$

DECNAKB—Greek/N-A Keyboard Mapping

This control function sets the keyboard mapping to North American and resets the mapping to Greek/N-A.

Format

| | | | | | |
|------------|----------|----------|----------|----------|--------|
| CSI | ? | 5 | 7 | h | Set. |
| 9/11 | 3/15 | 3/5 | 3/7 | 6/8 | |
| CSI | ? | 5 | 7 | l | Reset. |
| 9/11 | 3/15 | 3/5 | 3/7 | 6/12 | |

DECNCSM—Set/Reset No Clearing Screen On Column Change

Set/reset the following condition: do not clear the screen whenever the column mode changes.

Format

| | | | | | |
|------------|----------|----------|----------|----------|--|
| CSI | ? | 9 | 5 | h | Set: do not clear screen when column mode changes. |
| 9/11 | 3/15 | 3/9 | 3/5 | 6/8 | |
| CSI | ? | 9 | 5 | l | Reset: clear the screen when column mode changes. |
| 9/11 | 3/15 | 3/9 | 3/5 | 6/12 | |

Description

When enabled, a column mode change (either through Set-Up or by the escape sequence DECCOLM) does not clear the screen. When disabled, the column mode change clears the screen as a side effect.

This sequence does not affect the column mode change caused by the sequence, DECSCPP.

DECNKM—Numeric Keypad Mode

DECNKM—Numeric Keypad Mode

This control function works like the DECKPAM and DECKPNM functions. DECNKM is provided mainly for use with the request and report mode (DECRQM/DECRPM) control functions.

Available in: VT Level 4 mode only

Default: Numeric

Format

| | | | | | |
|------------|----------|----------|----------|----------|-----------------------------|
| CSI | ? | 6 | 6 | h | Set: application sequences. |
| 9/11 | 3/15 | 3/6 | 3/6 | 6/8 | |
| CSI | ? | 6 | 6 | I | Reset: keypad characters. |
| 9/11 | 3/15 | 3/6 | 3/6 | 6/12 | |

DECNRCM—National Replacement Character Set Mode

Enable operation in 7-bit or 8-bit character mode.

Format

| | | | | | |
|------------|----------|----------|----------|----------|-----------------------------------|
| CSI | ? | 4 | 2 | h | Set: 7-bit characters. |
| 9/11 | 3/15 | 3/4 | 3/2 | 6/8 | |
| CSI | ? | 4 | 2 | I | Reset: 8-bit characters (default) |
| 9/11 | 3/15 | 3/4 | 3/2 | 6/12 | |

Description

The character set mode is reset to 8-bit characters. In 8-bit mode, the terminal operates as a normal level 4 terminal allowing 8-bit controls and using the default character set, which is user-selectable for transmission and reception.

DECNUM—Set/Reset Ignoring Null Mode

Allow Null (NUL) characters to be ignored or buffered at printer port only.

Format

| | | | | | | |
|------------|----------|----------|----------|----------|----------|----------------------------|
| CSI | ? | 1 | 0 | 2 | h | Set: ignore NUL (default). |
| 9/11 | 3/15 | 3/1 | 3/0 | 3/2 | 6/8 | |
| CSI | ? | 1 | 0 | 2 | l | Reset: accept NUL. |
| 9/11 | 3/15 | 3/1 | 3/0 | 3/2 | 6/12 | |

Description

When set, the NUL character is discarded on receipt from the host. When reset, the NUL character is passed through to the printer.

DECNUMLK—Num Lock Mode

DECNUMLK controls the state of the keyboard's Num Lock key.

Format

| | | | | | | |
|------------|----------|----------|----------|----------|----------|-----------------------|
| CSI | ? | 1 | 0 | 8 | h | Set: num lock mode. |
| 9/11 | 3/15 | 3/1 | 3/0 | 3/8 | 6/8 | |
| CSI | ? | 1 | 0 | 8 | l | Reset: num lock mode. |
| 9/11 | 3/15 | 3/1 | 3/0 | 3/8 | 6/12 | |

DECOM—Origin Mode

DECOM—Origin Mode

This control function sets the origin for the cursor. 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 is at the upper-left of the screen, independent of margins.

Format

| | | | | |
|------------|----------|----------|----------|----------------------|
| CSI | ? | 6 | h | Set: within margins. |
| 9/11 | 3/15 | 3/6 | 6/8 | |

| | | | | |
|------------|----------|----------|----------|---------------------------|
| CSI | ? | 6 | l | Reset: upper-left corner. |
| 9/11 | 3/15 | 3/3 | 6/12 | |

Description

When DECOM is set, the home cursor position is 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.

When DECOM is reset, the home cursor position is 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.

DECOSCNM—Set/Reset Overscan Mode

Sets or resets overscan mode.

Default: Overscan disabled (reset).

Format

| | | | | | | |
|------------|----------|----------|----------|----------|----------|-----------------|
| CSI | ? | 1 | 0 | 6 | h | Enable overscan |
| 9/11 | 3/15 | 3/1 | 3/0 | 3/6 | 6/8 | |

| | | | | | | |
|------------|----------|----------|----------|----------|----------|----------------------------|
| CSI | ? | 1 | 0 | 6 | l | Disable overscan (Default) |
| 9/11 | 3/15 | 3/1 | 3/0 | 3/6 | 6/12 | |

Description

When set, overscan is enabled.

Overscan and 72 Hz refresh rate cannot co-exist when the terminal is set to 42 or 53 lines per screen. Refer to DECSNLS—Set Lines Per Screen for details.

DECPAK—Program Alphanumeric Key

Allow users to reprogram keys to transmit user-preferred alphanumeric codes or to perform user-preferred functions.

Format

| | | | | |
|-----|-----|-----|---------|------|
| DCS | " | y | D ... D | ST |
| 9/0 | 2/2 | 7/9 | ... | 9/12 |

Description

This sequence programs one or more keys (and their modifiers) to:

- Transmit desired alphanumeric codes
- Perform a local function or send user-defined sequence

This function works in all the VT modes except in VT52 mode.

The memory allocation and deallocation processes (program key lock and unlock process) on the DECPAK are the same as on the DECPFK. Refer to DECPFK—Program Function Key for details.

The data string D...D format is:

Key1/HEX Code String/Function #/UDS/UDS Direction;Key2/...;

Parameters

Keyn

is the key station number and slash "/" is a delimiter.

HEX code string

is the hex character code to be transmitted with each of the seven modifier states. The hex code represents a valid code in the current character set (either 7-bit or 8-bit). Use a period "." as a place holder if a modifier combination is not to be defined. Use a minus "-" preceding the hex representation of a diacritical sign if a diacritical mark is to be defined.

The terminal always allows the ISO character set to be used for specifying accent marks to DECPAK even when:

1. 7-bit NRCs characters are selected
2. The ISO character set is not the user-preferred supplemental character set

The corresponding ISO character set would be based on the keyboard language. Refer to Chapter 8 for keyboard information.

The position of the diacritical marks within the ISO Latin character sets is as follows:

DECPAK—Program Alphanumeric Key

| Diacritical Sign | Position | Available ISO Character Set(s) |
|---------------------|----------|--|
| Circumflex | 5/14 | ASCII |
| Grave | 6/0 | ASCII |
| Tilde | 7/14 | ASCII |
| Dieresis (umlaut) | 10/8 | Latin 1, Latin 2, Latin Greek, Latin Turkish |
| Degree (ring) | 11/0 | Latin 1, Latin 2, Latin Greek, Latin Turkish |
| Acute | 11/4 | Latin 1, Latin 2, Latin Greek, Latin Turkish |
| Cedilla | 11/8 | Latin 1, Latin 2, Latin Turkish |
| Macron | 10/15 | Latin 1 |
| Breve | 10/2 | Latin 2 |
| Ogonek | 11/2 | Latin 2 |
| Caron | 11/7 | Latin 2 |
| Double Acute Accent | 11/13 | Latin 2 |
| Dot Above | 15/15 | Latin 2 |

You should program the Hex string according in the following order:

1. Group 1 unshifted
2. Group 1 shifted
3. Group 1 alternate shifted (Shift 2)
4. Group 2 (Group Shift or Alt Gr) unshifted
5. Group 2 shifted
6. Group 2 alternate shifted
7. Control (if omitted, use default)

If the control state is not redefined in this sequence, then the **[Key/Ctrl]** combination generates the control code based on the "Group 1 unshifted" state.

A graphic key transmits alphanumeric codes only when pressed with the above modifiers. When pressed with **[Alt]** key, the graphic key performs either:

- Local terminal function
- User-defined sequence (same as UDK)

Function

corresponds to a local function to be performed when the key is pressed in combination with the **[Alt]** function. Example: Function number "0" is used to make the **[Key/Alt]** combination inoperative. Function number "100" indicates a user-defined sequence (UDS), and a UDS direction is defined for the **[Key/Alt]** combination following the "/" delimiter.

UDS and UDS direction

is a user-defined sequence. These parameters are the same as for DECPFK. Refer to DECPFK—Program Function Key for the details.

Once programmed, the key states are not affected by the terminal mode changes. Refer to DECPFK—Program Function Key for the list of terminal mode changes.

DECPCCM—Page Cursor-Coupling Mode

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.

Format

| | | | | | |
|------------|----------|----------|----------|----------|---|
| CSI | ? | 6 | 4 | h | Set: couples the cursor to the display. |
| 9/11 | 3/15 | 3/6 | 4/4 | 6/8 | |

| | | | | | |
|------------|----------|----------|----------|----------|------------------------------|
| CSI | ? | 6 | 4 | l | Reset: uncouples the cursor. |
| 9/11 | 3/15 | 3/6 | 4/4 | 6/12 | |

Description

When DECPCCM is set, the cursor is coupled to the display when the cursor moves to a new page. The new page appears in the display to keep the cursor in view.

When DECPCCM is reset, the cursor is uncoupled from the display. If the cursor moves to a new page, then the cursor disappears.

DECPCTERM—Enter/Exit PCTerm or Scancode Mode

DECPCTERM—Enter/Exit PCTerm or Scancode Mode

DECPCTERM enables you to switch the terminal between VT mode and PCTerm mode, while the terminal is in VT mode. It also enables you to switch the terminal between ASCII character and scancode keycode mode, while the terminal is in SCO Console mode.

Format

CSI ? *Ps1* ; *Ps2* **r**
9/11 3/15 3/*n* 3/11 3/*n* 7/2

Parameters

Ps1

selects VT mode or PCTerm mode. In SCO console mode, this parameter selects ASCII characters or scancode keycode mode. When the mode changes, some operating features are changed to reflect the characteristics of the selected emulation mode.

| Ps1 | VT Emulation Mode | SCO Console Mode |
|------------|--------------------------|-------------------------|
| 0 or none | VT Mode | ASCII characters |
| 1 | PCTerm Mode | Scancodes |

Ps2

indicates the character set selection. See SCS—Select Character Set for the character set designators.

Description

The character sets selectable with single-digit Ps2 parameters are available for both VT mode and PCTerm mode. If you select one of these character sets for use in PCTerm mode, then you can use the SCS—Select Character Set command to modify the PCTerm character set.

The PC character sets selectable with three-digit Ps2 parameters are available only in PCTerm mode or SCO console emulation. (SCO console uses PC character sets.) If you select one of these PC character sets, then the SCS command to invoke a character set is ignored.

DECPCTERM—Enter/Exit PCTerm or Scancode Mode

| Ps2 | Character Set |
|------------|----------------------|
| 0 or none | No Change |
| 1 | PC Multilingual |
| 2 | PC International |
| 3 | PC Danish/Norwegian |
| 4 | PC Spanish |
| 5 | PC Portuguese |
| 6 | DEC Supplemental |
| 7 | ISO Latin 1 |
| 8 | VT character set |
| 210 | PC Greek |
| 220 | PC Spanish |
| 437 | PC International |
| 850 | PC Multilingual |
| 852 | PC Slavic (Latin 2) |
| 857 | PC Turkish |
| 860 | PC Portuguese |
| 862 | PC Hebrew |
| 863 | PC French Canadian |
| 865 | PC Danish |
| 866 | PC Cyrillic |

DECPEX—Printer Extent Mode

DECPEX—Printer Extent Mode

This control function selects how much data you can print when you use the print page function.

Default: Scrolling region

Format

| | | | | | |
|------------|----------|----------|----------|----------|--|
| CSI | ? | 1 | 9 | h | The print function prints the complete page. |
| 9/11 | 3/15 | 3/1 | 3/9 | 6/8 | |
| CSI | ? | 1 | 9 | l | The print function prints the scrolling region only (data inside the margins). |
| 9/11 | 3/15 | 3/1 | 3/9 | 6/12 | |

DECPFF—Print Form Feed Mode

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. DECPFF does not affect the print cursor line function described in the next section.

Default: No form feed

Format

| | | | | | |
|------------|----------|----------|----------|----------|---|
| CSI | ? | 1 | 8 | h | The terminal sends a form feed (FF) to the printer at the end of a printing function. |
| 9/11 | 3/15 | 3/1 | 3/8 | 6/8 | |
| CSI | ? | 1 | 8 | l | The terminal sends nothing to the printer at the end of a printing function. |
| 9/11 | 3/15 | 3/1 | 3/8 | 6/12 | |

DECPFK—Program Function Key

Used to reprogram function keys.

Format

| | | | | |
|-----|-----|-----|-----------|------|
| DCS | " | x | D . . . D | ST |
| 9/0 | 2/2 | 7/8 | ... | 9/12 |

Description

This sequence programs one or more keys (and their modifier combinations) from the current state to perform user-desired functions. The type of the function programmed must be either:

- a local terminal function
- a user-defined sequence (same as UDK)

This sequence is ignored when the program key function is locked through DECPKA, DECUDK, or Set-Up.

There are 804 bytes reserved for programmable key operations. This memory is shared by the following four functions:

- Program keys through DECPFK or through Set-Up
- Program keys through DECPAK or through Set-Up
- Copy other key default through DECCKD or Set-Up
- Program user-defined keys through DECUDK

Space is supplied on a first-come, first-serve basis. Once the 804 bytes are used, no more keys may be redefined unless space is made available. Space may be made available by restoring keys back to their default states. There are four ways to do this:

- Execute a **Restore factory defaults** from the Set-Up main menu. All the terminal parameters, including the keys, return to their default states.
- Execute a “Restore factory defaults of all keys and key definitions” either through DECPKA (Program Key Action) or **Recall key definitions** in Set-Up. This action also releases the 804 bytes.
- Execute a **Copy key default** to copy a key’s own default either through DECCKD or in Set-Up to free the space occupied by the destination key.
- Clear UDKs by issuing a clear function in DECUDK.

The free bytes left for key programming can be seen using the **Define Key Editor** in Set-Up. *D . . . D* are the *key definition strings* such as:

```
Key1/Mod1/Function #/UDS/UDS Direction;
Key2/Mod2/Function #/UDS/UDS Direction;.....;
```

DECPFK—Program Function Key

Parameters

Keyn

is the key station number and a slash "/" is a delimiter. Refer to Chapter 8 for the key station number map.

Modn

denotes the modifier key that is to be pressed at the same time as the defined key.

| Modn | Modifier Key |
|-----------|-----------------------|
| 0 or None | Normal |
| 1 | Normal |
| 2 | Shift |
| 3 | Alt |
| 4 | Alt + Shift |
| 5 | Control |
| 6 | Shift + Control |
| 7 | Alt + Control |
| 8 | Alt + Control + Shift |

Function

represents a number associated with a local function. For example, function number "0" is used to make the key or key/modifier inoperative. Function number "100" indicates a user-defined sequence (UDS) and UDS direction is defined following the slash "/" delimiter. Refer to Chapter 8.

UDS

is a user-defined sequence with a maximum length of 255 bytes, which must be written in Hex format for DEC/ANSI terminals. Each hex code in this string represents a value transmitted by the defined key combined with the modifiers.

- *UDS* in DECPFK is functionally equivalent to the string *Stn* in the DECUDK control function.
- See DECUDK—User Defined Keys.

Dir (UDS Direction)

the user-defined sequence (UDS) direction of the transmission.

| <u>Dir</u> | <u>Direction</u> | <u>UDS is sent to . . .</u> |
|------------|------------------|--|
| 0, none | Normal | Host and/or the terminal, depending on the setting of the COMM mode parameter. The UDS is directed to: <ul style="list-style-type: none">- The host for full-duplex mode.- The screen for half-duplex mode. |
| 1 | Local | Terminal screen only. |
| 2 | Remote | Host only. |

Default: None (Normal)

Description

Any of the following four methods may be used to define a key to transmit a user-defined sequence (either single byte or multiple bytes):

- Control function DECPFK
- Control function DECPAK
- Control function DECUDK
- In Set-Up, **Define key** . . .

Once programmed, the key state is not effected by the terminal mode changes listed below:

- Keyboard mode change, such as switching between Data Processing mode and Typewriter mode
- Character Mode change, such as switching between 7-bit character and 8-bit character
- Keyboard Layout change, such as switching between PC layout and VT layout
- Keyboard Style change, such as switching between PC-style and VT-style
- Terminal Mode change, such as switching between VT modes

This function works in all the ANSI VT modes except VT52 mode.

DECPKA—Program Key Action

DECPKA—Program Key Action

Allow changes to programmable keys, which affects all the keys on the keyboard in all the VT modes except in VT52 mode.

Format

| | | | |
|------------|-----------|----------|----------|
| CSI | Ps | + | z |
| 9/11 | 3/n | 2/11 | 7/10 |

Parameters

Ps

This sequence has two functions:

1. Lock the keys from redefinition.
2. Restore the definitions of the keys either from the factory default or the NVR.

If set to "1," the parameter determines whether the keys will be locked. Any attempt to program keys will be invalid.

If the keys are not locked, then the keys are available for further definition either through Set-Up or control functions DECPFK, DECPAK, DECKD, and DECUDK. But if "Lock UDK" is enabled by DECUDK, then the attempt to program the keys does not take effect. (Refer to DECUDK—User Defined Keys for details.)

Once locked, keys can only be unlocked through Set-Up. There is no host control function that can unlock the keys.

If the parameter Ps is set to 2, then all the keys and keys/modifiers combination restore to their factory default states. Refer to DECKD—Copy Key Default if restoring defaults for a single key and key/modifier combination.

If the parameter Ps is set to 3, all saved settings of the keys and keys/modifiers combination are recalled from the NVR.

If the keys are locked for further definition, then restore and recall operations are not valid.

| Ps1 | Program Key Action |
|------------|--|
| 0 or none | None |
| 1 | Locks keys and keys/modifiers from further definition |
| 2 | Restores factory defaults of all the keys and their keys/modifiers |
| 3 | Recalls saved keys definition |

DECPKFMR—Program Key Free Memory Report

Report the approximate free memory space for program key operations.

Format

```
CSI  Ps1  ;    Ps2  +    y
9/11 3/n  3/11 3/n  2/11 7/9
```

Parameters

Ps1

denotes the total memory space in bytes that is reserved for the programmable keys. The total memory available is 804 bytes, hence the Ps1 value is "804."

Ps2

denotes the memory space that is available at the time DECRQPKFM is received, depending on the number of bytes left in decimal format. A "0" indicates that no memory is left for any key programming operation; in which case, any attempt to program the keys will fail.

Description

The VT510 reports this sequence upon receiving DECRQPKFM from the host.

Note on DECPKFMR

The free bytes reported by Ps2 in this command represents only the approximate amount of memory available, because additional memory is used by the firmware data structure to program the key definitions.

DECRARA—Reverse Attributes in Rectangular Area

DECRARA—Reverse Attributes in Rectangular Area

This control function lets you reverse the visual character attributes (bold, blink, reverse video, and underline) of a specified rectangular area in page memory. The select attribute change extent (DECSACE) control function determines whether all or some of the character positions in the rectangle are affected.

Reversing a visual attribute means changing the attribute to its opposite setting, on or off. For example, DECRARA can change characters from bold and not underlined to characters that are underlined and not bold. DECRARA does not change the values of characters, just the visual attributes of those characters.

Available in: VT Level 4 mode only

Format

```
CSI   Pt; Pl; Pb; Pr;      Ps1; . . . Psn      $   t
9/11  area to be reversed  attributes to reverse  2/4  7/4
```

Parameters

Pt, Pl, Pb, and Pr

define the rectangular area to be reversed.

Pt is the top-line border. *Pt* must be less than or equal to *Pb*.
Default: *Pt* = 1.

Pl is the left-column border. *Pl* must be less than or equal to *Pr*.
Default: *Pr* = 1.

Pb is the bottom-line border.
Default: *Pb* = last line of the active page.

Pr is the right-column border.
Default: *Pr* = last column of the active page.

Ps1; . . . Psn

select the visual character attributes to reverse. These values correspond to the values used in the select graphic rendition (SGR) function.

| Ps | Meaning |
|-----------|---------------------------------------|
| 0 | Reverse all attributes (default). |
| 1 | Reverse the bold attribute. |
| 4 | Reverse the underline attribute. |
| 5 | Reverse the blink attribute. |
| 7 | Reverse the negative-image attribute. |

DECRARA ignores all other parameter values.

When you use more than one parameter in a command, DECRARA executes them cumulatively in sequence.

DECRARA—Reverse Attributes in Rectangular Area

Examples

The following sequence reverses the blink and underscore attributes of the complete screen:

```
CSI ; ; ; ; 0; 4; 5; $ t
```

The following sequence reverses all attributes except the blink attribute, from position line 10, column 2 to position line 14, column 45 on the current page:

```
CSI 10; 2; 14; 45; 1; 4; 7 $ t
```

Notes on DECRARA

- The coordinates of the rectangular area are affected by the setting of origin mode (DECOM).
- DECRARA is not affected by the page margins.
- If the value of *Pt*, *Pl*, *Pb*, or *Pr* exceeds the width or height of the active page, then the value is treated as the width or height of that page.
- DECRARA does not change the active cursor position.
- DECRARA does not change the current rendition set by the select graphic rendition (SGR) function.
- The exact character positions affected by DECRARA depend on the current setting of the select attribute change extent (DECSACE) function.

DECRC—Restore Cursor

DECRC—Restore Cursor

Restores the terminal to the state saved by the save cursor (DECSC) function.

Format

| | |
|------|-----|
| ESC | 8 |
| 1/11 | 3/8 |

Description

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 character attributes off (normal setting).
- 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.

DECRLCM—Right-to-Left Copy

Perform a copy/paste from right-to-left or from left-to-right.

Default: Disable right-to-left-copy.

Format

| | | | | | |
|------|------|-----|-----|------|---------------------------------------|
| CSI | ? | 9 | 6 | h | Enable right-to-left copy. |
| 9/11 | 3/15 | 3/9 | 3/6 | 6/8 | |
| CSI | ? | 9 | 6 | l | Disable right-to-left copy (default). |
| 9/11 | 3/15 | 3/9 | 3/6 | 6/12 | |

Description

When operating in Copy/Paste, you can paste the copied text according to the direction assigned in this command sequence.

If right-to-left copy is selected, then the text is stored in the paste buffer starting from right-to-left. For example if "ABCD" is to be copied right-to-left, when a Paste key is pressed, the string is saved in the paste buffer as "DCBA." Thus, the text is displayed as "DCBA".

DECRLM—Cursor Right to Left Mode

This control function starts/stops the right-to-left cursor direction.

Format

| | | | | | |
|------------|----------|----------|----------|----------|--------|
| CSI | ? | 3 | 4 | h | Set. |
| 9/11 | 3/15 | 3/3 | 4/4 | 6/8 | |
| CSI | ? | 3 | 4 | l | Reset. |
| 9/11 | 3/15 | 3/3 | 4/4 | 6/12 | |

Description

DECRLM state is common to both the main display and the status line display. The status line is effected only when you set it to Host Writable Status Display in the Display Set-Up screen. DECRLM does not affect column numbering within the line. The first line column is always at the left side of the display window. The last column is always at the right side of the display window.

The next character position is defined as the current cursor position minus 1.

If the terminal is in Replace mode (IRM is reset), then:

- The new character is inserted in the current cursor position.
- The cursor moves to the next character position.

If terminal is in Insert mode (IRM is set), then:

- All characters from the current cursor position to the left margin inclusively are shifted one position towards the left.
- The character previously displayed at the left margin disappears.
- The new character is inserted in the current cursor position.
- The cursor moves to the next character position.

The following escape sequences are not affected by the DECRLM setting:

| | |
|------------------------|-------------------------------------|
| ICH - Insert Character | DECSED - Selective Erase in Display |
| DCH - Delete Character | DECSEL - Selective Erase in Line |
| ED - Erase in Display | ECH - Erase Character |
| EL - Erase in Line | |

The following escape sequences are not affected by the DECRLM setting:

CUP - Cursor Position
 HVP - Horizontal and Vertical Position
 CUF - Cursor Forward
 CUB - Cursor Backward

DECRLM—Cursor Right to Left Mode

Notes on DECRLM

- The BS control character increases the current cursor position by one, thus moving the cursor on the screen one position to the right.
- When new line mode (LNM) is set and the terminal receives one of the control codes LF, VT, or FF, the cursor moves to the last right-most column of the next line.
- When control code CR is received, the cursor moves to the last right-most column of the current line.
- When control code SUB is received, a number of cancellation activities result within the terminal and the terminal displays an error character, according to the current DECRLM setting.
- When control code NEL is received, the cursor moves to the last right-most column of the next line. If the cursor is at the bottom margin, then the page scrolls up.
- If auto-wrap is enabled (DECAWM is set), then a graphic character received when the cursor is at column number one appears at the right margin column of the next line. If the cursor is at the end of the scrolling region, then any text already on the page scrolls up.

DECRLM—Report All Modifiers/Alphanumeric Key State

This control string is in response to a Request Key Definition (DECRLM).

Format

| | | | | |
|-----|-----|------|-----------|------|
| DCS | " | ~ | D . . . D | ST |
| 9/0 | 2/2 | 7/14 | ... | 9/12 |

Description

String D...D has a format same as DECPAK.

Parameters

D . . . D

See DECPAK for a description of parameters.

DECRPDE—Report Displayed Extent

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.

DECRPDE indicates how much of the screen has to display the current page.

Format

```
CSI  Ph  ;   Pw  ;   Pml ;   Pmt ;   Pmp  ;   "   w
9/11 3/n  3/11 3/n  3/11 3/n  3/11 3/n  3/11 3/n  3/11 2/2 7/7
```

Parameters

Ph

is the number of lines of the current page displayed excluding the status line.

Pw

is the number of columns of the current page displayed.

Pml

is the column number displayed in the left-most column.

Pmt

is the line number displayed in the top line.

Pmp

is the page number displayed.

DECRPFK - Report Function Key Definition

DECRPFK - Report Function Key Definition

The terminal reports a function key's definition when it receives a DECRQKD. DECRPFK denotes a local function number or a defined sequence, that the target key, which is combined with a specific modifier key, performs or transmits.

Format

```
DCS  "    }    D . . . D  ST
9/0   2/2  7/13  ...      9/12
```

Parameters

D . . . D

uses the same format as DECPFK, Key/Modifier/Function#/UDS/UDS Direction. Function# is skipped in the report, if the function key has not been redefined and is transmitting the default escape sequence as its UDS.

DECRPKT—Report Key Type

DECRPKT (from the terminal) is a response to a key type inquiry (DECRQKT).

Format

```
CSI  Ps1 ; Ps2 ,  v
9/11 3/n 3/11 3/n 2/12 7/6
```

Parameters

Ps1

indicates is the target key's station number.

Ps2

indicates

| Ps2 | Key Type |
|-----|----------|
|-----|----------|

| | |
|---|--------------|
| 0 | Alphanumeric |
|---|--------------|

| | |
|---|----------|
| 1 | Function |
|---|----------|

DECRPM—Report Mode - Terminal To Host

Reports the terminal mode in response to a request mode (DECRQM) function. In the response DECRPM informs the host if a certain mode is set (SM—Set Mode) or reset (RM—Reset Mode).

Programming Tip

Applications can use the information in the DECRPM report to save the current mode settings. Later, the application can restore the mode settings that were saved.

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 modes.

Reporting ANSI Modes

| | | | | | |
|------------|-----------|------|-----------|-----|----------|
| CSI | <i>Pa</i> | ; | <i>Ps</i> | \$ | y |
| 9/11 | 3/n | 3/11 | 3/n | 2/4 | 7/9 |

Reporting DEC Modes

| | | | | | | |
|------------|------|-----------|------|-----------|-----|----------|
| CSI | ? | <i>Pd</i> | ; | <i>Ps</i> | \$ | y |
| 9/11 | 3/15 | 3/n | 3/11 | 3/n | 2/4 | 7/9 |

Parameters

Pa

Table 5–6 lists the values for *Pa*.

Pd

indicates which DEC mode the terminal is reporting on. Table 5–6 lists the values for *Pd*.

Ps

indicates the setting of the mode. The *Ps* values are the same for the ANSI and DEC versions.

| Ps | Mode Setting |
|-----------|---------------------|
| 0 | Mode not recognized |
| 1 | Set |
| 2 | Reset |
| 3 | Permanently set |
| 4 | Permanently reset |

DECRPM—Report Mode - Terminal To Host

Examples

The following sequence reports the setting of a DEC mode:

| VT510 Report | Meaning |
|--------------------|---|
| CSI ? 57; h | (Greek) Keyboard mapping is currently set. (57 = DECNAKB, h = set) |

The following sequences report the setting for some modes:

`CSI Ps $ p` (or `CSI ? Ps $ p` (DEC)) (Request Mode)
`CSI Ps1; Ps2 $ y` (or `CSI ? Ps1; Ps2 $ y`) (Report Mode)
`CSI P1.....Pn l` (Reset Mode)
`CSI P1.....Pn h` (Set Mode)

Notes on DECRPM

The terminal can only report on one mode at a time.

Description

DEC RQM, DEC RPM, SM, and RM support all the mode settings as follows:

Table 5–6 Settings Supported by DEC RQM, DEC RPM, RM, and SM

| Pa | ANSI Mode Mnemonic | Pd | DEC Mode Mnemonic |
|----|--------------------|-----|-------------------|
| 1 | GATM* | ?1 | DECCKM |
| 2 | KAM | ?2 | DECANM† |
| 3 | CRM | ?3 | DECOLM |
| 4 | IRM | ?4 | DECSCLM |
| 5 | SRTM* | ?5 | DECSCNM |
| | | ?6 | DECOM |
| 7 | VEM* | ?7 | DECAWM |
| | | ?8 | DECARM |
| 10 | HEM* | – | – |
| 11 | PUM* | – | – |
| 12 | SRM | | |
| 13 | FEAM* | – | – |
| 14 | FETM* | – | – |
| 15 | MATM* | – | – |
| 16 | TTM* | – | – |
| 17 | SATM* | – | – |
| 18 | TSM* | ?18 | DECPFF |
| 19 | EBM* | ?19 | DECPEX |
| 20 | LNМ | – | – |
| – | – | ?25 | DECTCEM |
| – | – | ?34 | DECRLM |
| – | – | ?35 | DECHEBM |
| – | – | ?36 | DECHEM |
| – | – | ?42 | DECNRCM |
| – | – | ?57 | DECNAKB |
| – | – | ?60 | DECHCCM * |
| – | – | ?61 | DECVCCM |
| – | – | ?64 | DECPCCM |
| – | – | ?66 | DECNKM |
| – | – | ?67 | DECBKM |
| – | – | ?68 | DECKBUM |
| – | – | ?69 | DECLRMM (DECVSSM) |
| – | – | ?73 | DECXRLMM |

*This mode is always reset in the terminal and cannot be changed.

†When the terminal is set to VT52 mode, DEC RQM provides no report.

(continued on next page)

DECRPM—Report Mode - Terminal To Host

Table 5–6 (Cont.) Settings Supported by DECRQM, DECRPM, RM, and SM

| Pa | ANSI Mode Mnemonic | Pd | DEC Mode Mnemonic |
|----|-----------------------|------|----------------------|
| – | – | ?95 | DECNCSM |
| – | – | ?96 | DECRLCM |
| – | – | ?97 | DECCRTSM |
| – | – | ?98 | DECARSM |
| – | – | ?99 | DECMCM |
| – | – | ?100 | DECAAM |
| – | – | ?101 | DECCANSM |
| – | – | ?102 | DECNULM |
| – | – | ?103 | DECHDPXM |
| – | – | ?104 | DECESKM |
| – | – | ?106 | DECOSCNM |

DECRPSS—Report Selection or Setting

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.

Format

```
DCS  Ps  $   r   D...D  ST
9/0  3/n  2/4  7/2  ...      9/12
```

Parameters

Ps

indicates whether or not the request from the host is valid.

| Ps | Host Request |
|----|----------------------------|
| 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 underline, blinking, and reverse, then the terminal responds with the following DECRPSS sequence:

```
DCS 0 $ r 0 ; 4 ; 5 ; 7 m ST
```

0; 4 ; 5 ; 7 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 (24 lines/screen), then the terminal responds with the following DECRPSS sequence:

```
DCS 0 $ r 1 ; 24 r ST
```

1 ; 24 r are all the characters in the DECSTBM sequence, except CSI.

DECRPSS—Report Selection or Setting

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.

DECRPSS (and DECRQSS) support the following settings or selections:

| Setting | Mnemonic | Final Character(s) |
|----------------------------------|-----------|--------------------|
| Select Active Status Display | DECSASD | \$ } |
| Select Attribute Change Extent | DECSACE | * x |
| Set Character Attribute | DECSCA | " q |
| Set Conformance Level | DECSCL | " p |
| Set Columns Per Page | DECS CPP | \$ |
| Set Lines Per Page | DECSLPP | t |
| Set Number of Lines per Screen | DECSNLS | * |
| Set Status Line Type | DECSSDT | \$ ~ |
| Set Left and Right Margins | DECSLRM | s |
| Set Top and Bottom Margins | DECSTBM | r |
| Set Graphic Rendition | SGR | m |
| Select Set-Up Language | DECSSL | p |
| Select Printer Type | DECS PRTT | \$ s |
| Select Refresh Rate | DECSRFR | " t |
| Select Digital Printed Data Type | DECS DPT | (p |
| Select ProPrinter Character Set | DECSPPCS | * p |
| Select Communication Speed | DECS CS | * r |
| Select Communication Port | DECS CP | * u |
| Set Scroll Speed | DECSSCLS | SP p |
| Set Cursor Style | DECS CURS | SP q |
| Set Key Click Volume | DECSKCV | SP r |
| Set Warning Bell Volume | DECSWBV | SP t |
| Set Margin Bell Volume | DECSMBV | SP u |
| Set Lock Key Style | DECSLCK | SP v |
| Select Flow Control Type | DECSFC | * s |
| Select Disconnect Delay Time | DECSDDT | \$ q |
| Set Transmit Rate Limit | DECSTR L | " u |
| Set Port Parameter | DECSPP | + w |

DECRIPTUI—Report Terminal Unit ID

DECRIPTUI is a response from the terminal to a tertiary DA (DA3) request from the host. DECRIPTUI is available in VT Level 4 mode only. See DA3 for more information.

Format

| | | | | |
|------------|----------|----------|------------------|-----------|
| DCS | ! | | D . . . D | ST |
| 9/0 | 2/1 | 7/12 | ... | 9/12 |

Parameters

D...D

is the unit ID of the terminal, consisting of four hexadecimal pairs. The first pair represents the manufacturing site code. This code can be any hexadecimal value from 00 through FF.

The last three pairs are the terminal ID number. This number is unique for each terminal manufactured at that site.

DECRQCRA—Request Checksum of Rectangular Area

DECRQCRA—Request Checksum of Rectangular Area

This control function requests a checksum of the specified rectangular area in the specified page. The terminal returns a checksum report (DECCKSR) in response to this request.

Format

| | | | | | | |
|------------|------------|------|-------------|---|------|----------|
| CSI | <i>Pid</i> | ; | <i>Pp</i> ; | <i>Pt</i> ; <i>Pl</i> ; <i>Pb</i> ; <i>Pr</i> | * | y |
| 9/11 | 3/n | 3/11 | 3/n | 3/n . . . 3/n | 2/10 | 7/9 |

Parameters

Pid

is a numeric label you can provide to identify the checksum request. The checksum report returns this number. The number serves to differentiate between multiple checksum reports.

Pp

is the page number that has the rectangular area. If *Pp* is 0 or omitted, then the terminal ignores the following parameters and reports a checksum for all pages in page memory. If *Pp* is a higher number than the number of pages available, then the terminal reports on the last page.

Pt;Pl;Pb;Pr

are the top, left, bottom, and right borders of the rectangular area. *Pt* and *Pb* are line numbers. *Pt* must be less than or equal to *Pb*. *Pl* and *Pr* are column numbers. *Pl* must be less than or equal to *Pr*.

Defaults are *Pt* = 1, *Pb* = current page length, *Pr* = current page width. If these parameters are omitted, then the terminal returns a checksum of page *Pp*.

Note on DECRQCRA

The coordinates of the rectangular area are affected by the setting of origin mode (DECOM).

DECRQDE—Request Displayed Extent

The host sends a DECRQDE to the terminal requesting how much of the current page is displayed on the screen for the active session.

Format

```
CSI      "      v
9/11    2/2    7/6
```

DECRQKD—Request Key Definition

DECRQKD allows you to inquire about the terminal's definition of:

- A function key or a function key combined with a single modifier key.
- An alphanumeric key combined with all of its available modifier keys.

The terminal reports the function key definition with DECRPFK, and the alphanumeric key definition with DECRPAK.

Format

```
CSI  Ps1 ; Ps2 , w
9/11 3/n 3/11 3/n 2/12 7/7
```

Parameters

Ps1

indicates is the target key's station number. When inquiring for an alphanumeric key definition, *Ps2* is ignored by the terminal. DECRPAK always reports a hexadecimal string in which each hexadecimal code represents a value transmitted by pressing a combination of the target key and a modifier key. The whole sequence is ignored if you enter an invalid key/modifier. See DECRPAK.

ps

When inquiring for a function key definition, *Ps2* represents:

| Ps2 | Description |
|--------------|-----------------------|
| 0, 1 or none | Normal |
| 2 | Shift |
| 3 | Alt |
| 4 | Alt + Shift |
| 5 | Control |
| 6 | Shift + Control |
| 7 | Alt + Control |
| 8 | Alt + Control + Shift |

DECRQKT—Key Type Inquiry

DECRQKT—Key Type Inquiry

The host issues a DECRQKT to the terminal for the key definition of a function or alphanumeric key. Upon receiving the request, the terminal reports using DECRPKT.

Format

| | | | |
|------------|-------------|------|----------|
| CSI | <i>Ps</i> | , | u |
| 9/11 | 3/ <i>n</i> | 2/12 | 7/5 |

Parameters

Ps

is a decimal number representing the target key's station number.

DECRCM—Request Mode - Host To Terminal

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 (DECRCM—Report Mode - Terminal To Host).

DECRCM functions in ANSI and DEC modes.

Requesting ANSI Modes

| | | | |
|------------|-----------|-----------|----------|
| CSI | <i>Pa</i> | \$ | p |
| 9/11 | 3/n | 2/4 | 7/0 |

Requesting DEC Modes

| | | | | |
|------------|----------|-----------|-----------|----------|
| CSI | ? | <i>Pd</i> | \$ | p |
| 9/11 | 3/15 | 3/n | 2/4 | 7/0 |

Parameters

Pa

indicates the ANSI mode that the host is asking about. Table 5–7 lists the values for Pa.

Pd

indicates the DEC mode the host is asking about. Table 5–8 lists the values for Pd.

Examples

The following sequences request the setting of some ANSI modes:

| Host | 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 modes:

| Host | Meaning |
|----------------------|---|
| CSI ? 36 \$ p | What is the current state of Hebrew encoding mode (DECHEM)? (DECHEM = 36) |
| CSI ? 6 \$ p | What is the current state of origin mode (DECOM)? (DECOM = 6) |

DECRCM—Request Mode - Host To Terminal

Notes on DECRCM

- The terminal does not respond to a DECRCM sequence when in VT52 mode.
- A DECRCM sequence can only ask about one mode at a time.

Table 5–7 ANSI Modes for DECRCM, DECRCM, SM, and RM

| Mode | Mnemonic | Pa |
|---------------------------|----------|----|
| Guarded area transfer | GATM* | 1 |
| Keyboard action | KAM | 2 |
| Control representation | CRM† | 3 |
| Insert/replace | IRM | 4 |
| Status reporting transfer | SRTM* | 5 |
| Vertical editing | VEM* | 7 |
| Horizontal editing | HEM* | 10 |
| Positioning unit | PUM* | 11 |
| Send/receive | SRM | 12 |
| Format effector action | FEAM* | 13 |
| Format effector transfer | FETM* | 14 |
| Multiple area transfer | MATM* | 15 |
| Transfer termination | TTM* | 16 |
| Selected area transfer | SATM* | 17 |
| Tabulation stop | TSM* | 18 |
| Editing boundary | EBM* | 19 |
| Line feed/new line | LNМ | 20 |

*This control function is permanently reset.

†The host cannot change the setting of CRM. You can only change CRM from Set-Up. If CRM is set, then the terminal ignores DECRCM and most other control functions.

DEC RQM—Request Mode - Host To Terminal

Table 5–8 DEC Modes for DEC RQM, DEC RPM, 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 |
| Print form feed | DECPFF | 18 |
| Printer extent | DECPEX | 19 |
| Text cursor enable | DECTCEM | 25 |
| Cursor direction, right to left | DECRLM | 34 |
| Hebrew keyboard mapping | DECHEBM | 35 |
| Hebrew encoding mode | DECHEM | 36 |
| National replacement character set | DECNRCM | 42 |
| Greek keyboard mapping | DECNAKB | 57 |
| 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 |
| Vertical split screen | DECVSSM /DECLRMM | 69 |
| Transmit rate limiting | DECXRLM | 73 |
| Key position mode | DECNCSM | 95 |
| Key position mode | DECRLCM | 96 |
| Key position mode | DECCRTSM | 97 |
| Key position mode | DECARSM | 98 |
| Key position mode | DECMCM | 99 |
| Key position mode | DECAAM | 100 |
| Key position mode | DECCANSM | 101 |
| Key position mode | DECNULM | 102 |
| Key position mode | DECHDPXM | 103 |
| Key position mode | DECESKM | 104 |
| Key position mode | DECOSCNM | 106 |

DECQRPKFM—Program Key Free Memory Inquiry

DECQRPKFM—Program Key Free Memory Inquiry

Inquire as to the amount of free memory for programmable key operations.

Format

| | | |
|------------|----------|----------|
| CSI | + | x |
| 9/11 | 2/11 | 7/8 |

Description

Upon receiving of this sequence, the terminal responds with DECPKFMR.

DECQRPSR—Request Presentation State Report

The host sends this sequence to request a cursor information report (DECCIR) or tabulation stop report (DECTABSR).

Format

| | | | |
|------------|-----------|-----------|----------|
| CSI | Ps | \$ | w |
| 9/11 | 3/n | 2/4 | 7/7 |

Parameters

Ps
indicates which report the host requests.

| Ps | Report Requested |
|-----------|------------------------------------|
| 0 | Error. Request ignored |
| 1 | Cursor information report (DECCIR) |
| 2 | Tab stop report (DECTABSR) |

DECRQSS—Request Selection or Setting

The host requests the terminal setting. See DECRPSS for the terminal's response.

Format

DCS \$ q D . . . D ST
 9/0 2/4 7/1 . . . 9/12

Parameters

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.

Description

DECRQSS (and DECRPSS) support the following settings or selections:

| Setting | Mnemonic | Final Characters |
|----------------------------------|----------|------------------|
| Select Active Status Display | DECSASD | \$ } |
| Select Attribute Change Extent | DECSACE | * x |
| Set Character Attribute | DECSCA | " q |
| Set Conformance Level | DECSCCL | " p |
| Set Columns Per Page | DECSCPP | \$ |
| Set Lines Per Page | DECSLPP | t |
| Set Number of Lines per Screen | DECSNLS | * |
| Set Status Line Type | DECSSDT | \$ ~ |
| Set Left and Right Margins | DECSLRM | s |
| Set Top and Bottom Margins | DECSTBM | r |
| Set Graphic Rendition | SGR | m |
| Select Set-Up Language | DECSSL | p |
| Select Printer Type | DECSPRTT | \$ s |
| Select Refresh Rate | DECSRFR | " t |
| Select Digital Printed Data Type | DECSDPT | (p |
| Select ProPrinter Character Set | DECSPPCS | * p |
| Select Communication Speed | DECSCS | * r |
| Select Communication Port | DECSCP | * u |
| Set Scroll Speed | DECSSCLS | SP p |
| Set Cursor Style | DECSCUSR | SP q |
| Set Key Click Volume | DECSKCV | SP r |
| Set Warning Bell Volume | DECSWBV | SP t |

DECRQSS—Request Selection or Setting

| Setting | Mnemonic | Final Characters |
|------------------------------|----------|------------------|
| Set Margin Bell Volume | DECSMBV | SP u |
| Set Lock Key Style | DECSLCK | SP v |
| Select Flow Control Type | DECSFC | * s |
| Select Disconnect Delay Time | DECSDDT | \$ q |
| Set Transmit Rate Limit | DECSTRL | " u |
| Set Port Parameter | DECSPP | + w |

DECRQTSR—Request Terminal State Report

The host requests the terminal to report its state. The terminal reports (DECTSR) by indicating the setting of many device attributes. See DECTSR.

Format

CSI *Ps* \$ u
9/11 3/n 2/4 7/5

Parameters

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) |

Response

DCS 1 \$ S D . . . D ST

D . . . D

See Device Attributes (DA1, DA2, DA3).

DECRQUPSS—User-Preferred Supplemental Set

Applications can ask for the current user-preferred supplemental set. The terminal responds with the user-preferred supplemental set (DECAUPSS) sequence.

Host Request (DECRQUPSS)

The host requests the current user-preferred supplemental set by sending the following sequence:

Format

```
CSI   &   u
9/11  2/6  7/5
```

Terminal Responses

The terminal uses the DECAUPSS device control string to report the current user-preferred supplemental set (UPSS). The terminal sends DECAUPSS in response to a DECRQUPSS sequence. The terminal can send one of the following reports:

| Control Sequence | UPSS |
|-------------------------|--|
| 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. |

DECRSPS—Restore Presentation State

DECRSPS—Restore Presentation State

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)" section in this chapter.

Format

```
DCS  Ps  $  t  D . . . D  ST
9/0  3/n  2/4  7/4  . . .  9/12
```

Parameters

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— Cursor Information Report (DECCIR) or Tab Stop Report (DECTABSR).

Examples

The following DECRSPS sequence restores tab stops according to the tab stop report (DECTABSR):

```
DCS 2 $ t 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). If there is an invalid value in the DECRSPS sequence, then the terminal ignores the rest of the sequence. This action may leave the terminal in a partially restored state.

DECRSTS—Restore Terminal State

This sequence restores the terminal to a previous state specified in a terminal state report (DECTSR).

Programming Tip

Applications can use DECRSTS to restore the terminal to a previous operating state specified in a terminal state report.

Format

```
DCS  Ps  $  p  D...D  ST
9/0  3/n  2/4  7/0  ...  9/12
```

Parameters

Ps

indicates the format of the data string (D . . . D).

| Ps | Data String Format |
|----|--|
| 0 | Error, restore ignored |
| 1 | Selects the format of the terminal state report (DECTSR) |

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, then 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 terminals.

DECSACE—Select Attribute Change Extent

DECSACE—Select Attribute Change Extent

This control function lets you select which character positions in a rectangle can have their attributes changed or reversed. DECSACE controls the effect of two other functions—change attributes in rectangular area (DECCARA) and reverse attributes in rectangular area (DECRARA).

Available in: VT Level 4 mode only

Format

| | | | |
|------|-------------|------|----------|
| CSI | <i>Ps</i> | * | x |
| 9/11 | 3/ <i>n</i> | 2/10 | 7/8 |

Parameters

Ps

selects the area of character positions affected.

| Ps | Area Effected |
|----------------|---|
| 0 (default) | DECCARA or DECRARA affect the stream of character positions that begins with the first position specified in the DECCARA or DECRARA command, and ends with the second character position specified. |
| 1 | Same as 0. |
| 2 | DECCARA and DECRARA affect all character positions in the rectangular area. The DECCARA or DECRARA command specifies the top-left and bottom-right corners. |

DECSASD—Select Active Status Display

DECSASD selects whether the terminal sends data to the main display or the status line.

Available in: VT Level 4 mode only

Default: Main display

Format

```
CSI  Ps  $  }
9/11 3/n 2/4 7/13
```

Parameters

Ps

indicates the display to which the terminal sends data.

| 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. |

DECSC—Save Cursor

Format

```
ESC  7
1/11 3/7
```

Description

Saves the following items in the terminal's memory:

- Cursor position
- Character attributes set by the SGR command
- 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
- Any single shift 2 (SS2) or single shift 3 (SS3) functions sent

DECSCA—Select Character Protection Attribute

DECSCA—Select Character Protection Attribute

DECSCA defines the characters that come after it as erasable or not erasable from the screen. The selective erase control functions (DECSED and DECSEL) can only erase characters defined as erasable.

Available in: VT Level 4 mode only

Format

| | | | |
|------------|-------------|-----|----------|
| CSI | <i>Ps</i> | " | q |
| 9/11 | 3/ <i>n</i> | 2/2 | 7/1 |

Parameters

Ps

defines all characters that follow the DECSCA function as erasable or not erasable.

| Ps | Meaning |
|-------------|--|
| 0 (default) | DECSED and DECSEL can erase characters. |
| 1 | DECSED and DECSEL cannot erase characters. |
| 2 | Same as 0. |

Note on DECSCA

DECSCA does *not* effect visual character attributes set by the select graphic rendition (SGR) function.

DECSCSCL—Select Conformance Level

You select the terminal's operating level by using the following select conformance level (DECSCSCL) control sequences. The factory default is level 4 (VT Level 4 mode, 7-bit controls).

Note

When you change the conformance level, the terminal performs a hard reset (RIS).

Format

| Sequence | | Level Selected | |
|------------|------------------|---------------------------------|----------|
| | | <i>Level 1</i> | |
| CSI | 6 1 | " | p |
| 9/11 | 3/6 3/1 | 2/2 | 7/0 |
| | | VT100 mode | |
| | | <i>Level 4†</i> | |
| CSI | 6 n | " | p |
| 9/11 | 3/6 3/n | 2/2 | 7/0 |
| | | VT Level 4 mode, 8-bit controls | |
| CSI | 6 n ; 0 | " | p |
| 9/11 | 3/6 3/n 3/11 3/0 | 2/2 | 7/0 |
| | | VT Level 4 mode, 8-bit controls | |
| CSI | 6 n ; 1 | " | p |
| 9/11 | 3/6 3/n 3/11 3/2 | 2/2 | 7/0 |
| | | VT Level 4 mode, 7-bit controls | |
| CSI | 6 n ; 2 | " | p |
| 9/11 | 3/6 3/n 3/11 3/2 | 2/2 | 7/0 |
| | | VT Level 4 mode, 8-bit controls | |

†Level 4 includes levels 2 and 3. In these sequences, *n* can be 2, 3, or 4

DECSCLM—Scrolling Mode

DECSCLM—Scrolling Mode

This control function selects the way the terminal scrolls lines. You can select one of two scroll settings, smooth or jump.

Default: Smooth scroll.

Format

| | | | | |
|------------|----------|----------|----------|---------------------|
| CSI | ? | 4 | h | Set: smooth scroll. |
| 9/11 | 3/15 | 3/4 | 6/8 | |

| | | | | |
|------------|----------|----------|----------|---------------------|
| CSI | ? | 4 | l | Reset: jump scroll. |
| 9/11 | 3/15 | 3/4 | 6/12 | |

Description

When DECSCLM is set, the terminal adds lines to the screen at a moderate, smooth rate. You can select a slow rate or fast rate in Display Set-Up.

When DECSCLM is reset, the terminal can add lines to the screen as fast as it receives them.

DECSCNM—Screen Mode: Light or Dark Screen

This control function selects a dark or light background on the screen.

Default: Dark background.

Format

| | | | | |
|------------|----------|----------|----------|---------------------|
| CSI | ? | 5 | h | Set: reverse video. |
| 9/11 | 3/15 | 3/5 | 6/8 | |

| | | | | |
|------------|----------|----------|----------|------------------------|
| CSI | ? | 5 | l | Reset: normal display. |
| 9/11 | 3/15 | 3/5 | 6/12 | |

Description

When DECSCNM is set, the screen displays dark characters on a light background.

When DECSCNM is reset, the screen displays light characters on a dark background.

Note on DECSCNM

Screen mode only effects how the data appears on the screen. DECSCNM does not change the data in page memory.

DECSCP—Select Communication Port

Select the port to be used for printer or host connection.

Format

```
CSI  Ps1  ;   Ps2  *   u
9/11 3/n  3/11 3/n  2/10 7/5
```

Parameters

Ps1

indicates the port selection for a printer connection. The VT510 enables you to select from a Centronics parallel port.

| Ps1 | Printer Port |
|-----|---------------|
| 1 | Parallel port |
| 2 | Comm1 |
| 3 | Comm2 |

Ps2

indicates the port selection for a host connection. Since the VT510 is a single session terminal, the host session can connect to the Comm1 port or the Comm2 port.

| Ps2 | Session 1 |
|-----|-----------|
| 1 | Comm1 |
| 2 | Comm2 |

Comm1 is an RS232, 25-pin, serial port. Comm2 is an MMJ serial port.

DECSCPP—Select 80 or 132 Columns per Page

DECSCPP—Select 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 (DECCOLM—Select 80 or 132 Columns per Page).

NOTE

It is recommended 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.

Default: 80 columns

Format

| Sequence | | Sets Each Page to . . . | | | | |
|------------|-----------|-------------------------|-----------|-----------|----------|--------------|
| CSI | \$ | | | | | 80 columns. |
| 9/11 | 2/4 | 7/12 | | | | |
| CSI | 0 | \$ | | | | 80 columns. |
| 9/11 | 3/0 | 2/4 | 7/12 | | | |
| CSI | 8 | 0 | \$ | | | 80 columns. |
| 9/11 | 3/8 | 3/0 | 2/4 | 7/12 | | |
| CSI | 1 | 3 | 2 | \$ | | 132 columns. |
| 9/11 | 3/1 | 3/3 | 3/2 | 2/4 | 7/12 | |

Notes on DECSCPP

- DECSCPP changes the font to match the current number of columns on the page.
- DECSCPP does not move the cursor. If, however, the cursor is beyond the width of the new page when DECSCPP executes, then the cursor moves to the right column of the new page.
- If you switch from 132-column to 80-column pages, then 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.

DECSCS—Select Communication Speed

Select a communication speed for a communication line.

Format

CSI *Ps1* ; *Ps2* * **r**
 9/11 3/n 3/11 3/n 2/10 7/2

Parameters

Ps1

indicates the communication line.

| Ps1 | Comm Line Type |
|--------------|----------------|
| 1, 0 or none | Host Transmit |
| 2 | Host Receive |
| 3 | Printer |
| 4 | Modem Hi |
| 5 | Modem Lo |

Ps2

indicates the communication speed.

| Ps2 | Speed | Ps2 | Speed |
|-----------|---------|-----|--------|
| 0 or none | default | 6 | 9600 |
| 1 | 300 | 7 | 19200 |
| 2 | 600 | 8 | 38400 |
| 3 | 1200 | 9 | 57600 |
| 4 | 2400 | 10 | 76800 |
| 5 | 4800 | 11 | 115200 |

The default value depends on the type of communication line.

| Communication Line | Default Communication Speed |
|--------------------|-----------------------------|
| Host Transmit | 9600 |
| Host Receive | Receive=transmit |
| Printer | 4800 |
| Modem Hi | Ignore |
| Modem Lo | Ignore |

DECSCUSR—Set Cursor Style

DECSCUSR—Set Cursor Style

Select the style of the cursor on the screen.

Format

| | | | |
|------------|-------------|-----------|----------|
| CSI | <i>Ps</i> | SP | q |
| 9/11 | 3/ <i>n</i> | 2/0 | 7/1 |

Parameters

Ps
indicates the style of the cursor.

| Ps | Cursor Style |
|--------------|-----------------------|
| 0, 1 or none | Blink Block (Default) |
| 2 | Steady Block |
| 3 | Blink Underline |
| 4 | Steady Underline |

This sequence causes the cursor to be displayed in a different style when the cursor is enabled.

Note on DECSCUSR

The escape sequence DECTCEM can enable or disable the cursor display.

DECSDDT—Select Disconnect Delay Time

Select an appropriate disconnect delay time.

Format

CSI Ps \$ q
 9/11 3/n 2/4 7/1

Parameters

Ps
 indicates the selection for the disconnect delay time.

| Ps | Disconnect Delay Time |
|--------------|-----------------------|
| 1 | None |
| 2 | 60 ms |
| 3, 0 or none | 2 seconds |

Description

The disconnect delay feature determines the time allowed before the terminal disconnects from the communications line when the Received Line Signal Detect (RLSD) is lost.

All countries except the United Kingdom should use the 2 seconds delay. The 60 ms delay is for use in the United Kingdom.

If the terminal detects a loss of carrier and if the user has selected "no disconnect," then the terminal ignores RLSD (CD) after the beginning of the connection.

If the user tries to disconnect and reconnect the line, then the terminal checks if RLSD is asserted before granting the connection. Once it is connected, the terminal ignores the loss of carrier. In this case, the disconnect should be done on DSR going off.

DECSDPT—Select Digital Printed Data Type

DECSDPT—Select Digital Printed Data Type

Allow users to match the characters printed to the character sets the DEC ANSI conforming printer is capable of supporting.

Format

CSI *Ps*) **p**
9/11 3/*n* 2/9 7/0

Parameters

Ps
denotes the selection for printed data type.

| Ps | Printed Data Type |
|--------------|-------------------------------|
| 1, 0 or none | Print National Only (Default) |
| 2 | National and Line Drawing |
| 3 | Print Multinational |
| 4 | Print All Characters |

Description

This sequence takes effect only when a ProPrinter or DEC printer with ProPrinter emulation mode is attached.

DECSED—Selective Erase in Display

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 control function. DECSED works inside or outside the scrolling margins.

Available in: VT Level 4 mode only

Format

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

Parameters

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 |

DECSEL—Selective Erase in Line

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 control function. DECSEL works inside or outside the scrolling margins.

Available in: VT Level 4 mode only

Format

```
CSI  ?   Ps  K
9/11 3/15 3/n 4/11
```

Parameters

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 |

DECSERA—Selective Erase Rectangular Area

DECSERA—Selective Erase Rectangular Area

This control function erases all erasable characters from a specified rectangular area in page memory. The select character protection attribute (DECSCA) control function defines whether or not DECSERA can erase characters.

When an area is erased, DECSERA replaces character positions with the space character (2/0). DECSERA does not change:

- Visual attributes set by the select graphic rendition (SGR) function
- Protection attributes set by DECSCA
- Line attributes

Available in: VT Level 4 mode only

Format

```
CSI  Pt  ;  Pl  ;  Pb  ;  Pr  $  {  
9/11 3/n 3/11 3/n 3/11 3/n 3/11 3/n 2/4 7/11
```

Parameters

Pt, Pl, Pb, and Pr

define the rectangular area to be selectively erased:

Pt is the top-line border. *Pt* must be less than or equal to *Pb*.

Default: *Pt* = 1.

Pl is the left-column border. *Pl* must be less than or equal to *Pr*.

Default: *Pl* = 1.

Pb is the bottom-line border.

Default: *Pb* = the last line of the active page.

Pr is the right-column border.

Default: *Pr* = the last column of the active page.

Notes on DECSERA

- The coordinates of the rectangular area are affected by the setting of origin mode (DECOM).
- DECSERA is not affected by the page margins.
- If the value of *Pt*, *Pl*, *Pb*, or *Pr* exceeds the width or height of the active page, then the value is treated as the width or height of that page.
- DECSERA does not change the active cursor position.

DECSFC—Select Flow Control

Select a flow control scheme for the communication port or printer port.

Format

```
CSI  Ps1 ; Ps2 ; Ps3 ; Ps4 * s
9/11 3/n 3/11 3/n 3/11 3/n 3/11 3/n 2/10 7/3
```

Parameters

Ps1

determines which port is to be assigned the flow control scheme.

| Ps1 | Port Type |
|--------------|--------------|
| 1, 0 or none | Comm Port |
| 2 | Printer Port |

Ps2

indicates the flow method. On the VT510, the transmit side or the receive side of the communication line can select different or the same flow control methods.

| Ps2 | Transmit or Receive |
|--------------|----------------------|
| 1, 0 or none | Transmit |
| 2 | Receive |
| 3 | Transmit and Receive |

Ps3

is for the flow control type. When the terminal is in PCTerm mode, XPC replaces XON/XOFF on the receive side.

| Ps3 | Flow Control Type |
|--------------|---|
| 1, 0 or none | XON/XOFF or XPC (XPC is for receive only) |
| 2 | DTR |
| 3 | Both |
| 4 | None |

DECSFC—Select Flow Control

Ps4

sets the flow control threshold.

| Ps4 | Flow Control Threshold |
|--------------|------------------------|
| 1, 0 or none | Low (64) |
| 2 | High (768) |

The terminal uses "low" and "high" to denote the flow control threshold.

- If Low is selected, then the terminal sends an XOFF (if in software flow control) or lower DTR (in hardware flow control) to notify the host of holding transmission when the input buffer reaches 64 bytes.
- If High is selected, then 768 bytes is the flow control threshold.

"High" flow control threshold is not available for the printer port, which always uses low (64 bytes) as the flow control threshold.

DECSKCV—Set Key Click Volume

Set the keyclick volume.

Format

| | | | |
|------|-----|-----|-----|
| CSI | Ps | SP | r |
| 9/11 | 3/n | 2/0 | 7/2 |

Parameters

Ps

indicates the selection of the click volume.

| Ps | Key Click Volume |
|-----------------------|------------------|
| 1 | Off |
| 2, 3, 4 | Low |
| 5, 6, 7, 8, 0 or none | High (Default) |

DECSLCK—Set Lock Key Style

Allow user to select a Lock key style.

Format

CSI Ps SP v
 9/11 Ps 2/0 7/6

Parameters

Ps
 indicates the selection of the lock style.

| Ps | Lock Style | Meaning |
|--------------|--------------------|---|
| 1, 0 or None | Cap Lock (Default) | Lock alpha keys on main keypad in uppercase. |
| 2 | Shift Lock | Lock alpha and numeric keys on main keypad in shifted setting. |
| 3 | Reverse Lock | Lock numeric keys in shifted setting, but lock alpha keys in lowercase setting. |

DECSLPP—Set Lines Per Page

DECSLPP—Set Lines Per Page

This control function sets the number of lines for each page in page memory.

Default: One session—6 pages of 24 lines

Format

| | | |
|------|-----------|-----|
| CSI | <i>Pn</i> | t |
| 9/11 | <i>n</i> | 7/4 |

Parameters

Pn

Sets the lines per page according to the numeric parameter.

Description

If the number of lines specified is not one of the values supported by the implementation, then the next higher supported number of lines per page is assumed. If the number of lines specified exceeds the maximum number supported, then the maximum number supported is used. The valid *Pn* values are 24, 25, 36, 41, 42, 48, 52, 53, and 72.

The VT510 supports three pages of off-screen memory in the following configurations:

- 3 pages × 24 lines (default)
- 2 pages × 25 lines
- 2 pages × 36 lines
- 1 pages × 41 lines
- 1 pages × 42 lines
- 1 pages × 48 lines
- 1 pages × 52 lines
- 1 pages × 53 lines
- 1 pages × 72 lines

Notes on DECSLPP

- If you switch to a smaller page size, then data that was on the larger page may be split across the smaller pages. To avoid confusion, make sure you set the lines/page *before* you enter data into page memory.
- DECSLPP usually does not change the top and bottom scrolling margins. If, however, you change the page size so that the current scrolling margins exceed the new page size, then the terminal resets the margins to the page limits.

DECSLRM—Set Left and Right Margins

This control function sets the left and right margins to define the scrolling region. DECSLRM only works when vertical split screen mode (DECLRMM) is set.

Available in: VT Level 4 mode only

Default: Margins are at the left and right page borders.

Format

```
CSI  Pl  ;   Pr  s
9/11 3/n 3/11 3/n 7/3
```

Parameters

Pl

is the column number for the left margin.

Default: $Pl = 1$.

Pr

is the column number for the right margin.

Default: $Pr = 80$ or 132 (depending on the page width).

Notes on DECSLRM

- The value of the left margin (Pl) must be less than the right margin (Pr).
- The maximum size of the scrolling region is the page size, based on the setting of set columns per page (DECSCPP).
- The minimum size of the scrolling region is two columns.
- The terminal only recognizes this control function if vertical split screen mode (DECLRMM) is set.
- DECSLRM moves the cursor to column 1, line 1 of the page.
- If the left and right margins are set to columns other than 1 and 80 (or 132), then the terminal cannot scroll smoothly.

DECSMBV—Set Margin Bell Volume

DECSMBV—Set Margin Bell Volume

Set the margin bell volume.

Format

| | | | |
|------------|-----------|-----------|----------|
| CSI | <i>Ps</i> | SP | u |
| 9/11 | Ps | 2/0 | 7/5 |

Parameters

Ps
indicates the selection of the bell volume.

| Ps | Key Click Volume |
|--------------|-------------------------|
| 1, 0 or none | Off (default) |
| 2, 3, 4 | Low |
| 5, 6, 7, 8 | High |

Description

This sequence is used to adjust the warning bell volume, which sounds as the current position nears the right margin.

DECSMKR—Select Modifier Key Reporting

Program the modifier keys to send extended keyboard reports when pressed or released. DECSMKR only works when key position mode (DECKPM) is set. Applications can use DECSMKR to gain more control over the keyboard by monitoring the action of each modifier key.

Format

```
CSI  Pm1  ;  Pf1  ...  Pmn  ;  Pfn  +  r
9/11 3/n  3/11 3/n  ...  ***  3/11  ***  2/11  7/2
```

Parameters

Pmn

is the key number that corresponds to the modifier key affected. A *Pmn* value of 0 selects all modifier keys.

| Pmn | Key | Default Function |
|-----|---|--------------------------------|
| 1 | left Shift | Local shift. |
| 2 | right Shift | Local shift. |
| 3 | Lock | Local lock. |
| 4 | Ctrl | Local control. |
| 5 | left Alt Function | Report up or down transitions. |
| 6 | right Alt Function | Report up or down transitions. |
| 7 | left Compose Character | Local compose. |
| 8 | right Compose Character | Local compose. |

Pfn

controls the action of the modifier key specified by the corresponding *Pmn* value.

| Pfn | Meaning |
|-----|---|
| 0 | Selects the default function of the key. |
| 1 | The key performs its default modifier function. |
| 2 | The key sends an extended keyboard report when pressed or released. The key does not modify other keystrokes or perform its default function. |
| 3 | The key is disabled. |

Description

DECSMKR can accept any number of parameter pairs. The terminal executes the parameters in the order in which it receives them. Applications cannot change the function of the F5 (Break) key. This restriction is required for secure systems to ensure that the operator has control of the communication line.

DECSNLS—Set Lines Per Screen

DECSNLS—Set Lines Per Screen

Set the maximum lines that can be displayed on the screen.

Format

```
CSI  Pn  *  |  
9/11  ... 2/10 7/12
```

Description

The terminal supports three different font heights, which allows 26, 42, or 53 data lines to be displayed on the screen or 25, 41, or 52 data lines to be displayed on the screen, plus a status line. The different character fonts are:

| | 80/26 | 132/26 | 80/42 | 132/42 | 80/53 | 132/53 |
|-------------|-------|--------|-------|--------|-------|--------|
| Cell Width | 10 | 6 | 10 | 6 | 10 | 6 |
| Cell Height | 16 | 16 | 10 | 10 | 8 | 8 |

Notes on DECSNLS

- When 26 Line per Screen/72 Hz/Overscan is selected, the cell size changes from 10 × 16 (6 × 16) to 10 × 13 (6 × 13).
- When 42 lines or 53 lines are selected, users can only select either overscan feature or 72 Hz refresh rate, not both.

Valid Combinations

The terminal has the following valid combinations:

| Lines Per Screen | Refresh Rate | Overscan |
|------------------|--------------|----------|
| 26 | 72 Hz | No |
| 26 | 72 Hz | Yes |
| 26 | 60 Hz | No |
| 26 | 60 Hz | Yes |
| 42 | 72 Hz | No |
| 42 | 60 Hz | No |
| 42 | 60 Hz | Yes |
| 53 | 72 Hz | No |
| 53 | 60 Hz | No |
| 53 | 60 Hz | Yes |

If an invalid combination is selected, the terminal automatically returns to a valid combination according to the following priority order:

1. Lines Per Screen
2. Refresh Rate
3. Overscan

Examples

The current combination is 26 lines/72 Hz/Overscan. If you attempt to assign 42 lines per screen, then the terminal becomes 42 lines/72 Hz/No Overscan.

The current combination is 42 lines/60 Hz/Overscan. If you attempt to assign 72 Hz refresh rate, then the terminal becomes 42 lines/72 Hz/No Overscan.

The current combination is 53 lines/72 Hz/No Overscan. Any attempt to enable Overscan is invalid.

DECSP—Set Port Parameter

DECSP—Set Port Parameter

Configures communication parameters for either a communication port or a printer port.

Format

```
CSI  Ps1  ;   Ps2  ;   Ps3  ;   Ps4  +   W
9/11 3/n  3/11 3/n  3/11 3/n  3/11 3/n  2/11 7/7
```

Parameters

Ps1

determines which port is to be configured.

| Ps1 | Port Selection |
|--------------|----------------|
| 1, 0 or none | Comm Port |
| 2 | Printer Port |

Ps2

determines the data bit.

| Ps2 | Data Bit |
|--------------|----------|
| 1, 0 or none | 8 bits |
| 2 | 7 bits |

Ps3

determines the parity.

| Ps3 | Parity | Ps3 | Parity |
|--------------|---------------------------|-----|-----------------------|
| 1, 0 or none | No Parity | 5 | Odd Parity, Unchecked |
| 2 | Even Parity | 6 | Mark Parity |
| 3 | Odd Parity | 7 | Space Parity |
| 4 | Even Parity, Unchecked | | |

Ps3 selections 4 and 5 are not available for the printer port.

Ps4

determines the stop bit.

| Ps4 | Stop Bit |
|--------------|----------|
| 1, 0 or none | 1 bit |
| 2 | 2 bits |

DECSPPCS—Select ProPrinter Character Set

Allow users to match the characters printed to the character sets the IBM ProPrinter is capable of supporting.

Format

```
CSI  Pn  *  p
9/11 3/n 2/10 7/0
```

Parameters

Pn

denotes the code page numbers for ProPrinter supported character sets.

| Pn | Printer |
|-----------|---------------------|
| 210 | PC Greek |
| 220 | PC Spanish |
| 437 | PC International |
| 850 | PC Multilingual |
| 852 | PC Slavic (Latin 2) |
| 857 | PC Turkish |
| 860 | PC Portuguese |
| 862 | PC Hebrew |
| 863 | PC French-Canadian |
| 865 | PC Danish |
| 866 | PC Cyrillic |

Description

This sequence takes affect only when a ProPrinter or DEC printer with ProPrinter emulation mode is attached.

DECSPRTT—Select Printer Type

DECSPRTT—Select Printer Type

Allow users to select a printer type that matches their environment.

Format

| | | | |
|------------|-------------|-----------|----------|
| CSI | <i>Ps</i> | \$ | s |
| 9/11 | 3/ <i>n</i> | 2/4 | 7/3 |

Parameters

Ps
indicates the selection of the printer type.

| Ps | Printer Type |
|--------------|---------------------|
| 1, 0 or none | DEC ANSI (default) |
| 2 | IBM ProPrinter |
| 3 | DEC + IBM |

Description

Printer type "DEC ANSI" indicates a printer type that is capable of recognizing the attached Digital ANSI conforming escape sequences.

"ProPrinter" indicates an attached printer type that recognizes the IBM ProPrinter escape sequences.

If the attached printer is an ANSI-compatible printer that has the IBM ProPrinter emulation feature, then select "DEC + IBM."

DECSR—Secure Reset

This control function sets the terminal to its power-up state. DECSR lets applications know the exact state of the terminal before any attempted operations. You can use DECSR to guarantee the terminal state for secure connections. DECSR is similar to RIS, but does not perform a disconnect from the host.

Format

| | | | |
|------------|-------------|----------|----------|
| CSI | <i>Pr</i> | + | p |
| 9/11 | 3/ <i>n</i> | 2/11 | 7/0 |

Parameters

Pr
is an optional random number from 0 to 16383. If *Pr* is included, then the terminal sends a confirmation (DECSRC) with this number.

DECSR Actions

- Clears user-defined keys.
- Clears soft character sets.
- Clears the screen and all off-screen page memory.
- Returns the cursor to the upper-left corner of the first page.
- Resets the scrolling margins.
- Resets origin mode (DECOM) to absolute.
- Sets visual character attributes to normal.
- Sets the selective erase (DECSCA) attribute to not selectively erasable.
- Sets all character sets to the defaults (G0, G1, G2, G3, GL, GR).
- Erases macro memory.
- Erases the paste buffer.
- Reinitializes the keyboard state by:
 - Clearing the keyboard input buffer
 - Canceling compose sequences
 - Resetting the keyboard to send its default codes (in NVR)
 - Unlocking the keyboard (resetting KAM)

DECSR replaces all set-up parameters to their saved settings or power-up default values. If you include the optional *Pr* parameter, then the terminal returns a secure reset report to the host.

Notes on DECSR

- DECSR works in all conformance levels (level 1 or higher).
- DECSR works in display controls mode (CRM) and causes the terminal to exit this mode.
- DECSR does not work in VT52 mode or printer controller mode. The host software must explicitly exit these modes. You can send DECSR to an attached printer if the terminal is in printer controller mode.
- The terminal buffers DECSR like any other incoming data.

DECSRC—Secure Reset Confirmation

DECSRC—Secure Reset Confirmation

The terminal returns this report to the host if the *Pr* parameter was included in the last secure reset (DECSR) control function. DECSRC report indicates that the secure reset operation was successful.

Format

| CSI | <i>Pr</i> | * | q |
|------|-------------|------|-----|
| 9/11 | 3/ <i>n</i> | 2/10 | 7/1 |

Parameters

Pr

is the number from 0 to 16383 that was included in the corresponding secure reset sequence.

DECSRFR—Select Refresh Rate Selection

Selects a refresh rate.

Format

CSI *Ps* " t
 9/11 3/*n* 2/2 7/4

Parameters

Ps

indicates the refresh rate selection. On the VT510, only 60 Hz and 72 Hz are supported.

| Ps | Refresh Rate |
|--------------|---------------------------|
| 1 | 50 Hz |
| 2 | 60 Hz |
| 3, 0 or none | Greater or equal to 70 HZ |

Description

The terminal can be set to refresh its display at the power line frequency in electrically noisy environments. Normally this is unnecessary. The 72 Hz refresh rate is preferred to minimize flicker.

Because of a hardware limitation, overscan and 72 Hz refresh rate cannot co-exist when the lines per screen is set to 42 or 53. See DECSNLS for details. If a combination of lines per screen, refresh rate, and overscan become invalid, then the terminal returns to a valid combination in this order of priority:

1. Lines Per Screen
2. Refresh Rate
3. Overscan

DECSSCLS—Set Scroll Speed

DECSSCLS—Set Scroll Speed

Select how fast lines appear on the screen.

Format

| | | | |
|------------|-----------|-----------|----------|
| CSI | <i>Ps</i> | SP | p |
| 9/11 | Ps | 2/0 | 7/0 |

Parameters

Ps

indicates the scroll speed and lines per second.

| Ps | Scroll Speed | Lines per Second |
|--------------------|---------------------|-------------------------|
| 0, 1, 2, 3 or none | Smooth 2 (default) | 9 |
| 4, 5, 6, 7, 8 | Smooth 4 | 18 |
| 9 | Jump | As fast as received |

Description

This is a user preference feature. If the **User Features Locked** is enabled, then the scroll speed cannot be changed by this control function.

The escape sequence DECSCLM can change the scroll speed between Smooth 2 and Jump scroll.

DECSSDT—Select Status Display (Line) Type

This control function lets the host select the type of status line displayed.

Available in: VT Level 4 mode only

Default: Indicator status display

Format

```
CSI  Ps  $  ~
9/11 3/n 2/4 7/14
```

Parameters

Ps

indicates which status line the host selects:

| Ps | Status Line Selected |
|-------------|---------------------------|
| 0 (default) | No status line |
| 1 | Indicator status line |
| 2 | Host-writable status line |

Notes on DECSSDT

- If you select no status line ($Ps = 0$), then the terminal uses the line as an additional user window line to display data.
- If you change from an indicator to a host-writable status line, then 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 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 (DECSCCL) | Exits the status line. |
| Scrolling mode (DECSCCLM) | Affects the main display and the status line. |
| Soft terminal reset (DECSTR) | Exits the status line. |

DECSSDT—Select Status Display (Line) Type

| Control Function | Action |
|---------------------------|---|
| 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 the main display and status line. |
| Autowrap mode (DECAWM) | Affects the 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.

DECSSL—Select Set-Up Language

Select one of several languages for Set-Up display menus.

Format

CSI *Ps* **p**
9/11 3/*n* 5/0

Parameters

Ps
indicates the set-up language.

| Ps | Set-Up Language |
|--------------|------------------------|
| 0, 1 or none | English |
| 2 | French |
| 3 | German |
| 4 | Spanish |

DECST8C—Set Tab at Every 8 Columns

Set a tab stop at every eight columns starting with column 9.

Format

```
CSI  ?   5   W
9/11 3/15 3/5 5/7
```

Description

Any tab stop setting before this command is executed is cleared automatically. Control function TBC clears the tab stops on the display; HTS sets a horizontal tab stop at the active column.

DECSTBM—Set Top and Bottom Margins

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

Default: Margins are at the page limits.

Format

```
CSI  Pt   ;   Pb   r
9/11 3/n  3/11 3/n  7/2
```

Parameters

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

Pb
is the line number for the bottom margin.
Default: $Pb =$ current number of lines per screen.

Notes on DECSTBM

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

DECSTR—Soft Terminal Reset

DECSTR—Soft Terminal Reset

Perform a soft reset to the default values listed in Table 5–9.

Format

```
CSI  !  p
9/11 2/1 7/0
```

Description

Table 5–9 lists the terminal's default settings:

Table 5–9 Terminal's Default Settings

| Mode | Mnemonic | State after DECSTR |
|---|------------------------|--|
| Text cursor enable | DECTCEM | Cursor enabled. |
| Insert/replace | IRM | Replace mode. |
| 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). |
| Set top and bottom margins | DECSTBM | Top margin = 1; bottom margin = page length. |
| All character sets | G0, G1, G2, G3, GL, GR | Default settings. |
| Select graphic rendition | SGR | Normal rendition. |
| Select character attribute | DECSCA | Normal (erasable by DECSEL and DECSER). |
| Save cursor state | DECSC | Home position. |
| Assign user preference supplemental set | DECAUPSS | Set selected in Set-Up. |
| Select active status display | DECSASD | Main display. |
| Keyboard position mode | DECKPM | Character codes. |
| Cursor direction | DECRLM | Reset (Left-to-right), regardless of NVR setting. |
| PC Term mode | DECPCTERM | Always reset. |

DECSTRL—Set Transmit Rate Limit

Limit the rate of character transmission according to the selected rate.

Format

```
CSI  Ps1  ;   Ps2  "   u
9/11 3/n  3/11 3/n  2/2  7/5
```

Parameters

Ps1

indicates the key type.

| Ps1 | Key Type |
|--------------|--------------|
| 1, 0 or none | All Keys |
| 2 | Graphic Key |
| 3 | Function Key |

Ps2

indicates the characters per second.

| Ps2 | Characters Per Second |
|--------------|-----------------------|
| 1, 0 or none | 150 CPS |
| 2 | 50 CPS |
| 3 | 30 CPS |

Description

When enabled, the terminal limits the rate at which it transmits the answerback, CPR, DA, TSI, and DSR messages, as well as the keyboard keys, and any other characters transmitted from the terminal. All messages and keystrokes are transmitted according to the selected "character per second" rate.

You can select different transmit rates for graphic keys and function keys, which usually transmit more than one byte at a time.

The transmit rate limit function can be enabled and disabled through the DECXRLM control function. When disabled, all messages and keystrokes are transmitted as fast as possible without any delay between characters.

DECSWBV—Set Warning Bell Volume

DECSWBV—Set Warning Bell Volume

Set the warning bell volume.

Format

| | | | |
|------------|-----------|-----------|----------|
| CSI | <i>Ps</i> | SP | t |
| 9/11 | Ps | 2/0 | 7/4 |

Parameters

Ps
indicates the selection of the click volume.

| Ps | Bell Volume |
|-----------------------|--------------------|
| 1 | Off |
| 2, 3, 4 | Low |
| 5, 5, 7, 8, 0 or none | High (default) |

Description

This sequence is used to adjust the warning bell volume (for errors and receipt of **Ctrl G**).

DECSWL—Single-Width, Single-Height Line

DECSWL makes the line with the cursor a single-width, single-height line. This line attribute is the standard for all new lines on the screen.

Format

| | | |
|------------|----------|----------|
| ESC | # | 5 |
| 1/11 | 2/3 | 3/5 |

DECTABSR—Tab Stop Report

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 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. Refer to DECRSPS—Restore Presentation State for additional information.

Format

```
DCS 2 $ u D...D ST
9/0 3/2 2/4 7/5 ... 9/12
```

Parameters

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
```

9, 17, 25, 33, 41, 49, 57, 65, and 73 are the column numbers for tab stops.

DECTCEM—Text Cursor Enable Mode

This control function makes the cursor visible or invisible.

Default: Visible

Format

```
CSI ? 2 5 h Set: makes the cursor visible.
9/11 3/15 3/2 3/5 6/8
```

```
CSI ? 2 5 l Reset: makes the cursor invisible.
9/11 3/15 3/2 3/5 6/12
```

DECTID—Select Terminal ID

DECTID—Select Terminal ID

Select a terminal ID.

Format

```
CSI  Ps  ,  q
9/11 3n  2/12 7/1
```

Parameters

Ps
denotes the ID type.

| Ps | ID Type |
|----|---------|
| 0 | VT100 |
| 1 | VT101 |
| 2 | VT102 |
| 5 | VT220 |
| 7 | VT320 |
| 9 | VT420 |
| 10 | VT510 |

Description

This sequence selects the Primary DA Response ("Terminal ID") transmitted by the terminal. DECTID has no effect when the terminal is in VT52 mode.

The VT510 supports the following DA1 responses:

| | |
|-----------------|---------------------------------------|
| VT100 ID | ESC [? 1; 2 c |
| VT101 ID | ESC [? 1; 0 c |
| VT102 ID | ESC [? 6 c |
| VT220 ID (N.A.) | CSI ? 62; 1; 2; 7; 8 c |
| VT220 ID (Intl) | CSI ? 62; 1; 2; 7; 8; 9 c |
| VT320 ID (N.A.) | CSI ? 63; 1; 2; 7; 8 c |
| VT320 ID (Intl) | CSI ? 63; 1; 2; 7; 8; 9 c |
| VT420 ID (N.A.) | CSI ? 64; 1; 2; 7; 8; 9; 15; 18; 21 c |
| VT420 ID (Intl) | CSI ? 64; 1; 2; 7; 8; 9; 15; 18; 21 c |
| VT510 ID | Reference function DA1 |

The default ID is "VT510."

DECTME—Terminal Mode Emulation

Select a terminal emulation mode.

Format

```
CSI  Ps  SP  ~
9/11 3/n 2/0 7/17
```

Parameters

Ps

The Ps parameter selects the terminal emulation mode as follows:

Table 5–10 Terminal Emulation Modes

| Ps | Terminal Mode |
|---------------|--------------------|
| 0, 1, or none | VT500 (VT Level 4) |
| 2 | VT100 |
| 3 | VT52 |
| 4 | VT420 PCTerm |
| 5 | WYSE 60/160 |
| 6 | WYSE 60/160 PCTerm |
| 7 | WYSE 50+ |
| 8 | WYSE 150/120 |
| 9 | TVI 950 |
| 10 | TVI 925 |
| 11 | TVI 910+ |
| 12 | ADDS A2 |
| 13 | SCO Console |

Description

This sequence allows you to select the terminal emulation mode. After any mode change is made, a soft reset is performed.

Notes on DECTME

- Printer operations are not affected or halted by a change in mode.
- A soft reset is always performed as a result of a mode change between VT modes.
Exception: Entering VT52 mode using DECANM does not cause a soft reset from VT100 mode.
- DECANM and DECSCL can also change the VT operating modes.

DECTSR—Terminal State Report—Terminal to Host

DECTSR—Terminal State Report—Terminal to Host

Requests and reports the state of the terminal.

Format

| | | | |
|------------|-----------|-----------|----------|
| CSI | <i>Ps</i> | \$ | u |
| 9/11 | Ps | 2/4 | 7/5 |

Parameters

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) |

Response

DCS 1 \$ S D . . . D ST

D . . . D

See Device Attributes (DA1, DA2, DA3).

Description

DECRQTSR and DECTSR requests and reports the state of the terminal.

DECTST—Invoke Confidence Test

Select tests to be performed.

Format

```
CSI  4  ;  Ps  ...  ;  Ps  y
9/11 3/4 3/11 3/n ... 3/11 3/n 7/9
```

Parameters

Ps

is the parameter indicating a test to be done.

| Ps | Test |
|----|--|
| 0 | "All Tests" (1,2,3,6) |
| 1 | Power-Up Self Test |
| 2 | RS-232 Port Data Loopback Test |
| 3 | Printer Port Loopback Test |
| 4 | Speed Select and Speed Indicator Test |
| 5 | Reserved - No action |
| 6 | RS-232 Port Modem Control Line Loopback Test |
| 7 | EIA-423 Port Loopback Test |
| 8 | Parallel Port Loopback Test |
| 9 | Repeat (Loop On) Other Tests In Parameter String |

Description

After the first parameter, "4", the parameters each select one test. Several tests may be invoked at once by chaining the parameters together separated by semicolons. The tests are not necessarily executed in the order in which they are entered in the parameter string.

"ESC # 8" invokes the Screen Alignment test for the VT510. Additionally, after executing the power-up selftest, the terminal displays either the diagnostic messages in the upper left corner of the screen or the "VT510 OK" message in the center of the screen and within a box. Upon receipt of any character except XON or if the user types a keystroke, the screen is cleared. If the terminal is in local mode, then characters from the host are ignored and the message remains visible even if characters are received from the host. DECTST causes a disconnect; therefore, it should not be used in conjunction with a modem.

DECUDK—User Defined Keys

DECUDK—User Defined Keys

DECUDK downloads definitions for user-defined keys.

Format

| | | | | |
|------------|------------------------|-----------|-----------------------|------------|
| DCS | <i>Ps1 ; Ps2 ; Ps3</i> | | <i>D . . . D</i> | ST |
| 9/0 | | 7/12 | | 9/12 |
| Device | Clear, | Final | Key Definition String | String |
| Control | Lock, and | Character | | Terminator |
| String | Modifier | | | |
| Introducer | Parameters | | | |

Parameters

Ps1

| Ps1 | Meaning |
|------------------------|--|
| 0 (default) or none | Clear all keys before loading new values. |
| 1 | Load new UDK values; clear old values only when redefined. |

When *Ps1* is 1, the terminal only clears the keys you are loading. By using a *Ps1* value of 1, you can redefine some keys without redefining them all.

Note

There are 804 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 *Ps1* is 1, a key load may fail because no memory space is available. The reason for this is as follows:

With *Ps1* set to 1, keys are cleared and loaded sequentially. If the new definition for a key is larger than the old one, then you may exceed the 804 byte limit.

For example, suppose $\overline{F6}$ contains 412 bytes, $\overline{F7}$ contains 366 bytes, and $\overline{F8}$ contains 20 bytes. You try to load $\overline{F8}$ with 40 bytes, $\overline{F6}$ with one byte, and $\overline{F7}$ with one byte, in that order. This works if all keys are cleared first (*Ps1* is 0), but not if keys are cleared one at a time (*Ps1* is 1). When you try to load $\overline{F8}$ with 40 bytes, the load fails because only 26 bytes are free at that time.

$$804 \text{ (maximum)} - 412 (\overline{F6}) - 366 (\overline{F7}) = 26$$

Ps2

is the *lock parameter*. *Pl* determines whether the key definitions are locked or unlocked after you load them.

| Ps2 | Action |
|-----------|---|
| 0 or none | Lock the keys. If you want to load new values into the keys, then you must unlock the keys by using Set-Up. |
| 1 | Do not lock the keys against future redefinition. |

If *Ps2* is 1 and the keys are already locked, then nothing happens.

The terminal uses a special lock to prevent or allow 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 follow 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, then 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.

Ps3

is the *modifier parameter*. *Ps3* designates whether the key is shifted or unshifted.

| Ps3 | Action |
|---------------|---|
| 0, 2, or none | Defines the shifted function key. |
| 1 | Defines the unshifted function key. |
| 3 | Defines the alternate unshifted function key. |
| 4 | Defines the alternate shifted function key. |

|
is the *final character*. The vertical bar (7/12) identifies this control string as a DECUDK.

D . . . D

are the *key definition strings* such as:

```
Key1/Mod1/Function #/UDS/UDS Direction;  
Key2/Mod2/Function #/UDS/UDS Direction;.....;
```

You include these strings between the final character (|) and the string terminator (ST). Each string consists of a key selector number (*Kyn*), a string parameter (*Stn*), a slash (/) (2/15), and a direction (*Dir*). A semicolon (;) (3/11) separates different strings.

- **Kyn** is the key selector number of the key you are defining. Tables 5–11 and 5–12 list the definable keys and their identifying values. Table 5–13 compares the function keys on the VT keyboard to equivalent keys on the PC keyboard.

DECUDK—User Defined Keys

Description

Table 5–11 VT Keyboards

| Kyn | Pm = 1 | Pm = none, 0, or 2 |
|-----|--------|--------------------|
| | Key | Key |
| 11 | F1 | Shift/F1 |
| 12 | F2 | Shift/F2 |
| 13 | F3 | Shift/F3 |
| 14 | F4 | Shift/F4 |
| 15 | F5 | Shift/F5 |
| 17 | F6 | Shift/F6 |
| 18 | F7 | Shift/F7 |
| 19 | F8 | Shift/F8 |
| 20 | F9 | Shift/F9 |
| 21 | F10 | Shift/F10 |
| 23 | F11 | Shift/F11 |
| 24 | F12 | Shift/F12 |
| 25 | F13 | Shift/F13 |
| 26 | F14 | Shift/F14 |
| 28 | F15 | Shift/F15 |
| 29 | F16 | Shift/F16 |
| 31 | F17 | Shift/F17 |
| 32 | F18 | Shift/F18 |
| 33 | F19 | Shift/F19 |
| 34 | F20 | Shift/F20 |

Note

Pm values of 3 and 4 are specific to the PC keyboard. They are ignored when you use a VT keyboard.

Table 5–12 PC Keyboards

| Kyn | Pm Value | | | |
|-----|----------|---------------|---------|---------------|
| | 1 | None, 0, or 2 | 3 | 4 |
| 11 | F1 | Shift/F1 | Alt/F1 | Alt/Shift/F1 |
| 12 | F2 | Shift/F2 | Alt/F2 | Alt/Shift/F2 |
| 13 | F3 | Shift/F3 | Alt/F3 | Alt/Shift/F3 |
| 14 | F4 | Shift/F4 | Alt/F4 | Alt/Shift/F4 |
| 15 | F5 | Shift/F5 | Alt/F5 | Alt/Shift/F5 |
| 17 | F6 | Shift/F6 | Alt/F6 | Alt/Shift/F6 |
| 18 | F7 | Shift/F7 | Alt/F7 | Alt/Shift/F7 |
| 19 | F8 | Shift/F8 | Alt/F8 | Alt/Shift/F8 |
| 20 | F9 | Shift/F9 | Alt/F9 | Alt/Shift/F9 |
| 21 | F10 | Shift/F10 | Alt/F10 | Alt/Shift/F10 |
| 23 | F11 | Shift/F11 | Alt/F11 | Alt/Shift/F11 |
| 24 | F12 | Shift/F12 | Alt/F12 | Alt/Shift/F12 |

- **Stn** is the string parameters, which are the encoded definition of the keys, consisting 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.

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.

DECUDK—User Defined Keys

Table 5–13 VT and PC Keyboard Function Keys Compared

| Kyn | Keyboard | |
|-----|----------|-----|
| | VT | PC |
| 11 | F1 | F1 |
| 12 | F2 | F2 |
| 13 | F3 | F3 |
| 14 | F4 | F4 |
| 15 | F5 | F5 |
| 17 | F6 | F6 |
| 18 | F7 | F7 |
| 19 | F8 | F8 |
| 20 | F9 | F9 |
| 21 | F10 | F10 |
| 23 | F11 | F11 |
| 24 | F12 | F12 |
| 25 | F13 | – |
| 26 | F14 | – |
| 28 | F15 | – |
| 29 | F16 | – |
| 31 | F17 | – |
| 32 | F18 | – |
| 33 | F19 | – |
| 34 | F20 | – |

- **Dir** is the user-defined sequence (UDS) direction.

| <u>Dir</u> | <u>Direction</u> | <u>UDS is sent to . . .</u> |
|------------|------------------|---|
| 0, none | Normal | Host and/or the terminal, depending on the setting of the COMM mode parameter. The UDS is directed to: <ul style="list-style-type: none"> - The host for full-duplex mode. - The screen for half-duplex mode. |
| 1 | Local | Terminal screen only. |
| 2 | Remote | Host only. |

Default: None (Normal)

Description

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.

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.

General Guidelines 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, then the old definition is lost. This clears space if the new definition uses less bytes than the old one.
- There is only one way to unlock UDKs.
To unlock a UDK, use Set-Up.
- When you clear a UDK, the key definition is empty.
- An invalid hex pair in a DECUDK string stops a UDK sequence.
When a load sequence stops (error or other cause), the terminal saves keys already loaded and sends the rest of DECUDK to the screen.
- You can disable the local function keys by redefining them with DECUDK.
- DECUDK works in all VT modes except VT52 mode.

Examples of DECUDK Device Control Strings

The following sequence clears unshifted UDKs:

```
DCS 0 ; 1 ; 1 | ST
```

The following sequence locks unshifted UDKs:

```
DCS 1 ; 0 ; 1 | ST
```

Suppose you want to define the unshifted **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 ; 1 | 3 4 /
```

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
```

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:

```
DCS 1 ; 1 ; 1 | 34 / 50 52 49 4E 54 ST
```

DECVCCM—Vertical Cursor-Coupling Mode

DECVCCM—Vertical Cursor-Coupling Mode

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

Format

CSI ? 6 1 h Set: couples the cursor to the display.
9/11 3/15 3/6 3/1 6/8

CSI ? 6 1 I Reset: uncouples the cursor.
9/11 3/15 3/6 3/1 6/12

Description

When DECVCCM is set, the cursor is coupled to the display for vertical movement. When the cursor moves past the top or bottom border of the user window, the window pans to keep the cursor in view.

If the cursor moves 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.

When DECVCCM is reset, the cursor is uncoupled from the display. If the cursor moves past the top or bottom border of the user window, the cursor disappears.

DECXCPR—Extended Cursor Position

The host asks the terminal for the current cursor position, including the current page number.

Format

CSI ? 6 7
9/11 3/15 3/16 6/14

Response

CSI *Pl* ; *Pc* ; *Pp* R

Parameters

Pl; Pc; Pp

The terminal indicates that the cursor is currently at line *Pl*, column *Pc*, on page *Pp*.

DECXRLM—Transmit Rate Limiting

Applications can control the transmit rate limiting feature through the DECXRLM control function.

Default: Unlimited

Format

CSI ? 7 3 h Set: limited transmit rate.
9/11 3/15 3/7 3/3 6/8

CSI ? 7 3 l Reset: unlimited transmit rate.
9/11 3/15 3/7 3/3 6/12

Modem Connection and Disconnections

When the terminal makes a connection to the host system through a modem, the terminal performs the following operations to ensure it is ready to send and receive.

- Unlocks the keyboard (if it was locked).
- Clears any transmission in progress.
- Clears the keyboard buffer and all message buffers.
- Clears the input buffer.
- Clears XOFF sent and XOFF received.

Any of the following conditions will disconnect the connection to the host system in VT mode:

- You press **Shift** **F5** (**Shift** **Break**).
- You use the **Recall** or **Default** fields in the **Set-Up Directory**.
- *International mode:* You change the host port you are using (from the RS-232 port to the EIS-423 port, or from the EIA-423 port to the RS-232 port).
- The terminal loses the data set read (DSR) signal.
- The terminal loses the received line signal detect (RLSD) signal for a period of time you defined in set-up. See the **disconnect delay** feature in the **Communications Set-Up** screen.
- The terminal does not receive an RLSD signal within 30 seconds after DSR.
- The terminal receives a self-test command from the host system.

The usual way to disconnect communications is to type **Shift** **F5** (**Shift** **Break**). The host system's response to the disconnect signal depends on the system and the software.

Terminal-to-Printer Data Flow Control

The terminal sends only data characters to the printer. The terminal does not send XON and XOFF characters. The terminal recognizes only XON and XOFF characters from the printer. Any other characters from the printer are ignored.

When the terminal receives XOFF from the printer, the terminal stops sending data. The terminal starts sending data again when it receives an XON, or when a clear comm operation is performed.

DECXRLM—Transmit Rate Limiting

Using C1 Control Characters

Using an 8-bit setting for the printer port implies the use of 8-bit C1 control characters. Using a 7-bit setting implies the use of the 7-bit ESC form of C1 control characters. You select the setting by using the **data bits/parity** feature in the Printer Set-Up screen.

Note on DECXRLM

Older printers may not recognize the 8-bit form of C1 control characters. With these printers, you must set the printer port to 7-bits for correct operation.

DL—Delete Line

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

Format

| CSI | <i>Pn</i> | M |
|------|-------------|------|
| 9/11 | 3/ <i>n</i> | 4/13 |

Parameters

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

Description

As lines are deleted, lines below the cursor and in the scrolling region move up. The terminal adds blank lines with no visual character attributes 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.

DSR—Device Status Reports

The host computer and terminal exchange DSR sequences to provide the host with the operating status of the following features:

| | |
|----------------------------|-----------------------|
| Operating status | User-defined keys |
| Keyboard status - language | Macro space report |
| Cursor position report | Memory checksum |
| Cursor position with page | Data integrity report |
| Printer port | - |

DSR requests and reports follow one of two formats, ANSI or DEC format. The format for each is as follows:

Format

| | | | | |
|------------|-----------|-----------|----------|-------------|
| CSI | <i>Ps</i> | n | | ANSI format |
| 9/11 | 3/? | 6/14 | | |
| CSI | ? | <i>Ps</i> | n | DEC format |
| 9/11 | 3/15 | 3/? | 6/14 | |

Parameters

Ps

indicates the type of DSR requested. See the following individual DSR reports for specific parameters within each report.

Description

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, then the printer receives the DSR request. The printer can respond through the bidirectional printer port.

DSR—Cursor Position Report (CPR)

The host asks the terminal for a cursor position report.

Format

| Exchange | Sequence | Meaning |
|------------------------------------|-----------------------------------|--|
| Request (Host to terminal) | CSI 6 n | The host asks for a cursor position report (CPR). |
| CPR response (Terminal to host) | CSI <i>Pl</i>; <i>Pc</i> R | The terminal indicates that the cursor is currently at line <i>Pl</i> , column <i>Pc</i> . |

DSR—Data Integrity Report

DSR—Data Integrity Report

The host asks for the status of the data integrity flag. The data integrity flag indicates the integrity of the data flow between the terminal and host. This flag is reset each time the terminal sends a data integrity report.

Programming Tip

Applications using the flag should always reset the flag before sending data to the terminal. You can reset the flag with a DSR request (**CSI ? 75 n**) sequence. After the application sends data, the application should send another request to find out if a parity error has occurred.

Format

| Exchange | Sequence | Meaning |
|--|-------------------|---|
| Request (Host to terminal) | CSI ? 75 n | The host asks for the status of the data integrity flag. |
| Possible responses (Terminal to host) | CSI ? 70 n | Ready, no communication errors or power-ups have occurred since last report. |
| | CSI ? 71 n | Malfunction, a communication error has occurred since the last report. |
| | CSI ? 73 n | The terminal has not reported data integrity since the last power-up or hard reset (RIS). |

DSR—Extended Cursor Position Report (DECXCPR)

The host asks the terminal for the current cursor position, including the current page number.

Format

| Exchange | Sequence | Meaning |
|--|--|--|
| Request (Host to Terminal) | CSI ? 6 n | The host asks for an extended cursor position report (DECXCPR). |
| DECXCPR response (Terminal to host) | CSI <i>Pl</i>; <i>Pc</i>; <i>Pp</i> R | The terminal indicates that the cursor is currently at line <i>Pl</i> , column <i>Pc</i> , on page <i>Pp</i> . |

DSR—Keyboard

The host asks for the current keyboard language, operating status, and type.

Format

| Exchange | Sequence | Meaning |
|--------------------------------|--------------------------------------|---|
| Request (Host to terminal) | CSI ? 26 n | The host asks for the keyboard status. |
| Response (Terminal to host) | CSI ? 27; Pn; Pst; Ptyp n | The keyboard language is <i>Pn</i> , the keyboard status is <i>Pst</i> , and the keyboard type is <i>Ptyp</i> . |

Parameters

Pn

Table 5–14 is a complete list of keyboards and keyboard languages.

Table 5–14 Keyboard Languages

| Pn | VT/PC Language |
|----|---|
| 0 | Keyboard language cannot be determined. |
| 1 | North American |
| 2 | British |
| 3 | Belgian (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 |
| 15 | Spanish |
| 16 | Portuguese |
| 19 | Hebrew |
| 22 | Greek |
| 28 | Canadian (English) |
| 29 | Turkish-Q/Turkish |
| 30 | Turkish-F/Turkish |
| 31 | Hungarian |
| 33 | Slovak |
| 35 | Polish |
| 36 | Romanian |
| 38 | SCS |
| 39 | Russian |
| 40 | Latin American |

DSR—Keyboard

Pst

indicates the keyboard status.

| Pst | Keyboard Status‡ | |
|-----|------------------|---|
| 0 | Keyboard Ready | The terminal sends typed characters to the current session. |
| 3 | No Keyboard | The terminal does not detect the keyboard. |
| 8 | Keyboard Busy | The other session is currently using the keyboard. |

‡The terminal only sends *Pst* in VT level 4 mode.

Ptyp

indicates the keyboard type.

| Ptyp | Keyboard Type |
|------|---------------|
| 4 | LK450 |
| 5 | PCXAL |

DSR—Macro Space Report

The host asks for the available macro space in the form of a macro space report (DECMSR).

Format

| Exchange | Sequence | Meaning |
|---------------------------------------|-------------------|---|
| Request (Host to terminal) | CSI ? 62 n | The host asks for a macro space report (DECMSR). |
| DECMSR response (Terminal to host) | CSI Pn * { | The terminal indicates the number of bytes available for macro definitions. |

Parameters

Pn

$Pn = \frac{\text{number of bytes}}{16}$ rounded down.

DSR—Memory Checksum (DECCKSR)

The host asks for a memory checksum report of current text macro definitions.

Programming Tip

Enter your macro definitions, then request and save a memory checksum. Later, you can request another checksum and see if it has changed.

Format

| Exchange | Sequence | Meaning |
|--|----------------------------|---|
| Request (Host to terminal) | CSI ? 63; Pid n | The host asks for a memory checksum report of current text macro definitions (DECCKSR). <i>Pid</i> is an optional numeric parameter that provides a label to identify the particular checksum request. The checksum report returns the label. This label lets you differentiate between multiple checksum reports. |
| DECCKSR response (Terminal to host) | DCS Pid ! ~ D..D ST | <i>Pid</i> is a label indicating which DSR request the report is for. <i>D..D</i> is the data string consisting of four hexadecimal digits indicating the checksum. The digits can be in the range of 3/0 through 3/9 and 4/0 through 4/6. |

DSR—Operating Status

The host requests the terminal's operating status.

Format

| Exchange | Sequence | Meaning |
|---------------------------------|----------------------|--|
| Request (Host to terminal) | CSI 5 n | The host requests the terminal's operating status. The host asks if the terminal is in good operating condition. |
| Responses (Terminal 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—Printer Port

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.

Format

| Exchange | Sequence | Meaning |
|--|-------------------|--|
| Request (Host to terminal) | CSI ? 15 n | The host asks for the current printer status. |
| Possible responses (Terminal 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. In VT Level 1, the terminal sends the <i>printer not ready</i> 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. In VT100 mode, the terminal sends the <i>no printer</i> sequence above. |

DSR—User-Defined Keys (VT Level 4 Only)

The host asks if the user-defined keys (UDKs) are locked or unlocked.

Format

| Exchange | Sequence | Meaning |
|--|------------|---|
| Request (Host to terminal) | CSI ? 25 n | The host asks if UDKs are locked or unlocked. |
| Possible responses (Terminal to host) | CSI ? 20 n | UDKs are unlocked. |
| | CSI ? 21 n | UDKs are locked. |

ECH—Erase Character

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 scrolling margins.

Available in: VT Level 4 mode only

Format

CSI *Pn* X
9/11 3/*n* 5/8

Parameters

Pn

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

Default: *Pn* = 1.

ED—Erase in Display

ED—Erase in Display

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

Format

```
CSI  Ps  J
9/11 3/n 4/10
```

Parameters

Ps
represents the amount of the display to erase.

| 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.

EL—Erase in Line

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 scrolling margins.

Format

```
CSI  Ps  K
9/11 3/n 4/11
```

Parameters

Ps
represents the section of the line to erase.

| 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 |

HPA—Horizontal Position Absolute

Inquire as to the amount of free memory for programmable key operations.

Format

| | | |
|------|--------|-----|
| CSI | P_n | ' |
| 9/11 | 3/ n | 6/0 |

Parameters

P_n
indicates horizontal position.

Description

HPA causes the active position to be moved to the n -th horizontal position of the active line. If an attempt is made to move the active position past the last position on the line, then the active position stops at the last position on the line.

HPR—Horizontal Position Relative

Inquire as to the amount of free memory for programmable key operations.

Format

| | | |
|------|--------|----------|
| CSI | P_n | a |
| 9/11 | 3/ n | 6/1 |

Parameters

P_n
indicates horizontal position.

Description

HPR causes the active position to be moved to the n -th following horizontal position of the active line. If an attempt is made to move the active position past the last position on the line, then the active position stops at the last position on the line.

HTS—Horizontal Tab Set

HTS—Horizontal Tab Set

HTS sets a horizontal tab stop at the column position indicated by the value of the active column when the terminal receives an HTS.

You can use either one of the following formats:

Format

| | | | |
|------------|----|------------|----------|
| HTS | or | ESC | H |
| 8/8 | | 1/11 | 4/8 |

Description

Executing an HTS does not effect the other horizontal tab stop settings.

HVP—Horizontal and Vertical Position

This control function works the same as the cursor position (CUP) function. New applications should use CUP instead of HVP. HVP is provided for compatibility with earlier VT products.

Format

| | | | | | |
|------------|-----------|---|-----------|----------|------------------------------------|
| CSI | f | Cursor moves to home position selected by DECOM | | | |
| 9/11 | 6/6 | | | | |
| CSI | PI | ; | Pc | f | Moves cursor to line PI, column Pc |
| 9/11 | 3/n | 3/11 | 3/n | 6/6 | |

Parameters

PI; PC

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

ICH—Insert Character

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

Available in: VT Level 4 mode only

Format

| | | |
|------|-------------|-----|
| CSI | <i>Pn</i> | @ |
| 9/11 | 3/ <i>n</i> | 4/0 |

Parameters

Pn
is the number of characters to insert.

Default: $Pn = 1$.

Description

The ICH sequence inserts Pn blank characters with the normal character attribute. The cursor remains at the beginning of the blank characters. Text between the cursor and right margin moves to the right. Characters scrolled past the right margin are lost. ICH has no effect outside the scrolling margins.

IL—Insert Line

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

Format

| | | |
|------|-------------|------|
| CSI | <i>Pn</i> | L |
| 9/11 | 3/ <i>n</i> | 4/12 |

Parameters

Pn
is the number of lines to insert.

Default: $Pn = 1$.

Description

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.

IND—Index

IND—Index

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

Format

| | |
|------|-----|
| ESC | D |
| 1/11 | 4/4 |

IRM—Insert/Replace Mode

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

Default: Replace.

Format

| | | | |
|------|-----|------|----------------------|
| CSI | 4 | h | Set: insert mode. |
| 9/11 | 3/4 | 6/8 | |
| CSI | 4 | I | Reset: replace mode. |
| 9/11 | 3/4 | 6/12 | |

Description

If IRM mode is set, then new characters move characters in page memory to the right. Characters moved past the page's right border are lost.

If IRM mode is reset, then new characters replace the character at the cursor position.

KAM—Keyboard Action Mode

This control function locks or unlocks the keyboard.

Default: Unlocked

Format

| | | | |
|------------|----------|----------|--------------------------|
| CSI | 2 | h | Set: locks the keyboard. |
| 9/11 | 3/2 | 6/8 | |

| | | | |
|------------|----------|----------|------------------------------|
| CSI | 2 | l | Reset: unlocks the keyboard. |
| 9/11 | 3/2 | 6/12 | |

Description

If KAM is set, then the keyboard cannot send characters to the host. The `Wait` indicator appears on the keyboard indicator line at the bottom of the screen. The terminal ignores all keystrokes that send characters to the host. KAM does not affect the `F3` (Set-Up) or `F4` (Session) keys.

If KAM is reset, then the terminal unlocks the keyboard. The keyboard can send characters to the host.

LNМ—Line Feed/New Line Mode

LNМ—Line Feed/New Line Mode

This control function selects the characters sent to the host when you press the `Return` key. LNМ 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 LNМ reset (line feed).

Default: Line feed

Format

| | | | | |
|------------|----------|----------|----------|----------------|
| CSI | 2 | 0 | h | Set: new line. |
| 9/11 | 3/2 | 3/0 | 6/8 | |

| | | | | |
|------------|----------|----------|----------|------------------|
| CSI | 2 | 0 | l | Reset: line feed |
| 9/11 | 3/2 | 3/0 | 6/12 | |

Description

If LNМ is set, then the cursor moves to the first column on the next line when the terminal receives an LF, FF, or VT character. When you press `Return`, the terminal sends both a carriage return (CR) and line feed (LF).

If LNМ is reset, then the cursor moves to the current column on the next line when the terminal receives an LF, FF, or VT character. When you press `Return`, the terminal sends only a carriage return (CR) character.

Note on LNМ

When the auxiliary keypad is in keypad numeric mode (DECKPNM), the `Enter` key sends the same characters as the `Return` key.

LS—Locking Shift

When you use a locking shift, the character set remains in GL or GR until you use another locking shift. Table 5–15 lists all locking shifts available.

Format

Table 5–15 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. |
| The following locking shift functions are available only in VT Level 4 mode. | | |
| 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.
```

MC—Media Copy

MC—Media Copy

MC is the control sequence that enables the terminal to control all print functions. There are two variations—ANSI standard and VT mode.

Format

CSI *Pn* *i* ANSI standard.
9/11 3/*n* 6/9

CSI ? *Ps* *i* VT mode.
9/11 3/15 3/*n* 6/9

Parameters

Pn (ANSI standard)

indicates the following ANSI standard print functions:

| Pn | Action | Notes on Print Page |
|-----------|--------------------------------------|---|
| 0 | Prints the page that has the cursor. | <ul style="list-style-type: none">The terminal stores data from the keyboard until printing is complete.If printer extent mode (DECPEX) is currently reset, then the print page function only prints the scrolling region. |
| 2 | Sends screen data through host port. | |

| Pn | Action | Notes on Printer Controller Mode |
|-----------|------------------------------------|--|
| 4 | Turns off printer controller mode. | <ul style="list-style-type: none">Printer controller mode lets the host control printer operation. The terminal sends characters and control sequences directly to the printer, without displaying them on the screen.The terminal sends all characters and control sequences except NUL, XON, XOFF, and the printer controller mode sequences.Printer controller mode cancels autoprint mode. When the terminal leaves printer controller mode, it 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. |

| Pn | Action |
|----|-------------------------------------|
| 5 | Turns on printer controller mode. |
| 6 | Disables a printer-to-host session. |
| 7 | Enables a printer-to-host session. |

Pn (VT mode)

indicates the following VT mode print functions:

| Pn | Action | Note on Print Cursor Line |
|----|--------------------------------------|---------------------------|
| 1 | Prints the line that has the cursor. | The cursor does not move. |

| Pn | Action | Notes on Autoprint Mode |
|----|---------------------------|--|
| 4 | Turns off autoprint mode. | |
| 5 | Turns on autoprint mode. | <ul style="list-style-type: none"> 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. |

| Pn | Action | Notes on Set/Reset Printer to Host |
|----|---|---|
| 8 | Disables communication from the printer port to the host. | CSI ? 8 i and CSI ? 9 i are media copy commands used in VT terminals to reset/set printer to host mode. |
| 9 | Enables communication from the printer port to the host. | |

| Pn | Action | Note on Print Screen Data |
|----|--------------------------------|---|
| 10 | Prints the data on the screen. | Printer extent mode (DECPEX) does not affect this function. |

MC—Media Copy

| Pn | Action | Notes on Print All Pages |
|----|----------------------------------|--|
| 11 | Prints all pages in page memory. | <ul style="list-style-type: none">• 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.• If print form feed mode (DECPFF) is set, then the terminal sends a form feed (FF) to the printer after each page. |

Note on MC Command

The ANSI Escape Sequences **CSI 6 i** and **CSI 7 i** to reset/set printer to host mode are functionally equivalent to **CSI ? 8 i** and **CSI ? 9 i**, respectively.

NEL—Next Line

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

Format

| | |
|-----|-----|
| ESC | E |
| 033 | 105 |

NP—Next Page

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, then the terminal ignores NP.

Default: Move to the next page.

Format

| | | |
|------|--------|-----|
| CSI | P_n | U |
| 9/11 | 3/ n | 5/5 |

Parameters

P_n

indicates how many pages to move the cursor forward.

Default: $P_n = 0$.

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

PP—Preceding Page

PP—Preceding Page

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, then the terminal ignores PP.

Default: Move to the preceding page.

Format

| | | |
|------|-------------|-----|
| CSI | <i>Pn</i> | V |
| 9/11 | 3/ <i>n</i> | 5/6 |

Parameters

Pn

indicates how many pages to move the cursor backward.

Default: $Pn = 0$.

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

PPA—Page Position Absolute

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, then the terminal ignores PPA.

Default: Move to page 1.

Format

| | | | |
|------|-------------|-----|-----|
| CSI | <i>Pn</i> | SP | P |
| 9/11 | 3/ <i>n</i> | 2/0 | 5/0 |

Parameters

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, then the cursor stops at the last page. If Pn is less than the number of the first page, then the cursor stops at the first page.

PPB—Page Position Backward

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, then the terminal ignores PPB.

Default: Move backward one page.

Format

| | | | |
|------|-------------|-----|-----|
| CSI | <i>Pn</i> | SP | R |
| 9/11 | 3/ <i>n</i> | 2/0 | 5/2 |

Parameters

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, then the cursor stops at the first page.

PPR—Page Position Relative

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, then the terminal ignores PPR.

Default: Move to the next page.

Format

| | | | |
|------|-------------|-----|-----|
| CSI | <i>Pn</i> | SP | Q |
| 9/11 | 3/ <i>n</i> | 2/0 | 5/1 |

Parameters

Pn

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

RIS—Reset to Initial State

RIS—Reset to Initial State

This control function causes a nonvolatile memory (NVR) recall to occur. RIS replaces all set-up features with their saved settings.

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.

Note

It is recommended that you not use 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. When performing a RIS, the terminal sends XOFF to the host to stop communication. When the RIS is complete, the terminal sends XON to resume communication.

Format

| | |
|------|-----|
| 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.
- Clears the screen and all off-screen page memory.
- 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.
- Selects the default character sets (ASCII in GL, and DEC Supplemental Graphic in GR).
- Clears all macro definitions.
- Erases the paste buffer.

RM—Reset Mode

There are two formats of this control function. You use the ANSI format to reset one or more ANSI modes. You use the DEC format to reset one or more DEC modes. You *cannot* reset ANSI and DEC modes with the same RM sequence.

Resetting DEC Modes

| | | | | | | | |
|------|------|-------------|------|-----|------|-------------|------|
| CSI | ? | <i>Pd</i> | ; | ... | ; | <i>Pd</i> | |
| 9/11 | 3/15 | 3/ <i>n</i> | 3/11 | ... | 3/11 | 3/ <i>n</i> | 6/12 |

Parameters

Pd

indicates a DEC mode to reset. Table 5–8 lists the *Pd* values for DEC modes. You can use more than one *Pd* value in a sequence.

Examples

DEC Modes

The following sequence resets (Hebrew) keyboard mapping (DECHEBM) and Hebrew encoding mode (DECHEM):

```
CSI ? 34; 36 l
```

34 indicates (Hebrew) keyboard mapping.

36 indicates Hebrew encoding mode.

Programming Tip

Applications can use the SM and RM functions to restore any number of VT510 modes to a desired state. See the Report Mode (DECRPM) section in this chapter for details.

S7C1T—Send C1 Control Character to the Host

S7C1T—Send C1 Control Character to the Host

The VT510 can send C1 control characters to the host as single 8-bit characters or as 7-bit escape sequences. You should select the format that matches the operating level you are using.

The following sequence causes the terminal to send all C1 control characters as 7-bit escape sequences or single 8-bit characters:

Format

| | | |
|------------|-----------|----------|
| ESC | SP | F |
| 1/11 | 2/0 | 4/7 |

Description

This sequence changes the terminal mode as follows:

| Mode Before | Mode After |
|---|----------------------------------|
| VT Level 4 mode, 8-bit controls | VT Level 4 mode, 7-bit controls. |
| VT Level 4 mode, 7-bit controls | Same. Terminal ignores sequence. |
| VT Level 1 or VT52 mode, 7-bit controls | Same. Terminal ignores sequence. |

S8C1T—Send C1 Control Character to the Host

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

Format

| | | |
|------------|-----------|----------|
| ESC | SP | G |
| 1/11 | 2/0 | 4/6 |

Description

This sequence changes the terminal mode as follows:

| Mode Before | Mode After |
|---------------------------------|----------------------------------|
| VT Level 4 mode, 8-bit controls | Same. Terminal ignores sequence. |
| VT Level 4 mode, 7-bit controls | VT Level 4 mode, 8-bit controls. |
| VT Level 1 mode | Same. Terminal ignores sequence. |

SCODFK—Define Function Key

Programs function key to send a defined string in SCO Console mode.

Format

```
ESC   Q   Fn   string
1/11  5/1  ...  ...
```

Parameters

Fn

is an ASCII code representing the function key being defined. F1, the first key, is represented by "0"; each following key has an ASCII value that increments 1 from the previous key's ASCII value as follows:

| Key | Function Key | Fn ASCII Character |
|---------|---|--------------------|
| 1 - 12 | F1 through F12 | 0 - ; |
| 13 - 24 | Shift/F1 through Shift/F12 | < - G |
| 25 - 36 | Ctrl/F1 through Ctrl/F12 | H - S |
| 37 - 48 | Ctrl/Shift/F1 through Ctrl/Shift/F12 | T - - |
| 49 | Kpd 7 | ' |
| 50 | Kpd 8 | a |
| 51 | Kpd 9 | b |
| 52 | Kpd - | c |
| 53 | Kpd 4 | d |
| 54 | Kpd 5 | e |
| 55 | Kpd 6 | f |
| 56 | Kpd + | g |
| 57 | Kpd 1 | h |
| 58 | Kpd 2 | i |
| 59 | Kpd 3 | j |
| 60 | Kpd 0 | k |

String

is the programmed key definition which is enveloped by two characters as the delimiters.

SCODFK—Define Function Key

Description

The first character after the ASCII character representing a function key becomes the delimiter. It looks for an identical character as the second and final delimiter. If string is too long and no memory is available, then the command string is aborted and remaining characters are displayed on screen. The character becomes the final character. All the following characters are displayed on the screen.

Example:

Executing "ESC Q 0 'abcdefghijklmnopq" when 100 bytes of memory is available defines the string "abcdefghijklmnop" into F1 function key and displays "klmnopq" on the screen.

If you execute the same sequence when only a 4 byte string is allowed, then the whole sequence is aborted.

A "^" character causes any following character to subtract 32 from its ASCII value. For example, "^e" in the string sends "E" when the key is pressed.

Any code in the 00-7F region can be defined. An 8-bit code entered is stripped of its eighth bit and defined as a corresponding 7-bit code.

For example, executing ESCQ0'F1KEY' defines string F1KEY for function key F1; ESC1aF2KEYa defines string F2key for F2.

The maximum string length for a defined key is 255 characters.

SCORC—Restore Saved Cursor Position

Moves cursor to the position saved by save cursor command in SCO console mode.

Format

| | |
|------|-----|
| CSI | u |
| 9/11 | 7/5 |

Description

This command acts the same as the DECRC command, except that the cursor stays at the same page instead of moving to a page where the cursor was saved.

SCOSC—Save Current Cursor Position

Saves current cursor position for SCO console mode.

Format

| | |
|------|-----|
| CSI | s |
| 9/11 | 7/3 |

Description

This command acts the same as the DECSC command, except that the page number where the cursor is located is not saved as a result of executing the command.

SCS—Select Character Set

SCS—Select Character Set

Designate character sets to G-sets.

Format

```
ESC  I      Dscs
...  ...    ...
```

Parameters

I
is the intermediate character representing the G-set designator.

| I | 94-Character G-set |
|----------|---------------------------|
| (| G0 |
|) | G1 |
| * | G2 |
| + | G3 |

| I | 96-Character G-set |
|----------|---------------------------|
| - | G1 |
| . | G2 |
| / | G3 |

Dscs
represents a character set designator.

| Dscs | Default 94-Character Set |
|-------------|---------------------------------|
| % 5 | DEC Supplemental |
| " ? | DEC Greek |
| " 4 | DEC Hebrew |
| % 0 | DEC Turkish |
| & 4 | DEC Cyrillic |
| A | U.K. NRCS |
| R | French NRCS |
| 9 or Q | French Canadian NRCS |
| ‘, E, or 6 | Norwegian/Danish NRCS |
| 5 or C | Finnish NRCS |
| K | German NRCS |
| Y | Italian NRCS |
| = | Swiss NRCS |
| 7 or H | Swedish NRCS |
| Z | Spanish NRCS |

| Dscs | Default 94-Character Set |
|------|-----------------------------|
| % 6 | Portuguese NRCS |
| " > | Greek NRCS |
| % = | Hebrew NRCS |
| % 2 | Turkish NRCS |
| % 3 | SCS NRCS |
| & 5 | Russian NRCS |
| 0 | DEC Special Graphic |
| > | DEC Technical Character Set |
| < | User-preferred Supplemental |

| Dscs | Default 96-Character Set |
|------|-----------------------------|
| A | ISO Latin-1 Supplemental |
| B | ISO Latin-2 Supplemental |
| F | ISO Greek Supplemental |
| H | ISO Hebrew Supplemental |
| M | ISO Latin-5 Supplemental |
| L | ISO Latin-Cyrillic |
| < | User-preferred Supplemental |

SD—Pan Up

This control function moves the user window up a specified number of lines in page memory.

Format

```
CSI  Pn  T
9/11 3/n 5/4
```

Parameters

Pn

is the number of lines to move the user window up 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.

SGR—Select Graphic Rendition

SGR—Select Graphic Rendition

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

Default: Clear all attributes.

Format

```
CSI  Ps  ;   Ps  ...  m
9/11 3/n 3/11 3/n  ... 6/13
```

Parameters

Ps

is a number representing a certain visual attribute. You can use more than one *Ps* value to select different character attributes. Table 5–16 lists *Ps* values and the attributes they select.

Default: *Ps* = 0 (clears all attributes).

Table 5–16 Visual Character Attribute Values

| Ps | Attribute |
|----|---|
| 0 | All attributes off |
| 1 | Bold |
| 4 | Underline |
| 5 | Blinking |
| 7 | Negative image |
| 8 | Invisible image |
| 10 | The ASCII character set is the current 7-bit display character set (default)— <i>SCO Console only</i> . |
| 11 | Map Hex 00-7F of the PC character set codes to the current 7-bit display character set— <i>SCO Console only</i> . |
| 12 | Map Hex 80-FF of the current character set to the current 7-bit display character set— <i>SCO Console only</i> . |
| 22 | Bold off |
| 24 | Underline off |
| 25 | Blinking off |
| 27 | Negative image off |
| 28 | Invisible image off |

Examples

When you select more than one attribute in an SGR sequence, then 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, then the attributes move with the characters.
- If you display control characters, then the terminal ignores the bold attribute for displayed control characters.

| When a PC character set is selected . . . | Displays . . . |
|---|--|
| Executing "CSI 10 m" | 00-1F: control codes 20-7F: ASCII characters 80-FF: 8 bit PC characters |
| Executing "CSI 11 m" | 00-1F: PC characters, except the following codes when XON/XOFF is enabled: 1B (ESC) 11 (DC1) 13 (DC3) 20-7F: ASCII characters (or PC 7 bit character) 80-FF: 8 bit PC characters |
| Executing "CSI 12 m" | 00-1F: PC characters that are located in 80 - 9F in PC character set, except the following codes when XON/XOFF is enabled: 9B (ESC) 91 (DC1) 93 (DC3) 20-7F: PC characters located in A0-FF 80-FF: 8 bit PC characters. |

SGR—Select Graphic Rendition

| When an ISO/ANSI character set is selected . . . | Displays . . . |
|--|--|
| Executing "CSI 10 m" | 00-1F: control codes 20-7F: ASCII characters 80-9F: control code A0-FF: GR characters |
| Executing "CSI 12 m" | 00-1F: control codes 20-7F: ISO/ANSI characters located in A0-FF 80-9F: control code A0-FF: GR characters |

Commands "CSI 10-12 m" affect only the Hex 00-7F portion of the display character set. The hex 80-FF region of the display character set is left intact.

The ASCII character set with control codes residing in Hex 00 to 1F region is the default 7-bit display character set. This is true regardless of the ISO/ANSI or PC character set. When in an ISO/ANSI character set, issuing "CSI 10 m" is equivalent to "designating and invoking ASCII to G0 and GL."

When "ESC 11 m" is executed, the display character set is loaded with codes in the Hex 00 to 7F region of a PC character set. PC characters whose code values are less than 1F can be displayed through this sequence except 1B (ESC) and 11(DC1), 13(DC3) when XON/XOFF is enabled. 1B is always executed as an ESC to allow the application to execute the command to go back to the default character set. Hex 11 and 13 can be displayed only when XON/XOFF is disabled. This command does not work when the ISO/ANSI character set is selected.

Command "ESC 12 m" toggles the high bit of the current 8-bit character set. All the characters in Hex 80-FF region can be displayed as 7-bit codes except 9B (ESC) and 91(DC1), 93(DC3) when XON/XOFF is enabled. After the command is executed, 1B is executed as an ESC. Hex 11 and 13 can be displayed only when XON/XOFF is disabled.

When in an ISO/ANSI character set, issuing "CSI 12 m" is equivalent to "designating and invoking current 8 bit char set to G2 and GL."

SRM—Local Echo: Send/Receive Mode

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

Format

| | | | | |
|------------|----------|----------|----------|----------------------|
| CSI | 1 | 2 | h | Set: local echo off. |
| 9/11 | 3/1 | 3/2 | 6/8 | |

| | | | | |
|------------|----------|----------|----------|-----------------------|
| CSI | 1 | 2 | l | Reset: local echo on. |
| 9/11 | 3/1 | 3/2 | 6/12 | |

Description

When the SRM function is set, the terminal sends keyboard characters to the host only. The host can echo the characters back to the screen.

When the SRM function is reset, the terminal sends keyboard characters to the host and to the screen. The host does have to echo characters back to the terminal.

SS—Single Shifts

SS—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.

Format

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

SM—Set Mode

This control function has two formats. You use the ANSI format to set one or more ANSI modes. You use the DEC format to set one or more DEC modes. You *cannot* set ANSI and DEC modes with the same SM sequence.

Setting DEC Modes

```
CSI ? Pd ; ... Pd h
9/11 3/15 3/n 3/11 ... 3/n 6/8
```

Parameters

Pd

indicates a DEC mode to set. Table 5–8 lists the *Pd* values for DEC modes. You can use more than one *Pd* value in a sequence.

Examples

DEC Modes

The following sequence sets (Hebrew) keyboard mapping (DECHEBM) and Hebrew encoding mode (DECHEM):

```
CSI ? 34; 36 h
```

34 indicates (Hebrew) keyboard mapping.

36 indicates Hebrew encoding mode.

Programming Tip

Applications can use the SM and RM functions to restore any number of VT510 modes to a desired state. See the Report Mode (DECRPM) section in this chapter for details.

SU—Pan Down

SU—Pan Down

This control function moves the user window down a specified number of lines in page memory.

Format

| | | |
|------------|-------------|----------|
| CSI | <i>Pn</i> | S |
| 9/11 | 3/ <i>n</i> | 5/3 |

Parameters

Pn

is the number of lines to move the user window down 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.

TBC—Tab Clear

This control function clears tab stops.

Format

| | | |
|------------|-------------|----------|
| CSI | <i>Ps</i> | g |
| 9/11 | 3/ <i>n</i> | 6/7 |

Parameters

Ps

indicates the tab stops to clear. There are only two values for *Ps*, 0 and 3.

0 or none The terminal only clears the tab stop at the cursor.
(default)

3 The terminal clears all tab stops.

VPA—Vertical Line Position Absolute

VPA inquires as to the amount of free memory for programmable key operations.

Format

| | | |
|------|--------|-----|
| CSI | P_n | d |
| 9/11 | 3/ n | 6/4 |

Parameters

P_n
is column number.

Description

VPA causes the active position to be moved to the corresponding horizontal position.

The default value is 1.

Move cursor to line P_n . VPA causes the active position to be moved to the corresponding horizontal position at vertical position n . If an attempt is made to move the active position below the last line, then the active position stops on the last line.

VPR—Vertical Position Relative

VPR inquires as to the amount of free memory for programmable key operations.

Format

| | | |
|------|--------|-----|
| CSI | P_n | e |
| 9/11 | 3/ n | 6/5 |

Parameters

P_n
is column number.

Description

VPR causes the active position to be moved to the corresponding horizontal position.

This command causes the active position to be moved to the corresponding horizontal position at n -th following vertical position. If an attempt is made to move the active position below the last line, the active position stops at the last line.

SCO Console Emulation

This chapter describes the SCO Console mode. This chapter also describes the effects of switching from SCO Console to other emulation modes, including VT, PCTerm, and ASCII Terminal emulation.

6.1 SCO Console Emulation Mode

SCO Console mode is a terminal emulation mode. It uses ANSI sequences with minor modifications to run on a PC, which acts as a SCO UNIX operating system console.

Depending on the terminal status, SCO Console mode for the VT510 transmits ASCII characters (default) or scancode to the host when keys are pressed. Users can specify a keycode by issuing an escape sequence (DECPCTERM) or by keyboard encoding of Set-Up. When in SCO Console mode with the ASCII keycode selected, the terminal behavior is similar to VT mode. When in SCO Console mode with scancode selected, the terminal behavior is similar to VT420 PCTerm mode. Table 6–1 shows the similarities and differences.

Table 6–1 SCO Console Mode with ASCII Keycodes and Scancodes

| Default | SCO Console Mode with | | | |
|---------------------------------------|-----------------------|-----------|-----------|--------------|
| | ASCII Keycodes | Scancodes | VT Mode | VT420 PCTerm |
| Screen display | 25×80 | 25×80 | 24×80 | 24×80 |
| Autowrap | On | On | Off | Off |
| Autowrap behavior | Like WYSE | Like WYSE | Like VT | Like VT |
| Status line | None | None | Local | Local |
| Cursor position while switching pages | Saved | Saved | Not saved | Not saved |

SCO Console Emulation

6.1 SCO Console Emulation Mode

| Default | SCO Console Mode with | | | |
|---------------------------------------|--|------------------------|-------------------------------------|---------------|
| | ASCII Keycodes | Scancodes | VT Mode | VT420 PCTerm |
| Character set | PCTerm (including PC, ISO/ANSI character sets) | | VT character set (ISO/ANSI) | |
| CSI 10-12 m | Supported | Supported | Not supported | Not supported |
| SU | Acts like IND | Acts like IND | Acts like SU | Acts like SU |
| SD | Acts like RI | Acts like RI | Acts like SD | Acts like SD |
| CSI s and CSI u DECSC and DECRC | Supported Supported | Supported Supported | Only DECSC and DECRC are supported. | |
| CSI Pn z (switch pages) | Supported | Supported | Not supported | Not supported |
| ESC Q Fn String (Define Function) | Supported | Supported | Not supported | Not supported |
| Transmit flow control | None | None | XON/XOFF | XON/XOFF |

6.1.1 Keyboard

SCO Console mode works with either a PC keyboard or a VT keyboard attached.

6.1.1.1 Local Function Keys in SCO Console Mode

The keys used to perform local functions in SCO Console mode are similar to those used for VT mode (see Chapter 8, Keyboard Processing. Table 6–2 shows the exceptions).

Table 6–2 Local Functions on VT and Enhanced PC Layouts

| Fn# | Function | VT Layout | EPC Layout |
|-----|--------------------------------|---------------------|--|
| 1 | Hold | Lock/F1 | Scroll Lock |
| 2 | Print | Lock/F2 | Print Screen |
| 3 | Set-Up | Lock/F3 | Caps Lock/Print Screen Alt/Print Screen |
| 5 | Break | Lock/F5 | Caps Lock/Pause |
| 7 | Hard Reset | Lock/Ctrl/F3 | Ctrl/Caps Lock/Print Screen |
| 8 | Toggle Autoprint | Lock/Ctrl/F2 | Ctrl/Print Screen |
| 9 | Disconnect | Lock/Shift/F5 | Shift/Caps Lock/Pause |
| 10 | Send Answerback | Lock/Ctrl/F5 | Ctrl/Caps Lock/Pause |
| 11 | Print Composed Main Display | Not supported | |
| 20 | Pan Up | Not supported | |
| 21 | Pan Down | Not supported | |
| 24 | Pan Prev Page | Not supported | |
| 25 | Pan Next Page | Not supported | |
| 30 | Copy and Paste | Lock/F1 (hold down) | Scroll Lock |
| 47 | Primary KB language | Lock/Ctrl/Alt/F1 | Caps Lock/Ctrl/Alt/F1 |

(continued on next page)

SCO Console Emulation 6.1 SCO Console Emulation Mode

Table 6–2 (Cont.) Local Functions on VT and Enhanced PC Layouts

| Fn# | Function | VT Layout | EPC Layout |
|-----|-----------------------|------------------|-----------------------|
| 48 | Secondary KB language | Lock/Ctrl/Alt/F2 | Caps Lock/Ctrl/Alt/F2 |
| 53 | ±DEC/IBM PC Style | Not supported | |

6.1.1.2 PC Keyboard

Tables 6–3 through 6–8 list the default codes sent by keys in ASCII character code mode.

The keys that can be affected by Caps Lock or Num Lock send a shifted value when in Lock state. If **[Shift]** is pressed when Caps Lock or Num Lock is in effect, the key sends its unshifted value. This "Reverse Lock" is the default for a Caps Lock function.

[Alt] has no effect on the key pressed unless otherwise indicated. A blank in any column means the key is not defined.

Table 6–3 SCO Console Mode Function Key Default Codes

| Key | Unmodified | [Shift] | [Ctrl] | [Ctrl/Shift] |
|-----------------------|--------------|----------------|---------------|---------------------|
| [F1] | ESC[M | ESC[Y | ESC[k | ESC[w |
| [F2] | ESC[N | ESC[Z | ESC[l | ESC[x |
| [F3] | ESC[O | ESC[a | ESC[m | ESC[y |
| [F4] | ESC[P | ESC[b | ESC[n | ESC[z |
| [F5] | ESC[Q | ESC[c | ESC[o | ESC[@ |
| [F6] | ESC[R | ESC[d | ESC[p | ESC[[|
| [F7] | ESC[S | ESC[e | ESC[q | ESC[< |
| [F8] | ESC[T | ESC[f | ESC[r | ESC[] |
| [F9] | ESC[U | ESC[g | ESC[s | ESC[^ |
| [F10] | ESC[V | ESC[h | ESC[t | ESC[_ |
| [F11] | ESC[W | ESC[i | ESC[u | ESC[' |
| [F12] | ESC[X | ESC[j | ESC[v | ESC[{ |
| [Print Screen] | Print Screen | ESC[0i | | |
| [Scroll Lock] | Scroll Lock | Scroll Lock | N/A | N/A |
| [Pause] | Break | Break | N/A | N/A |

SCO Console Emulation

6.1 SCO Console Emulation Mode

Table 6-4 SCO Console Mode Main Keypad Default Codes

| Key | Unmodified | Shift | Ctrl | Ctrl/Shift |
|-----------|------------|-------|------|------------|
| ESC | ESC | ESC | ESC | ESC |
| 1 | 1 | ! | 1 | ! |
| 2 | 2 | @ | Nul | Nul |
| 3 | 3 | # | ESC | ESC |
| 4 | 4 | \$ | FS | FS |
| 5 | 5 | % | GS | GS |
| 6 | 6 | ^ | RS | RS |
| 7 | 7 | & | US | US |
| 8 | 8 | * | DEL | DEL |
| 9 | 9 | (| | |
| 0 | 0 |) | | |
| - | - | _ | US | US |
| = | = | + | | |
| Backspace | BS | BS | DEL | DEL |
| Tab | HT | ESC[Z | | |
| q | q | Q | DC1 | DC1 |
| w | w | W | ETB | ETB |
| e | e | E | ENQ | ENQ |
| r | r | R | DC2 | DC2 |
| t | t | T | DC4 | DC4 |
| y | y | Y | EM | EM |
| u | u | U | NAK | NAK |
| i | i | I | HT | HT |
| o | o | O | SI | SI |
| p | p | P | DLE | DLE |
| [| [| { | ESC | ESC |
|] |] | } | GS | GS |
| \ | \ | | FS | FS |
| Return | CR | CR | LF | LF |
| Ctrl | Ctrl | Ctrl | Ctrl | Ctrl |
| a | a | A | SOH | SOH |
| s | s | S | DC3 | DC3 |
| d | d | D | EOT | EOT |
| f | f | F | ACK | ACK |
| g | g | G | BEL | BEL |
| h | h | H | BS | BS |
| j | j | J | LF | LF |
| k | k | K | VT | VT |

(continued on next page)

SCO Console Emulation 6.1 SCO Console Emulation Mode

Table 6–4 (Cont.) SCO Console Mode Main Keypad Default Codes

| Key | Unmodified | Shift | Ctrl | Ctrl/Shift |
|-----|------------|-------|------|------------|
| | l | L | FF | FF |
| ; | ; | : | | |
| ' | ' | " | | |
| z | z | Z | SUB | SUB |
| x | x | X | CAN | CAN |
| c | c | C | ETX | ETX |
| v | v | V | SYN | SYN |
| b | b | B | STX | STX |
| n | n | N | SO | SO |
| m | m | M | CR | CR |
| , | , | < | | |
| . | . | > | | |
| / | / | ? | US | US |

Table 6–5 SCO Console Mode Editing Keypad Default Codes

| Key | Unmodified | Shift | Ctrl | Ctrl/Shift |
|-----------|------------|-------|-------|------------|
| Insert | ESC[L | ESC[L | ESC[L | ESC[L |
| Home | ESC[H | ESC[H | ESC[H | ESC[H |
| Page Up | ESC[I | ESC[I | ESC[I | ESC[I |
| Delete | DEL | DEL | DEL | DEL |
| End | ESC[F | ESC[F | ESC[F | ESC[F |
| Page Down | ESC[G | ESC[G | ESC[G | ESC[G |

Table 6–6 SCO Console Mode Cursor Keypad Default Codes

| Key | Unmodified | Shift | Ctrl | Ctrl/Shift |
|-----|------------|-------|-------|------------|
| ↑ | ESC[A | ESC[A | ESC[A | ESC[A |
| ↓ | ESC[B | ESC[B | ESC[B | ESC[B |
| ⇒ | ESC[C | ESC[C | ESC[C | ESC[C |
| ⇐ | ESC[D | ESC[D | ESC[D | ESC[D |

SCO Console Emulation

6.1 SCO Console Emulation Mode

Table 6–7 SCO Console Mode Numeric Keypad Default Codes, Num Lock Off

| Keypad Function Key | Unmodified | Shift | Ctrl | Ctrl/Shift |
|---------------------|------------|----------|-------|------------|
| Num Lock | Num Lock | Num Lock | DC3 | DC3 |
| / | / | / | | |
| * | * | * | | |
| 7 | ESC[H | 7 | ESC[H | 7 |
| 8 | ESC[A | 8 | ESC[A | 8 |
| 9 | ESC[I | 9 | ESC[I | 9 |
| - | - | - | - | - |
| 4 | ESC[D | 4 | ESC[D | 4 |
| 5 | ESC[E | 5 | ESC[E | 5 |
| 6 | ESC[C | 6 | ESC[C | 6 |
| + | + | + | + | + |
| 1 | ESC[F | 1 | ESC[F | 1 |
| 2 | ESC[B | 2 | ESC[B | 2 |
| 3 | ESC[G | 3 | ESC[G | 3 |
| 0 | ESC[L | 0 | ESC[L | 0 |
| . | DEL | . | DEL | DEL |
| Enter | CR | CR | LF | LF |

Table 6–8 SCO Console Mode Numeric Keypad Default Codes, Num Lock On

| Keypad Function Key | Unmodified | Shift | Ctrl | Ctrl/Shift |
|---------------------|------------|---------|------|------------|
| Numlock | Numlock | Numlock | DC3 | DC3 |
| / | / | / | | |
| * | * | * | | |
| 7 | 7 | ESC[H | | |
| 8 | 8 | ESC[A | | |
| 9 | 9 | ESC[I | | |
| - | - | - | - | - |
| 4 | 4 | ESC[D | | |
| 5 | 5 | ESC[E | | |
| 6 | 6 | ESC[C | | |
| + | + | + | | |
| 1 | 1 | ESC[F | | |
| 2 | 2 | ESC[B | | |
| 3 | 3 | ESC[G | | |
| 0 | 0 | ESC[L | | |
| . | . | DEL | | |

(continued on next page)

SCO Console Emulation 6.1 SCO Console Emulation Mode

Table 6–8 (Cont.) SCO Console Mode Numeric Keypad Default Codes, Num Lock On

| Keypad Function Key | Unmodified | Shift | Ctrl | Ctrl/Shift |
|------------------------|------------|-------|------|------------|
| Enter | CR | CR | | |

Note

Pressing Alt. on the numeric keypad sends DEL, not a period.

6.1.1.3 VT Keyboard Key Mapping

More key mapping information is provided in Chapter 8, Keyboard Processing.

- On the main keypad, 8-bit codes are allowed for keyboard input.
- Function keys F1 through F12 send the same codes as F1 through F12 on a PC keyboard. Function keys F13 through F20 send the same codes as F13 through F20 in VT mode, except Do sends an ESC code.
- On the editing keypad, VT keyboard keys send the same sequences as the corresponding PC keyboard keys:

| PC Keyboard | VT Keyboard |
|--|---|
| Insert | Insert Here |
| Home | Find |
| PageUp | Prev |
| Delete | Remove |
| End | Select |
| PageDown | Next |

- For Autowrap, On is the default.
- On the cursor keypad, SCO Console mode sends the same sequence as VT510 mode.
- The cursor position is saved while switching pages.
- On the numeric keypad, SCO Console mode sends the same sequence as VT510 mode.
- SCO Console mode uses the PCTerm character set.

Character Sets

This chapter describes the character sets supported by the VT510 video terminal.

7.1 Overview

The VT510 video terminal supports most character sets for Eastern Europe; Cyrillic, Greek, Hebrew, and Turkish character sets. In addition to traditional DEC and ISO character sets, which conform to the structure and rules of ISO 2022, the VT510 supports a number of IBM PC *code pages* (page numbers in IBM's standard character set manual) in PCTerm mode to emulate the console terminal of industry-standard PCs.

Each code page defines both the exact repertoire (set of characters) and the assignment of code positions in the 0 - 255 range. Once configured, the code page is not usually changed within a single application.

7.2 Character Sets Supported

The following sections list the characters sets supported by the VT510 terminal.

7.2.1 VT Graphic Character Sets

The VT510 supports the following VT 8-bit multinational character sets:

- ISO Latin-1
- ISO Latin-2
- ISO Latin-Cyrillic
- ISO Latin-Greek
- ISO Latin-Hebrew
- ISO Latin-5
- KOI-8 Cyrillic
- DEC Multinational
- DEC Greek
- DEC Hebrew
- DEC Turkish

The VT510 also supports the following character sets:

- DEC Special Graphics (VT100 Line Drawing set)
- DEC Technical Character

Character Sets

7.2 Character Sets Supported

When **7-bit NRCS Characters** is selected, a corresponding 7-bit or NRC set is used depending on the keyboard language selected. (See Chapter 8 for details.)

- U.K. NRC (ISO)
- French NRC (ISO)
- DEC French Canadian NRC
- Norwegian/Danish NRC (ISO)
- DEC Finnish NRC
- German NRC (ISO)
- Italian NRC (ISO)
- DEC Swiss NRC
- Swedish NRC (ISO)
- Spanish NRC (ISO)
- DEC Portuguese NRC
- SCS NRC
- Russian 7-bit (KOI-7)
- DEC 7-bit Greek
- DEC 7-bit Hebrew
- DEC 7-bit Turkish

7.2.2 PCTerm Graphic Character Sets

When **PCTerm mode** is selected, the terminal can still use all the VT 8-bit character sets listed in Section 7.2.1. Additionally, the following PC code pages are supported:

- PC International (437)
- PC Multilingual (850)
- PC Slavic (852)
- PC Greek (210)
- PC Spanish (220)
- PC Turkish (857)
- PC Portuguese (860)
- PC Hebrew (862)
- PC French/Canadian (863)
- PC Danish/Norwegian (865)
- PC Cyrillic (866)

Note

7-bit NRC sets are not available in PCTerm mode.

7.2.3 Control Character Sets

The following control character sets are defined in the terminal. ASCII C0 and C1 control sets have corresponding fonts for graphic representation in control representation mode.

- ASCII C0 Control Set (32 characters)
- 8-bit ASCII C1 Control Set (32 characters)

The control representation mode font includes C0 and C1 control character set graphic representations plus DELETE (7/15), non-breaking space - NBS (10/0), and 15/15 (total of 67 characters).

7.2.4 Character Set Structure

The VT 8-bit multinational character sets are formed from two 7-bit character set "halves." ASCII is used as the left half (GL), and the corresponding named supplemental set is used as the right half (GR). Although the character set "halves" can be designated and invoked independently, in practice, they are almost always used together. It is simpler and more convenient to think of them as a single 8-bit multinational set, although technically they are also separate 7-bit sets.

Many characters appear in more than one of the mentioned sets, so the total number of characters is far less than the sum of the individual totals. There is also a down-line loadable portion of character RAM provided for a custom *soft font*, a Dynamically Redefinable Character Set (DRCS). This character RAM can contain up to 2×96 characters.

7.2.5 Characters Not in a Character Set.

The following characters are not technically part of any of character set. They are like "control characters," but they are not in the C0 or C1 control sets.

| Name | Description |
|------|-------------|
| SP | SPACE |
| DEL | DELETE |
| | Reserved |
| | Reserved |

Notes

NULL is the only fill character. (DEL and 255 are not usable as fill characters.)

If a 96-character character set is invoked into GL, then the receipt of codes 32 and 127 are part of that character set, and their graphic characters are displayed from the 96-character set. In this case, the codes 32 and 127 are not treated as SP or DEL.

If a 96-character character set is invoked into GR, the receipt of codes 160 and 255 are part of that character set, and their graphic characters are displayed from the 96-character character set. In this case, the codes 160 and 255 are not treated as an error condition or ignored, respectively.

Character Sets

7.3 VT Mode

7.3 VT Mode

All DEC character sets are supported in VT500 mode with either a VT keyboard or an attached Enhanced PC keyboard.

In VT100 mode, VT52 mode, or when **7-bit NRCS characters** is selected (through Set-Up or DECNRCM), only ASCII, NRC sets, and DEC Special Graphic characters are available.

7.3.1 Selecting Character Sets

Character sets are designated with the select character set (SCS) control function. Refer to Chapter 5 for more details.

7.3.2 Character Set Mappings

The following table lists the character set mappings.

| Character Set | Mapped onto decimal . . . |
|--|---------------------------|
| C0 controls | 0 to 31 |
| Space | 32 |
| ASCII, all other NRC sets, Line Drawing, and DEC Technical set | 33 to 126 |
| DEL | 127 |
| C1 controls | 128 to 159 |
| 10/0 | 160 |
| DEC Multinational Graphic, DEC 7-Bit Greek, DEC 7-Bit Hebrew, or DEC 7-Bit Turkish | 161 to 254 |
| 15/15 | 255 |
| ISO Latin-1 Supplemental Graphic, ISO Latin-2 Supplemental Graphic, ISO Latin-Cyrillic, ISO Latin-Greek, ISO Latin-Hebrew, or ISO Latin-5. | 160 to 255 |

These are typical assignments. By appropriate designating and invoking sequences, other mappings are possible for the graphic character sets.

7.4 PCTerm Mode

This section describes how to select character sets in PCTerm mode.

7.4.1 Selecting Character Sets

If a **PC character set** is selected, then all the SCS sequences used to designate and invoke character sets into G0, G1, G2, G3, GL, and GR (including single and locking shifts) are ignored. You select the character set through a Set-Up field or an escape sequence, DECPCTERM. You can use only one code page containing 256 characters at a time.

7.4.2 Character Set Mappings

In PC character sets, the conventional ISO C1 region, (80 hex through 9F hex) are all displayable character codes. The VT510 does not recognize control sequences that have 8-bit control codes; therefore, the 8-bit control mode becomes invalid.

C0 and C1 regions are all control codes. The C0 region (00 hex through 1F hex) in a PC character set is mixed with control characters and graphic characters. Among them, 11 locations can have both *control characters* and *displayable characters* in the same locations; other locations are occupied by displayable characters only. The 11 C0 locations include 0/5, 0/7, 0/8, 0/9, 0/A, 0/B, 0/C, 0/D, 1/1, 1/3, and 1/B.

Control codes are used for ENQ, BEL, BS, HT, LF, VT, FF, CR, DC1, DC3, and ESC operations.

You access the *displayable characters* by preceding the C0 control code with ESC to form a 2-byte pair (1Bh XXh). These 2-byte pairs, such as ESC 0/5, are only recognized in PCTerm mode and SCO console mode.

The C0 characters may also be displayed using the SGR sequence “*CSI 11 m*”.

7.5 SCO Console Mode

SCO console mode can use both VT character sets and PC character sets. You select a **VT character set** through the **PCTerm character set** field in Set-Up, or you can use an SCS invocation sequence. You can select a PC character set through the same Set-Up field, or you can use the DECPCTERM escape sequence.

7.6 Soft Character Sets

The ANSI control string command to down-line load the soft character sets is DECDLD. The DECDLD command down-line loads one or more characters of a specified 94- or 96-character dynamically redefinable character set (DRCS) with a specified logical pixel pattern. The affected characters in the DRCS set also change the presentation of characters from the set currently being displayed on the screen. The DECDLD control does not clear the screen.

See Chapter 5 for a description of the DECDLD—Dynamically Redefinable Character Sets command.

Keyboard Processing

This chapter describes the physical keyboards and keyboard-to-host interface supported by the VT510 video terminal.

8.1 Overview

The VT510 supports two keyboard layouts:

- VT keyboard (VT layout)
- Enhanced PC 101/102 keyboard (PC layout)

Any time the terminal is operating, a keyboard encoding is being used to translate graphic character keystrokes into character codes, called the keyboard character set. The Keyboard Character set is a function of the **Keyboard Dialect**, the default character set, the 7-bit or 8-bit characters setting, and any keyboard customization defined in terminal Set-Up.

When the graphic character assigned to a keystroke (which usually corresponds to the legend appearing on the keycap) has a corresponding character in the Keyboard Character set, the terminal transmits the corresponding character code for that keystroke. The code transmitted for any given keystroke can vary depending on the Keyboard Character set. If the graphic character assigned to a keystroke does not have a corresponding character in the Keyboard Character set, then that keystroke becomes dead.

The term keyboard layout describes the physical layout of a keyboard, specifically, the number of keys and their positions on the keyboard. The keys are marked with symbols which indicate their function. Graphic keys transmit codes that match the graphic character symbol on the key cap, whereas keys such as the `Tab` key transmit control codes. Modifier keys (`Shift`, `Ctrl` and `Alt`) change the behavior of other keys. Function keys transmit multi-byte sequences of control and character data; local function keys enable local terminal functions (For example, `Set-Up`, and `Print Screen`).

8.2 PC Keyboard–VT Style vs. PC Style

The VT510 is designed to operate with either a VT keyboard or an enhanced PC keyboard. These keyboards differ in the number and positioning of keys. This leads to different user expectations of where function and local function keys are positioned on the PC keyboard. For example, traditional VT keyboard users expect `F2` and `F3` to enable local functions for printing the screen and entering Set-Up. Traditional PC keyboard users expect that these same keys will send signals to the host to control the application. These keyboard layouts are called VT style and PC style layouts. The PC style layout is the factory default.

Keyboard Processing

8.2 PC Keyboard–VT Style vs. PC Style

VT Style is an alternate way of mapping the PC keyboard to look like a VT keyboard. With this mapping, PC keys send the same function sequences as similarly named keys on the VT layout (Figure 8–1). Since the enhanced PC layout does not correspond key-for-key to the VT Layout, some adaptation is necessary. Some function keys, that are missing from the PC keyboard, can be created by pressing a Function Key in combination with **Caps Lock** (For example, press and hold **Caps Lock** while typing another key).

Pressing **Caps Lock/Num Lock** toggles between the VT Style and PC Style. When VT Style is selected, "VT" is displayed on the keyboard indicator line at the bottom of the screen. The style is saved in NVM when you select **Save settings**. VT Style and PC Style mappings apply to VT modes only.

Figure 8–1 VT Keyboard Layout

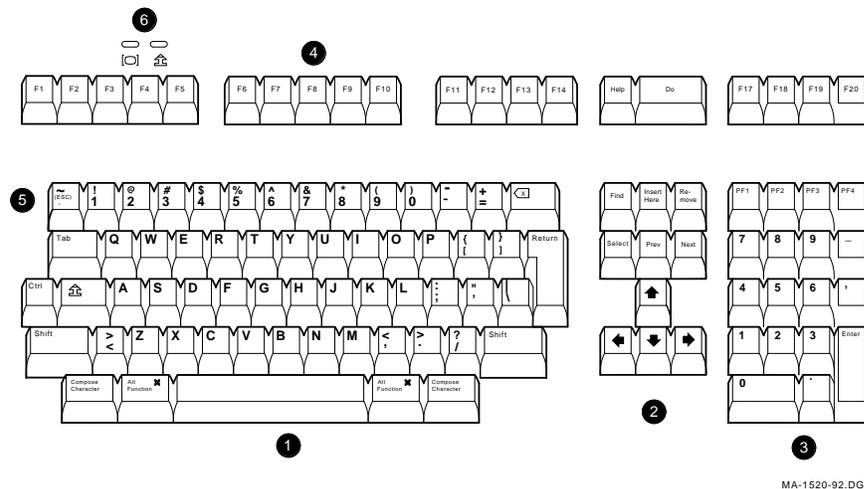
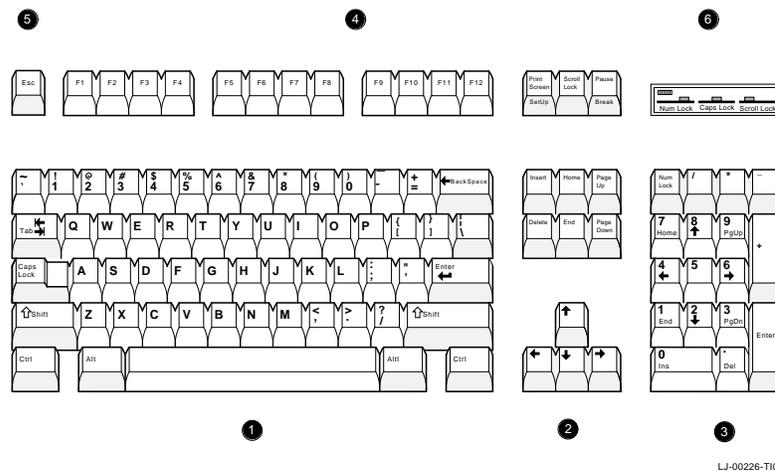


Figure 8–2 PC Keyboard Layout



- ① Main keypad, ② Editing keypad, ③ Numeric keypad,
- ④ Function keys, ⑤ Escape key, ⑥ Indicator lights.

8.2.1 Differences—PC Style vs. VT Style

The differences between PC Style and VT Style are:

- Editing keypad keys `Home` and `Delete` send different sequences corresponding to their functions in PC Style and VT Style.
- Numeric keypad keys send different sequences when the keypad is in numeric mode to accommodate the `Num Lock` feature. With `Num Lock` off, the numeric keypad sends editing key sequences.
- Top row function keys `F1` through `F5` send function key sequences. Local terminal functions are relocated to the `Print Screen`, `Scroll Lock`, and `Pause` keys on the enhanced PC layout.
- `Print Screen`, `Scroll Lock`, and `Pause` are either local function keys or function keys in PC style, but are only function keys in VT Style.
- The keys to operate the Copy/Paste function are different between the two styles (See Table 8–5).
- Left `Alt/Space` works as compose in VT Style only.

8.3 Top Row Function Keys

There are 20 top row function keys on the VT layout and 12 on the enhanced PC layout. `Caps Lock/F1` through `Caps Lock/F10` keys on the enhanced PC layout transmit the same sequences as `F11` through `F20` in the VT layout. Additional unique function sequences are transmitted by pressing function keys in combination with `Shift`, `Alt`, or `Ctrl` keys. See DECFNK and DECPAK for details.

In VT Style, the `F1` through `F5` keys operate the same as on the VT layout. In VT Style, `F13` (Print Screen), `F14` (Scroll Lock), and `F15` (Pause) send their corresponding function key sequences. In PC Style, the `F1` through `F5` keys send function sequences (unless re-programmed) while `Print Screen`, `Scroll Lock`, and `Pause` default to local functions.

8.4 Main Key Array

This section describes the main keys on the keyboard.

8.4.1 Character Sets

Only characters from the currently selected keyboard character set may be generated. All other graphic character keystrokes are ignored. The following keyboard character sets are supported: ISO Latin 1, ISO Latin 2, ISO Latin Cyrillic, ISO Latin Greek, ISO Latin Hebrew, ISO Latin 5 (Turkish), DEC Multinational, DEC Cyrillic, DEC Greek, DEC Hebrew and DEC Turkish. When **7-bit NRCS characters** is selected, a corresponding 7-bit NRC set is supported based on the Keyboard Dialect.

PC character sets are not supported in VT modes since the terminal is being used as a conventional video terminal that happens to have a PC keyboard attached. New applications should be written to use ISO character sets. (PC character sets are available in PCTerm and SCO console mode.)

Keyboard Processing

8.4 Main Key Array

8.4.2 Caps Lock

The Lock function may operate in three ways:

| | |
|--------------|--|
| Caps Lock | Alphabetic keys send their shifted character. |
| Shift Lock | All keys on the main key array send their shifted character. |
| Reverse Lock | Pressing [Shift] temporarily reverses the effect of [Caps Lock] ; that is, unshifted or lowercase alphabetic characters are transmitted. |

Pressing and releasing the **[Caps Lock]** key toggles the lock state on or off.

The **[Caps Lock]** key is also used to generate keystrokes for keys that are not present on the keyboard. Known as keyboard extension, this is done by pressing and holding the **[Caps Lock]** key and then pressing the extension key. The lock state is not toggled when an extension keystroke is pressed. Extension keystrokes are shown in Table 8–5, Local Functions.

8.4.3 Tab Key

With an enhanced PC keyboard, pressing **[Shift/Tab]** causes a CBT sequence, CSI Z, to be transmitted. A horizontal tabulation code (HT, 0/9) is transmitted when a VT keyboard is used.

8.4.4 Left Alt

Left **[Alt]** on the PC layout corresponds to the **[Alt Function]** on the VT layout. Depressing the left **[Alt]** key performs the following functions (unless re-programmed):

- Left **[Alt/Space]** acts as the compose key in VT Style.
- On the North American PC layout, left **[Alt]** is the same as **[Alt Gr]** when pressed and held in combination with keys from the numeric keypad. This feature keeps the two **[Alt]** keys equivalent to each other.

8.4.5 Right Alt

The right **[Alt]** key appears on the North American, Hebrew, and Greek PC layouts. On other country layouts, the right **[Alt]** key appears as **[Alt Gr]**. Depressing the right **[Alt]** key performs the following functions (unless re-programmed):

- Right **[Alt/Space]** acts as the compose key in VT Style. This feature keeps the two **[Alt]** keys equivalent.
- Right **[Alt]** key is the same as the **[Alt Gr]** key when pressed and held in combination with keys from the numeric keypad.
- The right **[Alt]** key is the same as the Right Alt function on the VT layout with the exceptions listed previously.

8.4.6 Alt Gr

The right **[Alt]** key is marked as **[Alt Gr]** on some Enhanced PC layouts. The words Alt Gr are short for alternate graphic and corresponds roughly to the function of the compose key.

- **[Alt Gr]** in combination with graphic character keys generate the character corresponding to the right side of the keyboard.
- **[Alt Gr]** is used for numeric keypad compose.

8.4.7 Modifier Keys

Table 8–1 shows the corresponding modifier keys for the VT and the enhanced PC layouts.

Table 8–1 VT Layout vs. Enhanced PC Layout Modifier Keys

| VT Keyboard | PC Keyboard |
|--------------------------------|--------------------------|
| Left Shift | Left Shift |
| Right Shift | Right Shift |
| Lock | Caps Lock |
| Ctrl | Left Ctrl |
| none | Right Ctrl |
| Left Compose Character | Alt Gr |
| Right Compose Character | none |
| Left Alt | Left Alt |
| Right Alt | none or Right Alt |

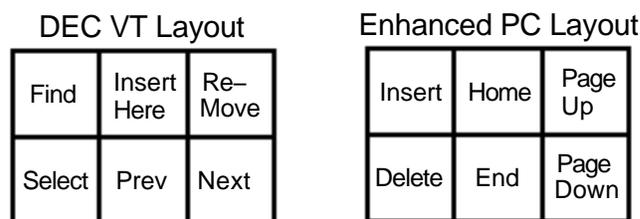
There is no **Ctrl** key on the right side of the VT keyboard. Left and right **Ctrl** keys on the enhanced PC layout generates the single control function on the VT Layout.

There is no key labeled "compose" on the enhanced PC layout. **Alt Gr** (Right **Alt**) accesses the supplemental characters on the top right half of the keyboard on some enhanced PC layout keyboards. **Alt Gr** can be used with the numeric keypad to enter character codes directly. Left **Alt/Space** can be used to initiate compose sequences when VT Style is selected.

8.5 Editing Keypad Keys

Figure 8–3 shows the layout for the DEC VT and enhanced PC editing keypads.

Figure 8–3 Editing Keypad Legends on DEC and PC Layouts



MA-0028-93.GRA

When VT Style is selected, the enhanced PC layout editing keys transmit the same function sequences as the similarly legend editing keys in the VT layout. In PC Style, the **Home** key sends a Cursor Up (CUP) sequence to move the cursor home and the **Delete** key transmits a DEL (7/15).

Table 8–2 lists the key sequences for PC editing keypads.

Keyboard Processing

8.5 Editing Keypad Keys

Table 8–2 Editing Keypad Sequences for PC Layout

| Enhanced PC Legend | VT Legend | VT Style Sequence | PC Style Sequence |
|--------------------|-------------|-------------------|-------------------|
| Insert | Insert Here | CSI 2 ~ | CSI 2 ~ |
| Delete | Remove | CSI 3 ~ | DEL |
| Home | Find | CSI 1 ~ | CSI H |
| End | Select | CSI 4 ~ | CSI 4 ~ |
| Page Up | Prev Screen | CSI 5 ~ | CSI 5 ~ |
| Page Down | Next Screen | CSI 6 ~ | CSI 6 ~ |

In addition to these unshifted sequences, the editing keys can send unique sequences when pressed in combination with **Shift**, **Alt**, or **Ctrl**. See DECFNK for details.

8.6 Cursor Keypad Keys

The cursor keypad keys send the same sequences as the VT layout. Additional unique sequences can be sent when pressed in combination with **Shift**, **Alt**, or **Ctrl**. See DECFNK for details.

8.7 Numeric Keypad Keys

The enhanced PC layout numeric keypad has three differences from the VT layout:

1. The four keys at the top of the keyboard are labeled **Num Lock**, **/**, *****, and **-** instead of **PF1** through **PF4**.
2. The **Num Lock** key toggles the keypad keys, sending either numerals or function sequences.

In VT Style, with **Application Mode** enabled, the numeric keypad keys send the same sequences as the corresponding keys on a VT layout. When the numeric keypad is in numeric mode, the four keys at the top of the keyboard still operates as **PF1** through **PF4**, and the **+** key sends an ASCII "+" character.

Table 8–3 shows the numeric keypad sequences in VT Style.

Keyboard Processing 8.7 Numeric Keypad Keys

Table 8–3 PC Layout Numeric Keypad Sequences - VT Style

| PC Key | DEC Key | Numeric Mode | Application Mode |
|-------------|---------|--------------|------------------|
| Num Lock | PF1 | SS3 P | SS3 P |
| / | PF2 | SS3 Q | SS3 Q |
| * | PF3 | SS3 R | SS3 R |
| - | PF4 | SS3 S | SS3 S |
| Caps Lock/+ | - | | SS3 m |
| + | , | "+" | SS3 l |
| . | . | "." | SS3 n |
| Enter | Enter | CR | SS3 M |
| 0 | 0 | "0" | SS3 p |
| 1 | 1 | "1" | SS3 q |
| 2 | 2 | "2" | SS3 r |
| 3 | 3 | "3" | SS3 s |
| 4 | 4 | "4" | SS3 t |
| 5 | 5 | "5" | SS3 u |
| 6 | 6 | "6" | SS3 v |
| 7 | 7 | "7" | SS3 w |
| 8 | 8 | "8" | SS3 x |
| 9 | 9 | "9" | SS3 y |

In PC Style, when the numeric keypad is in **Application Mode**, the numeric keypad keys send the same sequences as the corresponding keys on the VT layout as shown in Table 8–3.

In PC Style, when the numeric keypad is in **Numeric Mode**, the keypad keys send either editing keypad sequences corresponding to the gray legend in the lower part of the keyboard, or the numerals corresponding to the black legend in the upper part of the keyboard. The numerals are sent when **Shift** or the **Num Lock** has been depressed. The Num Lock state can be toggled on or off by pressing the **Num Lock** key. "Num Lock" appears on the keyboard indicator line when this feature is activated. If Num Lock is on and "Reverse Lock" is activated, pressing **Shift** temporarily reverses the effect of Num Lock.

Table 8–4 lists the numeric keypad sequences in PC Style Numeric mode.

Keyboard Processing

8.7 Numeric Keypad Keys

Table 8–4 PC Layout Numeric Keypad Sequences - PC Style, Numeric Mode

| Keys | Num Lock Off unshifted, or Num Lock On with | Num Lock On unshifted, or Num Lock Off with |
|------|--|--|
| | | |
| | / | / |
| | * | * |
| | - | - |
| | + | + |
| | DEL | . |
| | CR | CR |
| | CSI 2 ~ | 0 |
| | CSI 4 ~ | 1 |
| | CSI B | 2 |
| | CSI 6 ~ | 3 |
| | CSI D | 4 |
| | | 5 |
| | CSI C | 6 |
| | CSI H | 7 |
| | CSI A | 8 |
| | CSI 5 ~ | 9 |

8.8 Local Function Key Defaults

The keys used to perform local terminal functions differ between the VT keyboard, PC keyboard, and the mode selection. Table 8–5 shows the corresponding keys for the default local functions. The function number in Table 8–5 is used in the DECPFK host sequence or DECPAK's alternate function to specify a change to that local function key.

Table 8–5 Local Functions

| Function Number | Function | VT Keyboard | SCO Console | PC Keyboard VT-Style | PC Keyboard PC-Style | PC Keyboard SCO |
|-----------------|-------------|-------------|-------------|----------------------|----------------------|-----------------|
| 0 | no function | | | | | |
| 1 | Hold | | | | | |
| 2 | Print | | | | | |
| 3 | Set-Up | | | | | |
| | | | | | | |
| | | | | | or | |
| | | | | | | |

± means the function switches alternately between on and off.
 C&P means Copy and Paste.
 means the key, key, or key with lock icon.

(continued on next page)

Keyboard Processing 8.8 Local Function Key Defaults

Table 8–5 (Cont.) Local Functions

| Function Number | Function | VT Keyboard | SCO Console | PC Keyboard VT-Style | PC Keyboard PC-Style | PC Keyboard SCO |
|-----------------|-----------------------------|-----------------------|----------------|----------------------|------------------------|-----------------|
| 5 | Break | F5 | Lock/F5 | F5 | Lock/Pause | |
| 7 | Hard Reset | Ctrl/F3 | Lock/Ctrl/F3 | Ctrl/F3 | Ctrl/Lock/Print Screen | |
| 8 | Toggle Autoprint | Ctrl/F2 | Lock/Ctrl/F2 | Ctrl/F2 | Ctrl/Print Screen | |
| 9 | Disconnect | Shift/F5 | Lock/Shift/F5 | Shift/F5 | Shift/Lock/Pause | |
| 10 | Send Answerback | Ctrl/F5 | Lock/Ctrl/F5 | Ctrl/F5 | Ctrl/Lock/Pause | |
| 11 | Print Composed Main Display | Shift/F2 | X ¹ | Shift/F2 | Shift/Print Screen | X |
| 20 | Pan Up | Ctrl/ ↑ | X | Ctrl/ ↑ | Ctrl/ ↑ | X |
| 21 | Pan Down | Ctrl/ ↓ | X | Ctrl/ ↓ | Ctrl/ ↓ | |
| 24 | Pan Prev Page | Ctrl/Prev | X | Ctrl/Page Up | Ctrl/Page Up | |
| 25 | Pan Next Page | Ctrl/Next | X | Ctrl Page Down | Ctrl/Page Down | |
| 30 | Copy & Paste Mode | F1 (hold down) | Caps Lock/F1 | F1 | Scroll Lock | |
| 31 | C&P Cursor Left | ← | | ← | ← | |
| 32 | C&P Cursor Down | ↓ | | ↓ | ↓ | |
| 33 | C&P Cursor Up | ↑ | | ↑ | ↑ | |
| 34 | C&P Cursor Right | → | | → | → | |
| 35 | C&P Start Selection | Select | | Home | Home | |
| 36 | C&P Copy | Remove | | End | End | |
| 37 | C&P Paste | Insert Here | | Insert | Insert | |
| 38 | C&P ± Left-to-Right | Select | | Home | Home | |
| 41 | Shift Modifier | Left or right Shift | | Left or right Shift | Left or right Shift | |
| 42 | Control Modifier | Ctrl | | Left or right Ctrl | Left or right Ctrl | |
| 43 | Alt Function Modifier | Left or right Alt | | Left or right Alt | Left or right Alt | |
| 44 | Start Compose | Left or right Compose | | | Left Alt/Space | |
| 45* | Group Shift Modifier | Group Shift | | Alt/Gr | Alt/Gr | |
| 46† | Shift2 Modifier | Alt/Shift | | | | |

¹ X means the function is not available in the default SCO state. If there is no "X" in the **SCO Console** column, then this means that the key sequence is the same as the **VT Keyboard** column. If there is no "X" in the **PC Keyboard SCO** column, then this means that the key sequence is the same as the **PC Keyboard PC-Style** column.

†The Shift2 Modifier is assigned to the **Alt Shift** key (German "right **Compose**") when it appears on the corresponding keyboard (German).

± means the function switches alternately between on and off.
C&P means Copy and Paste.

Lock means the **Lock** key, **Caps Lock** key, or key with lock icon.

(continued on next page)

Keyboard Processing

8.8 Local Function Key Defaults

Table 8–5 (Cont.) Local Functions

| Function Number | Function | VT Keyboard | SCO Console | PC Keyboard VT-Style | PC Keyboard PC-Style | PC Keyboard SCO |
|-----------------|-----------------------|--------------|------------------|----------------------|----------------------|-----------------|
| 47 | Primary KB language | Ctrl/Alt/F1 | Lock/Alt/Ctrl/F1 | Ctrl/Alt/F1 | Ctrl/Alt/F1 | See SCO Console |
| 48 | Secondary KB language | Ctrl/Alt/F2 | Lock/Alt/Ctrl/F2 | Ctrl/Alt/F2 | Ctrl/Alt/F2 | See SCO Console |
| 49‡ | ± KB language | | | | | |
| 51 | ± Caps Lock State | Lock | | Lock | Lock | |
| 52 | ± Num Lock State | | | Num Lock | Num Lock | |
| 53 | ± VT/IBM Style | | X | Lock Num Lock | Lock Num Lock | X |
| 54 | Extend Kbd Modifier | | | Lock | Lock | |
| 61 | Screen saver | | | | | |
| 62 | Calculator | Lock/Alt/F12 | | Lock/Alt/F12 | Lock/Alt/F12 | |
| 63 | Clock | Lock/Alt/F11 | | Lock/Alt/F11 | Lock/Alt/F11 | |
| 64 | Character table | Lock/Alt/F10 | | Lock/Alt/F10 | Lock/Alt/F10 | |
| 65 | Transfer result | Shift/Enter | | Shift/Enter | Shift/Enter | |

‡Toggle KB language is assigned to the named language key when it appears on the corresponding keyboard (Greek, Hebrew, and Russian).

± means the function switches alternately between on and off.
C&P means Copy and Paste.

Lock means the Lock key, Caps Lock key, or key with lock icon.

Note

See Chapter 2 to re-define keys using the Define Key Editor.

Table 8–6 lists the local functions for ASCII emulations.

Keyboard Processing 8.8 Local Function Key Defaults

Table 8–6 Local Functions for ASCII emulations

| Function | DEC VT Layout | EPC Layout |
|--------------------------------|------------------------|---|
| Hold Screen | F1 | Scroll Lock |
| Print Page | Ctrl/Shift/. kpd | Ctrl/Shift/. kpd |
| Set-Up | F3 | Alt/Print Screen |
| | Caps Lock/F3 | Caps Lock/Print Screen |
| Break | F5 | Ctrl/Pause |
| Hard Reset | Ctrl/F3 in Setup | |
| Soft Reset | Shift/F3 | Alt/Shift/Print Screen |
| Autoprint Mode | Ctrl/F2 | Ctrl/Print Screen |
| | Ctrl/Shift/F2 | Ctrl/Shift/Print Screen |
| | | Alt/Ctrl/Shift/Print Screen |
| Disconnect | Shift/F5 | Pause |
| Send Answerback | Ctrl/F5 | Shift/Pause |
| Display Next Page | Ctrl/Next | Ctrl/Page Down |
| | Shift/Ctrl/Next | Ctrl/Shift/Page Down |
| Active Other Window | Ctrl/Next or Ctrl/Prev | Ctrl/Page Down or Ctrl/Shift/Page Down or Ctrl/Page Up or Ctrl/Shift/Page Up |
| | | |
| Display Prev. Page | Ctrl/Prev | Ctrl/Page Up |
| | Shift/Ctrl/Prev | Ctrl/Shift/Page Up |
| Display Page 0 | Ctrl/0 kpd | Ctrl/0 kpd |
| Display Page 1 | Ctrl/1 kpd | Ctrl/1 kpd |
| Display Page 2 | Ctrl/2 kpd | Ctrl/2 kpd |
| Display Page 3 | Ctrl/3 kpd | Ctrl/3 kpd |
| Display Page 4 | Ctrl/4 kpd | Ctrl/4 kpd |
| Display Page 5 | Ctrl/5 kpd | Ctrl/5 kpd |
| Block Mode | F4 | Ctrl/Shift/Pause |
| | Ctrl/F4 | |
| | Shift/Ctrl/F5 | |
| Change Status Line Display | Ctrl/⇒ | Ctrl/⇒ |
| | Ctrl/Shift/⇒ | Ctrl/Shift/⇒ |
| Insert Mode | Ctrl/PF4 | Ctrl/Insert |
| | Ctrl/Shift/PF4 | Ctrl/Shift/Insert |
| Monitor Mode | Ctrl/Shift/1 kpd | Ctrl/Shift/1 kpd |
| Screen Saver | Ctrl/Shift/PF3 | Ctrl/Shift/End |
| Speed Scroll Rate | Ctrl/Shift/↑ | Ctrl/Shift/↑ |
| Slow Scroll Rate | Ctrl/Shift/↓ | Ctrl/Shift/↓ |
| Home Cursor & Clear Display | | Ctrl/Shift/Home |

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Keyboard Processing

8.8 Local Function Key Defaults

Table 8–6 (Cont.) Local Functions for ASCII emulations

| Function | DEC VT Layout | EPC Layout |
|---------------------------------|------------------|------------------|
| Roll Active Window Up in Page | Ctrl/↑ | Ctrl/↑ |
| Roll Active Window Down In Page | Ctrl/↓ | Ctrl/↓ |
| Toggle Split Screen | Ctrl/Shift/- kpd | Ctrl/Shift/- kpd |
| Raise Split Line | Ctrl/- kpd | Ctrl/- kpd |
| Lower Split Line | Ctrl/, kpd | N.A. |
| Adjust Window to Include Cursor | | Ctrl/Home |
| Cursor Drag Mode | Ctrl/Shift/, kpd | N.A. |
| Caps Lock State | Lock | Caps Lock |
| Num Lock State | N.A. | Num Lock |
| Keyclick State | Shift/Enter kpd | Shift/Enter kpd |

8.8.1 Numeric Keypad Compose

Pressing and holding **Compose**, **Alt** or **Alt Gr** while typing a decimal number on the numeric keypad sends the corresponding decimal character code when the compose key is released. If the **.** key on the keyboard is pressed while entering a number, then the value entered before pressing the **.** key is multiplied by 16 and added to the value entered next. This supports column/row entry commonly used in character coding tables.

When accessibility aids are enabled, remember to Lock and Unlock the compose key when entering codes.

8.8.2 Accessibility Aids

Accessibility aids allow the user with limited motor skills to use modifier key combinations in a sequential manner rather than a simultaneous manner (default). All modifier key combinations are supported.

The Accessibility aids option is enabled by depressing the **Shift** key five times in succession. This option can be disabled by pressing and holding a modifier key while pressing another key.

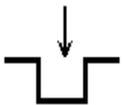
Once enabled, this option provides two levels of assistance known as Latch and Lock. The Latch state is achieved by pressing a modifier key once and affects the next key pressed. The Lock state is achieved by pressing a modifier key twice. All keys pressed are affected by the modifier until they are unlocked by either depressing the modifier key again or depressing another modifier key twice. Once any modifier is in the Locked state, pressing other modifier keys adds those modifiers to the Locked state.

A small icon appears on the Keyboard Indicator Line or Status Line to provide user feedback on the changing modifier state.

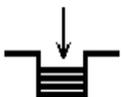
The icons for each state are as follows:



Accessibility Aid Keys Enabled



Modifier Latched (Cleared on Next Keystroke)



Modifier Locked

When Accessibility aid keys are disabled, no icon is displayed on the Keyboard Indicator Line or Status Line.

Keyboard Processing

8.9 Controlling Keyboard LEDs

8.9 Controlling Keyboard LEDs

The following sequences allow the host to control keyboard modifier states for Caps Lock, Scroll Lock, and Num Lock or keyboard LEDs to indicate program status. They are as follows:

ESC [? 108 h - Set NumLock mode (DECNUMLK)

ESC [? 108 l - Reset NumLock mode

ESC [? 109 h - Set CapsLock mode (DECCAPSLK)

ESC [? 109 l - Reset CapsLock mode

"Scroll Lock" or "Hold Screen" cannot be controlled from the host because it suspends transmission from the host and there is no way to release it.

DECLL controls keyboard LEDs independently of any keyboard state. The use of LEDs for this purpose conflicts with their use as keyboard state indicators. The host control selects a mode of how the keyboard LEDs are to be used: as keyboard indicators; or host indicators. If host indicators is selected, then the DECLL sequence can be used to control the keyboard LEDs.

The following control sequences are used to control keyboard LEDs.

ESC [? 110 h - Set Keyboard LEDs Host Indicator Mode (DECKLHIM)

ESC [? 110 l - Reset Keyboard LEDs Host Indicator Mode (default)

Note

See Chapter 2 to re-define keys using the Define Key Editor.

8.10 Keyboard Languages

Table 8–7 lists the keyboard languages available for the VT terminal.

Table 8–7 VT Keyboard Layouts

| | | |
|-------------------------|----------------|--------------|
| Austrian/German | Greek | Russian |
| Belgian/French | Hebrew | SCS |
| British | Hungarian | Slovak |
| Canadian-French/English | Italian | Spanish |
| Czech | North American | Swedish |
| Danish | Norwegian | Swiss-French |
| Dutch | Polish | Swiss-German |
| Finnish | Portuguese | Turkish F |
| Flemish | Romanian | Turkish Q |

Table 8–8 lists the keyboard languages available for the PC terminal.

Table 8–8 Enhanced PC Keyboard Layouts

| | | |
|-----------------|----------------|--------------|
| Belgian | Greek | Romanian |
| British | Hebrew | Russian |
| Czech | Hungarian | SCS |
| Danish | Italian | Slovak |
| Dutch | Latin American | Spanish |
| Finnish | North American | Swedish |
| French | Norwegian | Swiss-French |
| French-Canadian | Polish | Swiss-German |
| German | Portuguese | Turkish |

Keyboard Processing

8.11 Switching Between Keyboard Languages

8.11 Switching Between Keyboard Languages

The VT510 allows the user to easily switch between two different keyboard layouts for several languages (English and Hebrew, for example). This feature allows the VT510 to support both existing conventions and emerging standards for extending the graphic input repertoire and/or switching between languages in dual language environments.

The primary keyboard language corresponds to "Group 1" and generally references the legends on the left portion of the keyboard.

The secondary keyboard language corresponds to "Group 2" and generally references the legends on the right portion of the keyboard.

Unless otherwise overridden, **Ctrl/Alt/F1** activates the primary keyboard language (locking shift), and **Ctrl/Alt/F2** activates the secondary keyboard language. These factory defaults are standard on PCs.

Selecting a new Keyboard Dialect in Set-Up resets the keyboard group shift state to Group 1 and automatically initializes the keyboard character set and VT default character set as shown in table Table 8–9. The keyboard character set is initialized to match the VT default character set.

Table 8–9 Default Character Set when changing Keyboard Language

| Keyboard Language | VT Default Character Set | If desired, change to . . . |
|---|--------------------------------------|-----------------------------|
| Austrian/German, Belgian/French, British, Canadian-English, Canadian-French, Flemish, Danish, Dutch, Finnish, Italian, Portuguese, North American, Norwegian, Spanish, Swedish, Swiss-French, Swiss-German. | DEC MCS or ISO Latin-1 | ISO Latin-1 |
| Czech, Hungarian, Polish, Romanian, SCS, or Slovak | ISO Latin-2 | ISO Latin-1 |
| Greek | DEC Greek or ISO Latin-Greek | ISO Latin-Greek |
| Hebrew | DEC Hebrew or ISO Latin-Hebrew | ISO Latin-Hebrew |
| Russian | KOI-8 Cyrillic or ISO Latin-Cyrillic | ISO Latin-Cyrillic |
| Turkish | DEC Turkish or ISO Latin-Turkish | ISO Latin-Turkish |

Keyboard Processing

8.11 Switching Between Keyboard Languages

If 7-bit NRCS characters is selected, then the following corresponding NRC sets are available on the VT keyboards:

VT keyboards:

- Austrian/German - German NRC
- Belgian/French - French NRC
- British - U.K. NRC
- Canadian-English - French Canadian NRC
- Canadian-French - French Canadian NRC
- Danish - Norwegian/Danish NRC
- Finnish - Finnish NRC
- Flemish - French NRC
- Greek - DEC Greek NRC
- Hebrew - DEC 7-bit Hebrew
- Italian - Italian NRC
- Norwegian - Norwegian/Danish NRC
- Portuguese - Portuguese NRC
- Russian - DEC Russian NRC
- SCS - SCS NRC
- Spanish - Spanish NRC
- Swedish - Swedish NRC
- Swiss-French - Swiss NRC
- Swiss-German - Swiss NRC
- Turkish F - DEC 7-bit Turkish
- Turkish Q - DEC 7-bit Turkish

The 7-bit NRCS character sets are not available on the following keyboards:

- Czech
- Dutch
- Hungarian
- North American
- Polish
- Romanian
- Slovak

Keyboard Processing

8.11 Switching Between Keyboard Languages

If 7-bit NRCS characters is selected, then the following corresponding NRC sets are available on the enhanced PC keyboards:

Enhanced PC Keyboards

- Belgian - French NRC
- British - U.K. NRC
- Danish - Norwegian/Danish NRC
- Finnish - Finnish NRC (same KB as Sweden)
- French - French NRC
- French Canadian - French Canadian NRC
- German - Austrian/German NRC
- Greek - DEC Greek NRC
- Hebrew - DEC 7-bit Hebrew
- Italian - Italian NRC
- Latin American - Spanish NRC
- Norwegian - Norwegian/Danish NRC
- Portuguese - Portuguese NRC
- Russian - DEC Russian NRC
- SCS - SCS NRC
- Spanish - Spanish NRC
- Swedish - Swedish NRC (same KB as Finland)
- Swiss-French - Swiss NRC (Swiss Fr./Gr. is a single PC keyboard)
- Swiss-German - Swiss NRC (Swiss Fr./Gr. is a single PC keyboard)
- Turkish - DEC Turkish NRC

The 7-bit NRCS character sets are not available on the following enhanced PC keyboards:

- Czech
- Dutch
- Hungarian
- North American
- Polish
- Romanian
- Slovak

8.11.1 Non-Spacing Accent Marks

Accented characters that do not appear directly on a keyboard can often be entered by typing a non-spacing diacritical mark followed by a base character.

Table 8–10 Non-Spacing Accent Marks

| Symbol | Non-Spacing Accent Name |
|--------|-------------------------|
| ´ | Acute accent |
| ˘ | Breve |
| ˇ | Hacek (caron) |
| ¸ | Cedilla |
| ˆ | Circumflex accent |
| ¨ | Diaeresis (umlaut) |
| ˙ | Dot above |
| ˝ | Double acute accent |
| ˋ | Grave accent |
| ˊ | Greek Tonos |
| ˉ | Macron |
| ˛ | Ogonek |
| ˚ | Ring above |
| ˜ | Tilde |

Keystrokes assigned non-spacing accent marks do not send any character code immediately, but are used instead to modify the code transmitted by the subsequent keystroke. If a keystroke that has been assigned a non-spacing accent mark is followed immediately by a graphic character, then this forms a valid character in the keyboard character set, and the corresponding character code is transmitted.

When a non-spacing diacritical key is pressed, "Compose" appears on the keyboard indicator line until the next subsequent keystroke.

If the keystroke immediately following the non-spacing diacritical keystroke does not form a valid character in the keyboard character set, then the non-spacing diacritical mark is converted to the corresponding character, if any, and transmitted from the current keyboard character set. The second keystroke is then processed normally. This "error recovery" is different from previous VT auto-compose processing; however, this process follows the emerging standard used on personal computers.

8.11.2 German

For German keyboards, the Group Shift (left Compose) key functions as the keyboard repertoire extension mechanism. Group 1 and Group 2 are defined within the German keyboard dialect and are used whenever the keyboard language is set to German. Group Shift operates as a single shift prefix if pressed and released or as a modifier key if pressed and held.

Keyboard Processing

8.11 Switching Between Keyboard Languages

8.11.3 Hebrew

When Hebrew is selected as the Keyboard Dialect, the **Ctrl/Hebrew** key toggles between the primary and secondary keyboard language.

When switching into 7-bit Hebrew, lowercase English letters are swapped with their corresponding Hebrew characters throughout the display. The **Shift/Hebrew** key also performs this swapping function at any time.

8.12 Keystation Numbers

Figure 8-4 shows the keystation numbers for a VT keyboard.

Figure 8-4 VT Layout - Keystation Numbers

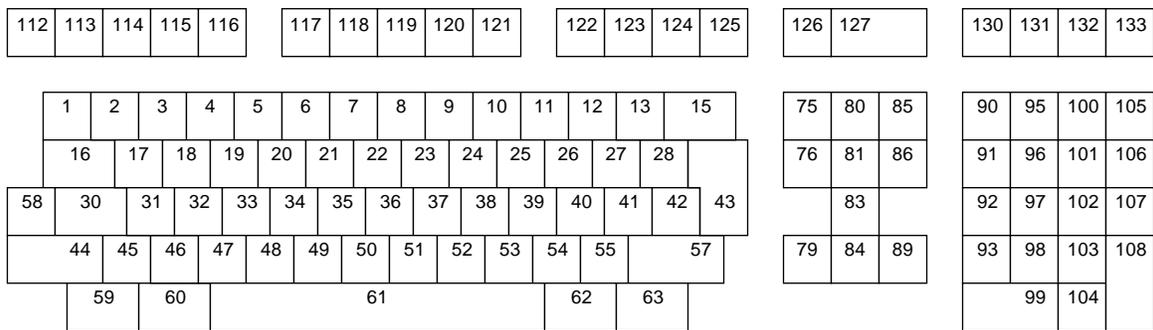
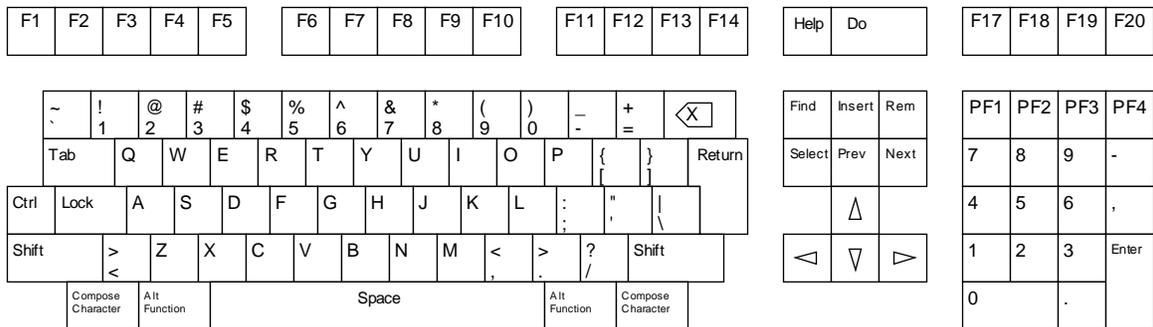


Figure 8-5 shows a typical legend for a North American VT keyboard.

Figure 8-5 VT Layout - Typical North American Key Legends



Keyboard Processing

8.12 Keystation Numbers

Figure 8-6 Enhanced PC Layout - Map Numbers

| | | | | | | | | | | | | | | | | | | | | | |
|-----|-----------------|-----------------|-----------------|-------------|----|----|----|----|----|----|----|----|----|-----|-----|----|----|----|-----|-----|-----|
| 110 | 112 113 114 115 | 116 117 118 119 | 120 121 122 123 | 124 125 126 | | | | | | | | | | | | | | | | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 75 | 80 | 85 | 90 | 95 | 100 | 105 |
| 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 76 | 81 | 86 | 91 | 96 | 101 | 106 | |
| 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | | | | 92 | 97 | 102 | 107 | |
| 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | | 83 | | 93 | 98 | 103 | 108 | |
| 58 | 60 | 61 | | | | | 62 | 64 | 79 | 84 | 89 | 94 | 99 | 104 | 109 | | | | | | |
| | | 65 | | 66 | 67 | | | | | | | | | | | | | | | | |

Figure 8-7 Enhanced PC Layout - Typical North American Key Legends

| | | | | | | | | | | | | | | | | | | | | | | |
|-----------|-------------|-------------|----------------|-------------------|-----------|---------------|--------------------------------------|---------------------------------------|---|------|---|---|-----------|-----|------|------|----------|-------|---------|-----|--|--|
| Esc | F1 F2 F3 F4 | F5 F6 F7 F8 | F9 F10 F11 F12 | Prnt Scrn SyRq | Scrl Lock | Paus Break | Num Lock <input type="checkbox"/> | Caps Lock <input type="checkbox"/> | Scroll Lock <input type="checkbox"/> | | | | | | | | | | | | | |
| ~ ` | ! 1 | @ 2 | # 3 | \$ 4 | % 5 | ^ 6 | & 7 | * 8 | (9 |) 0 | - | = | Backspace | Ins | Home | PgUp | Num Lock | / | * | - | | |
| Tab | Q | W | E | R | T | Y | U | I | O | P | { | } | \ | Del | End | PgDn | 7 Home | 8 Up | 9 PgUp | + | | |
| Caps Lock | A | S | D | F | G | H | J | K | L | : | " | ' | Enter | | | | 4 Left | 5 | 6 Right | | | |
| L Sht | | Z | X | C | V | B | N | M | < | > | ? | / | | | | | Up | | | | | |
| Ctrl | | Alt | Space | | | | | Alt | | Ctrl | | | | | | | | 0 Ins | . | Del | | |
| | | | | | | | | | | | | | | | | | | | | | | |

Keyboard Processing

8.13 Scan Codes Sent in PCTerm Mode for EPC Keyboards

8.13 Scan Codes Sent in PCTerm Mode for EPC Keyboards

The following keys send the corresponding scan codes, regardless of any modifiers that may be in effect.

| Key # | Legend (U.S.) | Scan Code Make/Break ¹ |
|-------|---------------|-----------------------------------|
| 1 | | 29/A9 |
| 2 | | 02/82 |
| 3 | | 03/83 |
| 4 | | 04/84 |
| 5 | | 05/85 |
| 6 | | 06/86 |
| 7 | | 07/87 |
| 8 | | 08/88 |
| 9 | | 09/89 |
| 10 | | 0A/8A |
| 11 | | 0B/8B |
| 12 | | 0C/8C |
| 13 | | 0D/8D |
| 14 | | 7D/FD ² |
| 15 | | 0E/8E |
| 16 | | 0F/8F |
| 17 | | 10/90 |
| 18 | | 11/91 |
| 19 | | 12/92 |
| 20 | | 13/93 |
| 21 | | 14/94 |
| 22 | | 15/95 |
| 23 | | 16/96 |
| 24 | | 17/97 |
| 25 | | 18/98 |
| 26 | | 19/99 |
| 27 | | 1A/9A |
| 28 | | 1B/9B |
| 29 | | 2B/AB [†] |
| 30 | | 3A/BA |
| 31 | | 1E/9E |
| 32 | | 1F/9F |
| 33 | | 20/A0 |
| 34 | | 21/A1 |

¹Make means when the key is pressed; Break means when the key is released.

²Not used on 101/102 keyboard layout.

[†]101 keyboard layout only

Keyboard Processing

8.13 Scan Codes Sent in PCTerm Mode for EPC Keyboards

| Key # | Legend (U.S.) | Scan Code Make/Break ¹ |
|-------|---------------------|-----------------------------------|
| 35 | G | 22/A2 |
| 36 | H | 23/A3 |
| 37 | J | 24/A4 |
| 38 | K | 25/A5 |
| 39 | L | 26/A6 |
| 40 | ; | 27/A7 |
| 41 | ' | 28/A8 |
| 42 | | 2B/AB‡ |
| 43 | Return | 1C/9C |
| 44 | Shift | 2A/AA |
| 45 | | 56/D6‡ |
| 46 | Z | 2C/AC |
| 47 | X | 2D/AD |
| 48 | C | 2E/AE |
| 49 | V | 2F/AF |
| 50 | B | 30/B0 |
| 51 | N | 31/B1 |
| 52 | M | 32/B2 |
| 53 | , | 33/B3 |
| 54 | . | 34/B4 |
| 55 | / | 35/B5 |
| 56 | | 73/F3 ² |
| 57 | Shift | 36/B6 |
| 58 | Left Ctrl | 1D/9D |
| 60 | Left Alt | 38/B8 |
| 61 | Space | 39/B9 |
| 62 | Right Alt | E0 38/E0 B8 |
| 64 | Right Ctrl | E0 1D/E0 9D |
| 90 | Num Lock | 45/C5 |
| 91 | ⁷ Home | 47/C7 |
| 92 | ⁴ ← | 4B/CB |
| 93 | ¹ End | 4F/CF |
| 94 | | 7C/FC ² |
| 96 | ⁸ ↑ | 48/C8 |
| 97 | Keypad ⁵ | 4C/CC |
| 98 | ² ↓ | 50/D0 |
| 99 | ⁰ Ins | 52/D2 |

¹Make means when the key is pressed; Break means when the key is released.

²Not used on 101/102 keyboard layout.

‡102 keyboard layout only

Keyboard Processing

8.13 Scan Codes Sent in PCTerm Mode for EPC Keyboards

| Key # | Legend (U.S.) | Scan Code Make/Break ¹ |
|-------|----------------------|-----------------------------------|
| 100 | Keypad * | 37/B7 |
| 101 | ⁹ PgUp | 49/C9 |
| 102 | ⁶ → | 4D/CD |
| 103 | ³ PgDn | 51/D1 |
| 104 | [.] Del | 53/D3 |
| 105 | Keypad - | 4A/CA |
| 106 | Keypad + | 4E/CE |
| 107 | | 7E/FE ² |
| 108 | Enter | E0 1C/E0 9C |
| 109 | | 78/F8 ² |
| 110 | Esc | 01/81 |
| 112 | F1 | 3B/BB |
| 113 | F2 | 3C/BC |
| 114 | F3 | 3D/BD |
| 115 | F4 | 3E/BE |
| 116 | F5 | 3F/BF |
| 117 | F6 | 40/C0 |
| 118 | F7 | 41/C1 |
| 119 | F8 | 42/C2 |
| 120 | F9 | 43/C3 |
| 121 | F10 | 44/C4 |
| 122 | F11 | 57/D7 |
| 123 | F12 | 58/D8 |
| 125 | Scroll Lock | 46/C6 |

¹Make means when the key is pressed; Break means when the key is released.

²Not used on 101/102 keyboard layout.

The keys in the following table send different series of scan codes depending on the modifier state in effect (Shift, Control, Alt, and/or Num Lock). Many of them have a base scan code that is identical to another key. To make each key unique, some have an extra byte hex 'E0' or hex 'E1' added to their scan code sequence.

Keyboard Processing

8.13 Scan Codes Sent in PCTerm Mode for EPC Keyboards

| Key # | Legend (U.S.) | Base Case Make/Break | Shift Case Make/Break | Num Lock ON Make/Break |
|-------|---------------|----------------------|--------------------------|-------------------------|
| 75 | | E0 52/E0 D2 | E0 AA E0 52/E0 D2 E0 2A* | E0 2A E0 52/E0 D2 E0 AA |
| 76 | | E0 53/E0 D3 | E0 AA E0 53/E0 D3 E0 2A* | E0 2A E0 53/E0 D3 E0 AA |
| 79 | | E0 4B/E0 CB | E0 AA E0 4B/E0 CB E0 2A* | E0 2A E0 4B/E0 CB E0 AA |
| 80 | | E0 47/E0 C7 | E0 AA E0 47/E0 C7 E0 2A* | E0 2A E0 47/E0 C7 E0 AA |
| 81 | | E0 4F/E0 CF | E0 AA E0 4F/E0 CF E0 2A* | E0 2A E0 4F/E0 CF E0 AA |
| 83 | | E0 48/E0 C8 | E0 AA E0 48/E0 C8 E0 2A* | E0 2A E0 48/E0 C8 E0 AA |
| 84 | | E0 50/E0 D0 | E0 AA E0 50/E0 D0 E0 2A* | E0 2A E0 50/E0 D0 E0 AA |
| 85 | | E0 49/E0 C9 | E0 AA E0 49/E0 C9 E0 2A* | E0 2A E0 49/E0 C9 E0 AA |
| 86 | | E0 51/E0 D1 | E0 AA E0 51/E0 D1 E0 2A* | E0 2A E0 51/E0 D1 E0 AA |
| 89 | | E0 4D/E0 CD | E0 AA E0 4D/E0 CD E0 2A* | E0 2A E0 4D/E0 CD E0 AA |

*When the left key is pressed, the AA-2A shift break and make should envelope the base codes as shown in the previous table. When the right key is pressed, the code B6 (right shift break) is sent in place of AA and the code 36 (right shift make) is sent in place of 2A. If both right and left keys are pressed, then both B6 and AA are sent where AA is shown, and both 36 and 2A are sent where 2A is shown.

| Key # | Legend (U.S.) | Scan Code Make/Break | Shift Case Make/Break |
|-------|---------------|----------------------|---------------------------|
| 95 | Keypad | E0 35/E0 B5 | E0 AA E0 35/E0 B5 E0 2A * |

The marker code Hex 'E0' precedes shift codes that are artificially produced by the keyboard logic. These artificially produced shift codes are not repeated during typamatic (auto repeat) operation of the corresponding key. Only the unique base code is repeated at the auto repeat rate. The terminal must ensure that both shift states are restored when all shift-dependent keys are released.

| Key # | Legend (U.S.) | Scan Code Make/Break | Ctrl Case and Shift Case Make/Break | Alt Case Make/Break |
|-------|----------------|-------------------------|-------------------------------------|---------------------|
| 124 | PrtSc SysRq | E0 2A E0 37/E0 B7 E0 AA | E0 37/E0 B7 | 54/D4 |

Notice there are two base scan codes associated with keystation 124. To ensure the make/break sequence, the code associated with the break must reflect the make code regardless of the Alt state at the time of the break.

| Key # | Legend (U.S.) | Scan Code Make | Ctrl down Make |
|-------|----------------|-------------------|----------------|
| 126 | Pause Break | E1 1D 45 E1 9D C5 | E0 46 E0 C6 |

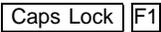
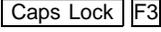
The Pause/Break key is a make-only key, meaning it generates a code when pressed, not when released. All scan codes or actions associated with this key occur with the make of the key.

Keyboard Processing

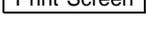
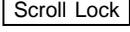
8.14 Scan Codes Sent in PCTerm Mode for VT Keyboards

8.14 Scan Codes Sent in PCTerm Mode for VT Keyboards

All keystrokes send scan codes except:

| Key | Which sends . . . |
|---|-------------------|
|  | Hold |
|  | Print |
|  | Enter Set-Up |
|  | Send Break |

All keys including Shift, Alt, and Ctrl send make codes immediately upon being pressed, except the Caps Lock key. The make code for the Caps Lock key is sent after the Caps Lock key is released. The following keys send the corresponding scan codes, regardless of any modifiers that may be in effect.

| Key # | Legend (U.S.) | Scan Code Make/Break |
|-------|---|---|
| 42 |  | 2B/AB |
| 107 |  | 7E/FE |
| 124 |  | E0 3D/E0 BD |
| 125 |  | E0 3E/E0 BE |
| 126 |  | E0 3F/E0 BF |
| 127 |  | 01/81 (Like  key on PC keyboard) |
| 130 |  | E0 41/E0 C1 |
| 131 |  | E0 2A E0 37/E0 B7 E0 AA Ctrl or Shift E0 37/E0 B7 |
| |  | Alt 54/D4 |
| 132 |  | 46/C6 |
| 133 |  | E1 1D 45 E1 9D C5 |
| |  | Ctrl E0 46 E0 C6 |

¹On Numeric keypad.

²This is a make-only key; code is sent only when key is pressed.

This chapter describes the serial asynchronous communications through the host ports.

9.1 Overview

The VT510 is a single-session terminal. You have a choice of switching between Comm1, an EIA 232 25-pin port; and Comm2, an MMJ port, for host communications.

The 25-pin port uses either a male or a female connector but does not use both at the same time. In Set-Up, you can also designate this port as a printer port.

The VT510 has the following features:

- Baud rate up to 115.2 K
- 1024-byte receive buffer to prevent buffer overflow
- Flow control scheme that independently selects the transmit and the receive side of the communication line
- Expanded flow control options to include hardware DTR/DSR flow control
- A Hold state that causes an XOFF to be sent immediately
- Option to accept or ignore NUL characters
- Support for half-duplex mode

9.2 Introduction to Communications

This chapter describes the physical layer and data link layer. The physical layer is comprised of the mechanical, electrical, and functional arrangements necessary for a physical connection, including cables and telephone lines. The physical layer applies to both ANSI and ASCII terminal emulations.

The data link layer is the electronic protocol used to convey a unit of information from the VT510 to a host computer. This layer includes flow control, character conversions, and some forms of error control.

The asynchronous character format consists of a start bit (space), the data bits (1=mark, 0=space), the parity bit (if present), and one or two stop bits (mark). The data bits represent a character with the least significant bit leading. The parity bit may be enabled as either none, odd, even, space, or mark. Received parity may be checked or ignored. Only odd or even parity when received and must be the same as the parity transmitted. These parameters can be selected through Set-Up or by using the escape sequence, DECSPP.

Communications

9.2 Introduction to Communications

For further information on the asynchronous character format, refer to 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*.

The VT510 supports the following:

- Full-duplex mode
- Half-duplex mode

Full-duplex mode allows simultaneous two-way communication, while half-duplex mode limits communication to one way at any given time. The VT510 always supports full duplex (two wires) at the physical layer. Half-duplex mode is a simple data link layer protocol intended to support half-duplex modems. It is common to view the terminal and attached modem as a single system. Refer to Section 9.3.4 for details on half-duplex mode. This feature can be selected from Set-Up or by the control function, DECHDPXM.

The VT510 does not support synchronous communications.

9.3 Physical Communications Link

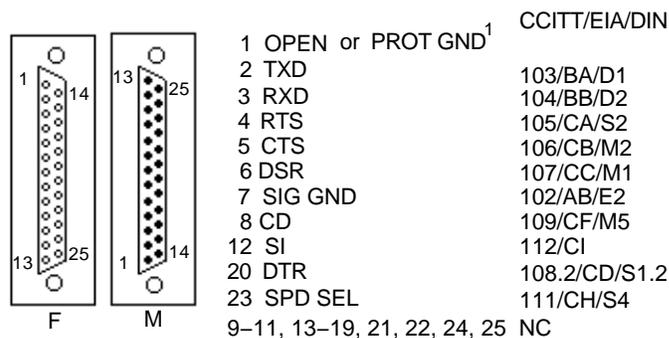
Communications lines may be connected to both Comm1 and Comm2 ports without interaction between the two lines. You can use the **Communication Port select** Set-Up menu to select the physical link to the cables. The port selection can also be programmed through the escape sequence, DECSCP.

When you change from EIA 232-E (25-pin port) to DEC 423 (MMJ port), the VT510 performs a disconnect on the EIA 232-E port. If the change is from DEC 423 to EIA 232-E, then the VT510 performs a disconnect on the EIA 423 port (deasserting DTR).

9.3.1 25-Pin Connectors

Figure 9-1 shows the 25-pin EIA 232 port.

Figure 9-1 25-Pin EIA 232 Port Pin Numbers



MA-0019-93.GRA

The DB-25P serial port accepts a variety of modems that meet national and international standards. Interface signals are labeled with both EIA and CCITT designations.

Communications

9.3 Physical Communications Link

Table 9–1 shows the EIA interface signals and functions.

Table 9–1 EIA Interface Signals and Functions

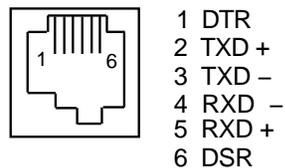
| Pin | Signal Name | Source | Function | CCITT/EIA/DIN |
|-----------------------------|-------------|----------|--------------------------|------------------|
| 1 | | | N.C. ¹ | See ¹ |
| 2 | TXD | Terminal | Transmitted Data | 103/BA/D1 |
| 3 | RXD | Modem | Received Data | 104/BB/D2 |
| 4 | RTS | Terminal | Request to Send | 105/CA/S2 |
| 5 | CTS | Modem | Clear to Send | 106/CB/M2 |
| 6 | DSR | Modem | Data Set Ready | 107/CC/M1 |
| 7 | SGND | | Signal Ground | 102/AB/E2 |
| 8 | RLSD | Modem | Rec Line Signal Detector | 109/CF/M5 |
| 9-11, 13-19, 21, 22, 24, 25 | | | N.C. | |
| 12 | SPDI | Modem | Speed Mode Indication | 112/CI/M4 |
| 20 | DTR | Terminal | Data Term. Ready | 108.2/CD/S1.2 |
| 23 | SPDS | Terminal | Speed Select | 111/CH/S4 |

¹ Pin 1 of the 25-pin connector normally will be open; however, the VT510 shall provide provisions for a 100-ohm resistor ground to be added to the VT510's printed circuit board. This may become necessary for products sold in Germany.

9.3.2 DEC Corporate Modular Jacks (MMJ)

The modular jacks provide DEC-423 compatible levels with the intent of allowing greater length between terminal and host. Limited modem support is also provided. The DTR output and DSR input are supported on this connector. Transmit ground for transmit data and DTR are isolated from receive ground used for receive data and DSR. Figure 9–2 shows the MMJ port signals.

Figure 9–2 MMJ Modular Jack Pin Numbers



MA-0020-93.GRA

Table 9–2 describes the function of each MMJ interface signal.

Table 9–2 MMJ Interface Signals

| Pin | Signal Name | Source | Function |
|-----|-------------|----------|----------------------|
| 1 | DTR | Terminal | Data Terminal Ready* |

*Pin 1 is a terminal output signal and uses pin 3 as a reference.

(continued on next page)

Communications

9.3 Physical Communications Link

Table 9–2 (Cont.) MMJ Interface Signals

| Pin | Signal Name | Source | Function |
|-----|-------------|----------|------------------------|
| 2 | TXD+ | Terminal | Transmitted Data |
| 3 | TXD- | Terminal | Transmit Signal Ground |
| 4 | RXD- | Modem | Receive Signal Ground |
| 5 | RXD+ | Modem | Received Data |
| 6 | DSR | Modem | Data Set Ready† |

†Pin 6 is a terminal input signal and uses pin 4 as a reference.

9.3.3 Connector Pins Description

This section describes the function of full-duplex mode connector pins. Half-duplex mode connector pins have different functions than the full-duplex mode connector pins as mentioned in Section 9.3.4.

9.3.3.1 Transmitted Data–TXD

The TXD signal is supported on the 25-pin D-sub and the Corporate Modular Connector.

Data on this circuit represents the serially encoded characters that are transmitted from the VT510. This circuit is held at the mark state (-) during stop bits between characters and also at times when no data is being transmitted.

On the 25-pin connector when modem control is enabled, no data is transmitted unless Clear to Send is asserted from the modem. Assertion of DSR or RLSD from the modem is not required. This is specific to the 25-pin EIA connector and is intended to allow the VT510 to communicate with intelligent modems (like the DF224) before a connection has been established.

9.3.3.2 Received Data–RXD

The RXD signal is supported on the 25-pin D-sub as well as on the Corporate Modular Connector.

Data on this circuit represents the serially encoded characters to be received by the VT510.

When modem control is not enabled, received data is processed regardless of the state of the control lines.

On a 25-pin EIA connector, when modem control is enabled and a connection has been established (DSR from the modem is asserted), the received characters are ignored if RLSD is unasserted, except when Disconnect Delay in Set-up is selected as **No disconnect**. This is an implementation in firmware of mark carrier clamping.

If a connection has not been established (DSR from the modem is not asserted), then received characters are processed even if RLSD is unasserted. This is an implementation that permits V.25 bis compatible autodial modems to be used without the user having to set "data leads only" to access the autodial functions.

9.3.3.3 Request to Send–RTS

The RTS signal is supported on the 25-pin D-sub but not on the Corporate Modular Connector.

For modems with this function, asserting RTS may put the modem in the transmit mode. When the modem is in the transmit mode, it then asserts CTS.

Note

For full-duplex modems without RTS inputs, CTS is asserted by the modem whenever it is capable of transmission.

9.3.3.4 Clear to Send–CTS

The CTS signal is supported on the 25-pin D-sub but not on the Corporate Modular Connector.

Assertion of CTS indicates that the modem is ready to receive data (that is, the terminal is clear to send data to the modem).

The data can be either a command to the modem if "off line" (DSR de-asserted) or transmitted data to the host if "on line" (DSR asserted).

9.3.3.5 Data Terminal Ready–DTR

The DTR signal is supported on the 25-pin D-sub as well as the Corporate Modular Connector.

The VT510 asserts DTR whenever it is ready to transmit and/or receive on the port to which it is associated with.

The VT510 de-asserts DTR when:

- Recalling saved settings
- Recalling factory defaults
- Pressing Shift/Break
- Powering up self-test
- Resetting to Initial State (RIS)–hard reset
- DTR is being used for hardware flow control and the receive buffer has reached the flow control threshold

The VT510 does not de-assert DTR when:

- Resetting session
- Clearing comm

9.3.3.6 Data Set Ready–DSR

The DSR signal is supported on the 25-pin D-sub as well as the Corporate Modular Connector.

When the DTR/DSR is not the selected flow control scheme, the assertion of DSR indicates the following:

- That the modem is in the data mode
- That the modem is connected to the communications channel
- The answer tone is finished

Communications

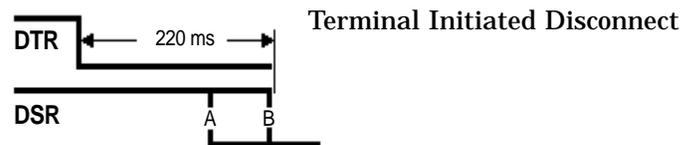
9.3 Physical Communications Link

- The user is being charged by the PTT
- That the modem is ready to exchange the appropriate control signals to initiate data transmission/reception

When DTR/DSR is the selected hardware flow control scheme only, refer to Section 9.4.2.2.3.

9.3.3.6.1 Modem Initiated Disconnect When DSR is unasserted during the progress of a call but before DTR is unasserted, the terminal interprets this condition as a lost or aborted call and disconnects. Any subsequent assertion of DSR is considered a new call. If connected to a modem and the modem's power is turned off or if DSR becomes an open circuit, then the VT510 interprets these conditions as a de-assertion. The state of the DSR input is shown on the indicator status line display.

9.3.3.6.2 Terminal Initiated Disconnect The terminal disconnects itself from the modem by dropping DTR.



If DSR is de-asserted 220 ms after DTR goes de-asserted, then do nothing, since the modem has already done a disconnect. If DSR is still asserted 220 ms after DTR goes deasserted, then DTR must remain deasserted for greater than 2 seconds to assure that the modem does a disconnect.

9.3.3.6.3 Modem off line When DSR is unasserted and modem control is enabled on the 25-pin EIA connector, the system is in a transitory "off line" state. In this state, the user may interact with a dial-up modem to enter numbers, change modem set-up, and so on.

When DSR is asserted and modem control is being used, the modem, terminal, and host system are ready for communication to a remote host.

9.3.3.7 Receive Line Signal Detector—RLSD

This signal is supported on the 25-pin D-sub but not on the Corporate Modular Connector.

RLSD is also called Carrier Detect. The modem asserts RLSD when the received signal is of sufficient amplitude or in the case of "training modems," when both modems have adjusted and equalized to the prevailing line conditions, to ensure demodulation of Received Data. The unasserted condition of RLSD indicates that there is neither a received signal nor that it is unsuitable for demodulation.

9.3.3.8 Speed Indicator—SPDI

The SPDI signal is supported on the 25-pin D-sub but not on the Corporate Modular Connector.

This signal comes from the modem. When **Modem Control** is enabled in Set-Up, the transmit and receive speed is set as follows:

| State | Transmit and Receive Speed |
|------------|----------------------------|
| Unasserted | Modem Low Speed |
| Asserted | Modem High Speed (default) |

The user should set these Set-Up fields so that the fast speed (2400 baud, for example) is exactly twice the slow (1200 baud, in the following example) if V.25 bis compatibility is desired. Otherwise, the user may set the two speeds as applicable (1200/300 baud, in the following example).

| | Assert | De-assert |
|----------|--------|-----------|
| Bell 212 | 1200 | 300 |
| Bell 103 | 300 | n/a |
| V.22 | 1200 | 600 |
| V.22 bis | 2400 | 1200 |
| V.26 ter | 2400 | 1200 |
| V.32 | 4800 | 2400 |
| V.32 | 9600 | 4800 |

9.3.3.9 Speed Select–SPDS

The SPDS signal is supported on the 25-pin D-sub but not on the Corporate Modular Connector.

If the speed is greater or equal to 1200 baud, then Speed Select will be high. If the speed is below 1200 baud, then Speed Select will be slow. This signal comes from the terminal.

9.3.4 Half-Duplex Mode

Half-duplex mode works on the EIA 232 line only. It uses the pin signals to control the data traffic to one direction at any given time.

In this mode, Data Terminal Ready (DTR) is always asserted. The terminal checks the assertion of Data Set Ready (DSR) constantly. The terminal disconnects once DSR is dropped. Ready to Send (RTS) is asserted only if the terminal intends to transmit.

Before transmitting, the terminal checks for the presence of Carrier Detect (CD). If CD is still detected for five seconds, then the terminal disconnects. Otherwise, the terminal asserts the Request to Send (RTS) signal and starts detecting the Clear to Send (CTS) signal. Transmission starts if CTS is detected within five seconds. If CTS is not monitored within five seconds, then the terminal disconnects. After transmission, RTS is de-asserted from the terminal. If CTS is still detected within the next five seconds, then the terminal disconnects.

9.3.5 Supported Modem Configurations

This section describes the supported modem configurations.

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9.3 Physical Communications Link

9.3.5.1 CCITT Public Switched Telephone Network (2-wire only)

V.21 Modem (V.24/V.28)
Async, FDX, up to 200/300 bit/s
V.22 Modem (V.24/V.28)
Async, FDX, up to 1200 bit/s
V.22 bis Modem (V.24/V.28)
Async, FDX, up to 2400 bit/s
V.23 Modem (V.24/V.28)
Async, Asymmetric FDX
Receive = 600 or 1200 bit/s,
Transmit = Reverse channel at 75 bit/s
V.25 bis Auto Dial Protocol Modem and Hayes

9.3.5.2 CCITT Dedicated Line (2-Wire / 4-Wire) Data Network

V.21 Modem (V.24/V.28, 2-W)
Async, FDX, 200/300 B
V.23 Modem (V.24/V.28)
FDX, Async, 1200 B, 4-W
V.25 bis compatible Modem
Async, FDX, any standard speed from 300 baud up.
X.20 bis Full-Duplex asynchronous 300 baud data service unit

9.3.5.3 European Public Circuit Switched Data Network

D1200S (Germany)
VC-DCE (Nordic Network)
VPC-DCE (Nordic Network)
X.20bis (V.21) Data Service Unit (V.28)
Async, FDX, up to 300 B

9.3.5.4 European Public Packet Switched Data Network (PSDN)

Germany: DATEX-P
Basic Datex P10-Service (X.25): Not supported
Additional Datex-P20 Service:
Fixed Connections to PAD facility with X.28 procedure:

| Service | DCE |
|-----------------------|---|
| DATEX-P20 H300 | DFG300(X.20 bis), D300S (V.21) |
| DATEX-P20 H1200 | D1200S12(V.22), D1200S (V.23,4-W) |
| DATEX-P20 H1200/75 | D1200S (V.23 with sec. channel, 75 baud Transmit / 1200 Baud Receive) |
| DATEX-P20 H2400 | |

Access to DATEX-P PAD facility from other public switched networks with X.28 procedure:

| Service | Access | DCE |
|-----------------------|---------------|--|
| DATEX-P20 L300 | DATEX-L | DFG300 (X.20bis) |
| DATEX-P20 F300 | PSTN | D300S (V.21) |
| DATEX-P20 F1200 | PSTN | D1200S12 (V.22) |
| DATEX-P20 F1200/75 | PSTN | D1200S (V.23 with sec channel, 75 baud Transmit, 1200 baud Receive) |
| DATEX-P20 F2400 | | |

9.4 Data Link Layer

This section describes the data link layer.

9.4.1 7-Bit VT100 or 8-Bit VT510 Operation

The VT510 supports three broad classes of application requirements:

- Strict compatibility for existing VT100 applications:
 - No 8-bit control codes
 - No 8-bit data Function keys are not limited to the VT100 set as in previous terminals.
- A migration path that allows most applications to run without modification:
 - No 8-bit control codes
 - 8-bit graphic data allowable
 - VT400 function keys are allowable (but not immediately useful) and can be integrated into the application over time.
- Full VT510 mode (VT level 4) functionality:
 - 8-bit data allowable
 - 8-bit controls allowable
 - All VT500 function and modifier keys

The VT510 application requirements are possible through the following VT terminal modes:

- VT52 Mode (7-bit characters, 7-bit controls)
- VT100 Mode (7-bit characters, 7-bit controls)
- VT400 Mode, 8-bit characters, 7-bit controls
- VT400 Mode, 8-bit characters, 8-bit controls
- VT400 Mode, 7-bit characters (Keyboard restricted to keys that generate 7-bit codes, 7-bit graphics, 7-bit controls, for NRC sets, worldwide version only).

These modes are the only supported modes. 8-bit characters are temporarily disabled when in VT100 mode.

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9.4 Data Link Layer

The following are certain limitations within these modes:

- The terminal accepts both C0 and C1 controls when 8-bit characters are selected (7-bit NRCS Characters is not selected).
- The terminal accepts both GL and GR characters when 8-bit Characters are selected.
- When 7-bit characters are selected, the terminal sets the high bit of all received characters to zero. This action results in compatible character handling. The received characters, therefore, have only seven significant bits. This is applicable to both graphics characters and control characters.
- If the user needs to restrict the controls to 7 bits, but still needs 8-bit graphic characters and new function keys, then the user can select **Transmit 7-bit controls** with an 8-bit host line. To get full efficiency out of new applications, select 8-bit controls and an 8-bit host line. The **7-bit NRCS Characters** selection is compatible with 7-bit NRC-based applications.
- C1 controls are never available directly from the default keyboard, although they may be available indirectly through the function keys or numeric compose.
- When the terminal is in printer controller mode and the 7-bit character mode, upon receiving 8-bit graphic characters, the terminal immediately retransmits them through the printer port to the printer. The highest bit is not stripped off.
- In printer controller mode when the terminal is receiving 8-bit characters and immediately retransmitting them on a 7-bit line, the high bit is stripped off.
- When the screen contains 8-bit (GR) characters and is being printed on a 7-bit printer, the characters are subject to constraints, which are described in Chapter 10.
- Keyboard operation guidelines are described in Chapter 8.

9.4.2 Flow Control

Flow control is a means to alternately suspend and resume the flow of characters over serial asynchronous point-to-point communication lines.

Depending on the type of flow control selected, the stop/resume transmission signal is different. Users can select a software flow control scheme, a hardware flow control scheme, or a combination software and hardware flow control scheme to meet their communication environment.

9.4.2.1 Receive Buffer

The VT510 operates at a transmission speed of up to 115.2K baud. To prevent loss of data, the receive buffer is 1024 byte. The substitute (SUB) character is substituted in the input buffer for any character with detected receive parity errors or framing errors. If the input buffer overflows, a SUB character is placed in the buffer in place of the lost characters. The SUB character is displayed as a reverse question mark.

9.4.2.2 Flow Control Selection

The VT510 supports bidirectional flow control. The flow control scheme can be selected independently for the transmit and receive direction. The user has the following choices for transmit data flow control:

- No Flow Control
- XON/XOFF
- DTR
- Both

The user has the following choices for receive flow control:

- No Flow Control
- XON/XOFF in VT mode or XPC in PC term mode
- DSR
- Both

You can select flow control methods from Set-Up or through the escape sequences, DECSFC.

9.4.2.2.1 No Flow Control

If **No Flow Control** is selected, then when the receive buffer is full, it does not send any signal; therefore, the **Hold** key is disabled. The **Ctrl/S** key stops the flow and the **Ctrl/Q** resumes the flow. It is left to the application and user to prevent buffer overflow.

Software that does not support flow control may use all the features of the VT510 by treating NUL as a fill character. If **Ignore NUL** is selected in Set-Up, then NUL is discarded upon receipt. All other received characters are stored in the input buffer for further processing. **Ignore NUL** or **Accept NUL** can be selected from Set-Up or through the escape sequence, DECNUMLM.

The VT510 can be used without flow control or fill characters, when the:

- Software never sends ESC sequences to the terminal
- Baud rate is limited to 19200 baud or less
- Software does not use smooth scrolling

9.4.2.2.2 XOFF/XON or XPC Flow Control

In the XOFF/XON flow control, two characters establish flow control. In VT mode, these two characters are DC1(11H) (XON) and DC3(13H) (XOFF). In VT mode, the VT510 sends XOFF to suspend the transmission of data and XON to resume the reception. Receipt of XOFF inhibits the VT510 from transmitting any code except XOFF and XON. If the keyboard data buffer overflows, then the keyboard locks and "wait" is displayed in the keyboard indicator line. Transmission resumes upon receipt of XON.

In PC Term mode, the terminal receives from the host 11H(DC1) and 13H(DC3) for flow control; but the terminal sends 65H and 67H to the host to resume/stop the communication, known as XPC flow control.

VT510 sends XOFF to indicate halt of transmission when:

1. The number of characters in the input buffer reaches the first XOFF point since the last XON was sent.

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9.4 Data Link Layer

2. The number of characters in the input buffer reaches the second XOFF point since the last XON was sent.
3. The input buffer is full.
4. Entering a hold state.

Entering a Hold state causes an XOFF to be sent by the VT510. A Hold state can be generated by pressing the **[Hold]** key or entering **[Ctrl/S]**. When exiting from the hold state either by depressing the **[Hold]** key or entering **[Ctrl/Q]**, the terminal sends XON to the host unless the input buffer is filled up to or beyond the first XOFF point (flow control threshold).

With the exception of exiting from the hold state, the VT510 sends an XON when the input buffer is emptied to the XON point and when XOFF was the last flow control sent.

Refer to the Section 9.4.2.2.5 for more information on the thresholds.

The VT510 re-initializes the XON/XOFF(XPC) state under the following conditions:

1. The Clear Comm function is performed.
2. The completion of the NVR recall after the RECALL function is performed.
3. The completion of all tests in a self-test sequence is performed.
4. Successful completion of a connection - generally, DSR assertion.
5. The reception of RIS.

9.4.2.2.3 DSR/DTR Flow Control

When **Hardware flow control** is selected, DTR is asserted any time the terminal is not in self-test and the terminal's input buffer is below the flow control threshold; DTR is de-asserted when the input buffer is filled up to or beyond the threshold.

If the terminal is a sending device, then it polls DSR before transmitting each character. If DSR is not being asserted by the receiving device, then transmission of the character is suspended until DSR is asserted.

As in the XON/XOFF software flow control, VT510 deasserts DTR when:

1. The number of characters in the input buffer is greater than or equal to the flow control threshold (first XOFF point).
2. Entering the Hold state.

As in the XON/XOFF flow control, entering a Hold state causes a deassertion of DTR. When exiting from the hold state either by depressing the **[Hold]** key or by entering **[Ctrl/Q]**, the terminal asserts DTR unless the input buffer is filled up to or beyond the flow control threshold (first XOFF point).

With the exception of exiting from the hold state, the VT510 reasserts DTR when the input buffer is emptied to the "resume transmission" (XON) point.

DSR/DTR can be used for hardware flow control when they are not needed for modem control functions. When **Modem Control** is enabled, DST/DTR should not be selectable.

9.4.2.2.4 Software and Hardware Combined Flow Control

For software and hardware flow control, both DTR/DSR and XON/XOFF(XPC) are used to control the data flow. When the receive input buffer reaches the flow control threshold, XOFF is sent and DTR is deasserted. When transmitting, the terminal must be in the XON state with DSR asserted to transmit the next character, except in the case of (XON/XOFF).

9.4.2.2.5 Flow Control Threshold

Table 9–3 shows the flow control threshold points available for the VT510.

Table 9–3 Flow Control Threshold Points

| 1st Flow Control Threshold | Resume Transmission Point | 2nd Flow Control Threshold |
|----------------------------|---------------------------|----------------------------|
| 64 | 32 | 896 |
| 768 | 128 | 896 |

9.4.2.3 Show Control Character Mode

While in show control character mode, all characters are temporarily stored in the input buffer and eventually displayed on the screen in the CRM font. XON and XOFF can serve both as data (to be displayed) and flow control. Note that this circumstance is unique to show control character mode.

9.4.2.4 Set-Up on Flow Control Handling

Entering Set-Up leaves the received character processing in the state it was in before entering Set-Up. Characters continue to fill the silo, depending on the flow control type selected. A signal (XOFF or lower DTR) will be sent when the silo gets to the first flow control threshold.

9.4.2.5 When Disconnect Occurs

If a disconnect occurs while the VT510's silo contains characters that have not been displayed or printed, then the characters may be discarded in order to prepare for the next call. XON is sent when a new connection is established.

9.5 Features that Affect Communications

The following features described in Chapter 2. affect communication:

- Clear communications
- On-Line/Local
- Transmit speed
- Receive speed
- Transmit rate limiting
- Word size
- Parity
- Stop bits
- Modem control
- Modem high speed
- Modem low speed

Communications

9.5 Features that Affect Communications

- Disconnect delay
- Local echo

9.5.1 Clear Communications

If the terminal appears to be "locked" in Set-Up, then select **Clear communications** to clear the current session. This action:

1. Aborts any print operation in progress if the printer is allocated to the active session.
2. Aborts any escape sequence, control sequence, or device control string (DCS) processing.
3. Clears the keyboard buffer.
4. Clears the receive buffer.
5. Clears the transmit buffer.
6. Takes the terminal out of printer controller mode.
7. Sends XON to the host port if software flow control is in use. Asserts DTR if hardware flow control is in use.
8. Resets XOFF received flags on the printer and host ports if software flow control is in use.

The communications had been cleared when "Done" appears on the terminal status line.

Note

Clear communications does not cause a disconnect and does not clear the screen.

9.5.2 Connection

If XON/XOFF flow control is enabled, then a single XON will be transmitted after the connection is made. When a connection is made, the VT510 performs the following operations to ensure that it is ready to send and receive:

1. Unlock the keyboard, if it is locked.
2. Clear any transmit in progress on this port.
3. Clear all buffers associated with this port.
4. Clear the "XOFF sent" and "XOFF received" state of this port.
5. At the reception of the carrier tone, the modem asserts CD, and data transmission/reception may begin.

9.5.3 Line Disconnection

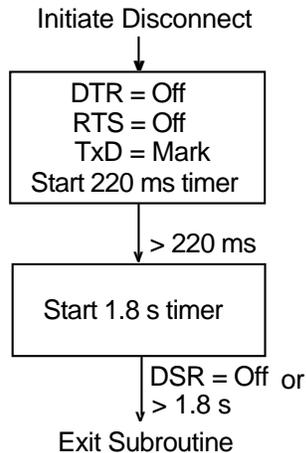
A disconnect sequence occurs on the following conditions:

- Operator initiates a disconnect by pressing Shift/Break (note that the BREAK can be disabled through Keyboard Set-Up).
- Doing a RECALL, or DEFAULT.
- Loss of DSR.

Communications

9.5 Features that Affect Communications

- Switching to the EIA 232-E port from the DEC423 port or to the DEC423 port from the EIA232-E port.
- With the 25-pin connector and modem control enabled, after a connection has been established, loss of RLSD for greater than 2 seconds (or 60 ms) on host line 1.
- Receipt of a DECTST or RIS sequence (Except the keyboard test in DECTST that leaves the terminal on line).
- Turning off the terminal.



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Normally DTR and RTS are asserted by the VT510 whenever power is applied except:

- During a disconnect sequence
- When hardware flow control DTR/DSR is being used and the receive buffer reaches 64 bytes threshold

9.5.4 Break

The **Break** key operates as described in Chapter 8.

A break consists of a 275 ± 25 ms space condition on the transmit data line if transmission is enabled. The break (space) condition is separated from any subsequent mark-to-space transition by at least 100 ms.

9.5.4.1 Received Break

If a break is detected on the received data circuit, then it is ignored. One or more error characters (reverse question mark) may be displayed because the framing errors were generated.

This chapter describes the features of the VT510 printer ports.

10.1 Overview

The VT510 expands the traditional printer port extension to include support for IBM ProPrinter and compatible low-cost parallel interface printers. In Set-Up, you specify the type of printer attached and the terminal automatically selects the correct printing commands and character sets.

The VT510 printer port has the following features:

- Centronics parallel port (25-pin, female, D-type connector)
- IBM ProPrinter mode
- Ability to transparently pass all characters (including the NUL character) through to the printer in printer controller mode

10.2 Serial Ports

The VT510 has two bi-directional serial communication/printer ports. Comm1 has full modem support at 300 to 115.2K baud:

EIA 232

Comm 1:
Two 25-pin D-sub male/female
(use one or the other)

EIA 423

Comm 2:
6-pin MMJ

You can connect both a serial and parallel printer to the VT510 at the same time. In this case, the printer port (serial or parallel) selected in Set-Up is used and the other port is inactive.

The interface signals are the same as those previously described in Chapter 9.

10.2.1 Serial Port Flow Control

The VT510 serial printer port is fully bi-directional when **Printer To Host** communications is enabled in Set-Up or by a Media Copy (MC) control sequence. Transmit and receive flow control protocols can be set independently to one of four choices through Set-Up or by the control sequence, DECSFC.

- None
- XON/XOFF

Printer Port

10.2 Serial Ports

- DTR/DSR
- Both

The printer port has two buffers: one is for output, which is 16 bytes long; and the other is for input, which is 254 bytes long. **XON/XOFF:** For the 254-character receive input buffer, the XON point is 32. The first XOFF point is 64 characters, and the second is 220 characters.

DTR/DSR: If enabled, the terminal polls DSR before transmitting each character. The terminal asserts DTR until the buffer fills up to or beyond the first XOFF point. When the buffer empties to the XON point, the terminal again asserts DTR. When not used for hardware flow control, DTR is asserted whenever the firmware is active and not in its self-test.

When the input buffer is full and receives another character byte, it overflows. In the event of an input buffer overflow, the last byte in the buffer is replaced with the SUB character.

10.3 Parallel Port

The Centronics parallel interface is considered to be industry standard and is not explained in this chapter. This port uses a 25-pin D-type connector with pin assignments shown in Figure 10–1 and listed in Table 10–1.

Figure 10–1 Parallel Printer Port

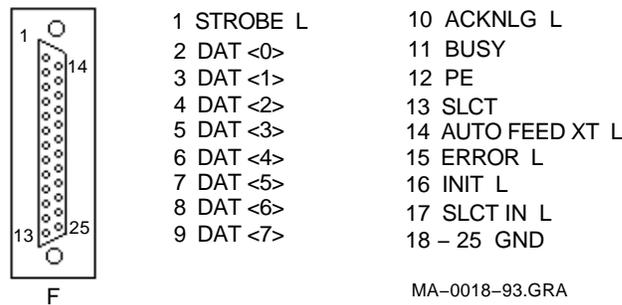


Table 10–1 Parallel Connector Signals

| Pin | Signal Name | Source | Function |
|-----|-------------|----------|------------|
| 1 | STROBE L | Terminal | Strobe |
| 2 | DATA0 | Terminal | Data Bit 1 |
| 3 | DATA1 | Terminal | Data Bit 2 |
| 4 | DATA2 | Terminal | Data Bit 3 |
| 5 | DATA3 | Terminal | Data Bit 4 |
| 6 | DATA4 | Terminal | Data Bit 5 |
| 7 | DATA5 | Terminal | Data Bit 6 |
| 8 | DATA6 | Terminal | Data Bit 7 |

(continued on next page)

Table 10–1 (Cont.) Parallel Connector Signals

| Pin | Signal Name | Source | Function |
|---------|----------------|----------|---|
| 9 | DATA7 | Terminal | Data Bit 8 |
| 10 | ACKNLG L | Printer | Acknowledge |
| 11 | BUSY | Printer | Printer cannot receive data. |
| 12 | PE | Printer | Printer is out of paper. |
| 13 | SLCT | Printer | Printer is on-line. |
| 14 | AUTO FEED XT L | Terminal | Feed 1 line automatically after printing. |
| 15 | ERROR L | Printer | Paper end, printer off-line, or printer error |
| 16 | INIT L | Terminal | Resets the printer to power-on defaults |
| 17 | SLCT IN L | Terminal | The VT510 monitors SLCT to determine if a parallel printer is attached and on-line. |
| 18 - 25 | GROUND | N/A | |

The VT510 uses the eight data lines along with control signals STROBE, ACKNLG, and BUSY to transfer data to the printer. All other interface signals are ignored.

10.3.1 Parallel Port Flow Control

Characters are transferred to the printer in 8-bit bytes. A parallel printer port is not duplex; data can only go from the terminal to the printer.

The terminal and the printer use interface signals STROBE, ACKNLG, and BUSY to synchronize the data transfer as follows:

1. When the terminal is ready to send data to the printer, the terminal puts the data on the data lines and then generates a STROBE pulse to the printer.
2. When the printer senses the STROBE, it responds with a BUSY signal.
3. When printer receives the data, it pulses ACKNLG to signal the terminal that data has been read into memory.
4. If the printer buffer is full, the printer keeps the BUSY signal asserted.

The parallel printer port does not recognize XON/XOFF flow control.

10.4 Print Modes

There are five modes that affect the control of printing operations:

- Printer Controller mode
- Local Controller mode
- Auto Print mode
- Print Form Feed mode
- Print Extent mode

These print modes follow standard terminal transmission except for Printer Controller mode.

Printer Port

10.4 Print Modes

10.4.1 Printer Controller Mode

When printer controller mode is enabled, all data received at the host port is passed through to the printer port, except for:

- XON/XOFF when XON/XOFF flow control is enabled at either the host port or the printer port
- NUL when **Ignore NUL characters** is selected in the communication setup.

If printer-to-host communication is enabled, then all data received at the printer port is passed through to the host port with the exceptions listed previously.

10.5 Print Operation

The VT510 supports the following print operations:

- Print Line
- Print Page or Scrolling Region
- Print Screen

Print Screen prints the screen as it appears, including the status lines if enabled. Print Screen, however, does not print the keyboard indicator line.

10.6 Transmitting Print Data

Users have three choices for a printer type:

- DEC ANSI
- IBM ProPrinter
- DEC + IBM emulation mode

Depending on the printer type selected, the terminal transmits different control functions to the printer. You can select the printer type in Set-Up or by using the escape sequence, DECSPPRT.

10.6.1 DEC ANSI

The DEC ANSI protocol supports the following printed data types:

- When in 8-bit mode:
 - ASCII only
 - ASCII + Line Drawing
- When in 7-bit mode:
 - National only
 - National + Line Drawing

You select a printed data type based on the 7- or 8-bit printer port setting and the character set capability of the attached printer. The VT510 sends initialization, transmission, and closing sequences according to the printed data type selected.

If IBM PC characters are displayed, then the terminal translates the corresponding characters in the ISO Latin-1 character set and transmits them based on the current printed data type selected. If there is no corresponding character in ISO Latin-1, then the Space character is used instead.

10.6.2 IBM ProPrinter or Compatible Printer

When an IBM ProPrinter is attached, the terminal sends IBM ProPrinter sequences. You can neither designate, nor invoke the ANSI sequence or any other operating sequences in this mode.

The VT510 supports the following printer character sets for the IBM printer: PC Multilingual, PC Latin 2 (PC Slavic), PC International, PC Spanish, PC Portuguese, PC Danish, PC French Canadian, PC Hebrew, PC Greek, PC Turkish, and PC Cyrillic.

During initialization, the VT510 sends a control sequence to the printer to select the same code page as the printer character set selected in the terminal. You must select the appropriate printer character set for the correct data to be printed either in Set-Up or by the escape sequence, DECSPPCS.

In an IBM ProPrinter, each code page has the following character sets:

- Character Set 1
- Character Set 2
- All Characters

The three character sets are identical, except for the interpretation of C0 (0/0 through 1/15) and C1 (8/0 through 9/15) characters.

In Character Set 1, the controls in C0 are identical to those in C1, except that 80 (hex) is ignored instead of being interpreted as NUL.

Character Set 2 uses the same controls as C0, except that some printable characters are added to unused character code spaces. The C1 region is all printable characters.

The "All Characters" set only has printable characters. No control codes are allocated to this character set.

The VT510 initializes the printer to use Character Set 2 at the start of a print screen operation. When a C0 printable character is encountered, the VT510 sends the appropriate sequence to print from the "All Characters" set.

10.6.2.1 Data Transmission

The printer is either an IBM personal printer or a compatible printer. It recognizes the IBM ProPrinter mode escape sequences and supports the terminal's code pages. The printer should support a software-selectable code page switching sequence. If it does not, then you need to take appropriate action to set the correct code page before a printing operation takes place.

Characters are sent to the printer along with their display attributes. If a C0 printable character is encountered, the VT510 prints from the "All Characters" set. If a character that is not in the selected code page is encountered, then a Space character is sent instead.

The VT510 supports bold, underline, and double-height and width display attributes.

If the terminal has DEC Supplemental or ISO Latin 1 characters on the screen, then the VT510 translates the characters to corresponding characters in the code page indicated by the printer character set before the transmission takes place. If there is no corresponding character in the selected IBM code page, then the Space character is used instead.

Printer Port

10.6 Transmitting Print Data

10.6.3 DEC ANSI with IBM ProPrinter Emulation

You can specify both DEC ANSI printed data types and IBM ProPrinter PC character sets in Set-Up when this type of printer is selected. If the terminal is set to display DEC or ISO character sets, then the VT510 treats the printer as a DEC ANSI printer and transmits data to the attached printer using ANSI protocols.

If the terminal is set to display PC character sets, then the VT510 transmits data to the attached printer using the IBM ProPrinter protocol. During initialization, the VT510 sends a forces the printer into IBM ProPrinter emulation mode. The terminal sends all other sequences just as in the IBM ProPrinter mode.

10.6.3.1 Data Transmission

If the printer is a DEC ANSI printer with IBM ProPrinter emulation, the printer is in its default ANSI mode state. The printer recognizes IBM ProPrinter mode escape sequences and supports the IBM code pages. The printer supports the software selectable code page switching sequence. If it does not, then you must take appropriate action to set the correct code page before a printing operation takes place.

10.6.3.2 Printer Status

The Session Management Extension is not supported, so the terminal does not respond with "Printer Busy" and "Printer Not Assigned."

If the printer stalls, the word "Printer" flashes continuously in the Indicator Status Line.

10.7 Suspending Print Operations

Entering Set-Up can suspend, but not abort, printing operations. Upon exit from Set-Up, all unfinished printing operations resume unless an explicit action has been taken in Set-Up to abort the print operation, such as **Clear communications**, **Reset terminal**, or **Restore factory defaults**.

10.8 Aborting Print Operations

The **Clear communications** function from Set-up, aborts the current print operation, clears the output silo, and re-initializes the printer port UART. This function may be used to get out of a "hung" state.

Note

After a **Clear communications** command, printing may not stop immediately because characters may still be in the printer's input buffer.

Part III

VT510 ASCII Emulation

This part contains the following chapters:

- Chapter 11, ASCII Emulations and Control Functions
- Chapter 12, ASCII Escape Sequences
- Chapter 13, Defining and Loading ASCII Character Fonts

ASCII Emulations and Control Functions

This chapter describes the ASCII emulations and control functions.

11.1 Overview

The VT510 video terminal includes emulations for several popular ASCII video terminals. ASCII terminals represent the other major class of serial asynchronous video terminals in widespread use today. Like the VT100, these terminals communicate with a host computer by transmitting and receiving a data stream of 7-bit or 8-bit coded characters. To communicate successfully, the computer and the terminal use a convention for interpreting this data stream. This convention specifies how to recognize characters in the data stream as well as how to recognize control information, such as formatting or editing commands. ASCII terminals support the ASCII character set, *American Standard Code for Information Interchange, ANSI X3.4*; however, they do not follow other ANSI standards that define controls for use with the ASCII character set. The original ASCII terminal protocol pre-dates the ANSI standards. These early protocols have since been widely copied and extended to form the ASCII terminal market.

11.2 ASCII Emulations

The VT510 includes a protocol emulation for the WYSE 160 Native mode, WYSE 60 Native mode, and many of its popular emulations of other ASCII terminals:

- WYSE 160/60 Native mode
- WYSE 160/60 PCTerm
- WYSE 50+
- WYSE 150/120
- Televideo 950
- Televideo 925
- Televideo 910+
- ADDS A2

Emulation means that virtually all host application programs designed for these terminals will function correctly.

Note that the VT510 video terminal cannot be identical to all of these terminals simultaneously, and the VT510 includes enhancements in its user interface and character handling ability. The VT510 can handle additional languages and keyboards that extend beyond the original terminals being emulated.

The VT510 does not emulate the graphics modes of the WYSE 160, such as the TEK 4010/4014 personality.

ASCII Emulations and Control Functions

11.2 ASCII Emulations

11.2.1 Enhanced Mode

WYSE 160 Native mode includes function sequences for almost all features supported by the WYSE 160 terminal, including those supported by individual sub-emulations, such as Televideo or ADDS. When one of these sub-emulations is selected, WYSE Enhanced mode (EnH) allows WYSE Native mode sequences to be used from within a sub-emulation to access features that are not normally supported by the physical terminal being emulated. This capability allows existing applications, for one of these emulated terminals, to be enhanced to take advantage of WYSE Native mode features. This enhanced mode does not apply to the VT or ANSI modes, which follow the corresponding ANSI standards.

11.3 Coding Notation

Since ASCII control functions do not follow a structured syntax, the notation used to describe function sequences and parameters is important to avoid confusion. Escape sequences are shown with a space between each character to make them easier to read. These spaces are not part of the Escape sequence.

Words in all caps: Strings of two or more capital letters, such as ESC or SPACE, are used as symbols, usually to represent a single character within an Escape sequence.

Words in italics: Words or abbreviations of two or more characters in *italics* represent sequence parameters that are described subsequently.

Single characters: Single characters, such as "E" or "8", represent the corresponding ASCII character in the sequence.

Regular text (upper- and lowercase): Regular text is sometimes used to describe sequences that are similar or related to other sequences.

Table 11–1 lists the symbols used in the ASCII control functions.

Table 11–1 Symbols Used in ASCII Terminal Escape Sequences

| Symbol | Meaning | Symbol | Meaning |
|--------|---|--------|--|
| Ctrl- | Ctrl immediately followed by a single character represents a control character in the range of 0/0 to 1/15. | EnH | Enhance Mode: This is the same as the WYSE native code when Enhance Mode is on. |
| Same | Same as the WYSE native code (code is native to this emulation). | Wyse | Same as the WYSE native code (code is <i>not</i> native to this emulation, but is a WYSE enhancement). |
| n/a | Not available in this emulation. | | |

(continued on next page)

ASCII Emulations and Control Functions 11.3 Coding Notation

Table 11–1 (Cont.) Symbols Used in ASCII Terminal Escape Sequences

| Symbol | Code | Symbol | Code |
|--------|------|---------------|------|
| NUL | 0/0 | DLE | 1/0 |
| SOH | 0/1 | DC1 (XON) | 1/1 |
| STX | 0/2 | DC2 | 1/2 |
| ETX | 0/3 | DC3 (XOFF) | 1/3 |
| EOT | 0/4 | DC4 | 1/4 |
| ENQ | 0/5 | NAK | 1/5 |
| ACK | 0/6 | SYN | 1/6 |
| BEL | 0/7 | ETB | 1/7 |
| BS | 0/8 | CAN | 1/8 |
| HT | 0/9 | EM | 1/9 |
| LF | 0/10 | SUB | 1/10 |
| VT | 0/11 | ESC | 1/11 |
| FF | 0/12 | FS | 1/12 |
| CR | 0/13 | GS | 1/13 |
| SO | 0/14 | RS | 1/14 |
| SI | 0/15 | US | 1/15 |
| SPACE | 4/0 | | |

ASCII Escape Sequences

This chapter summarizes the ASCII escape and control Sequences that the VT510 recognizes when it is operating in its ASCII emulation modes.

12.1 ASCII Communications

Table 12–1 lists the serial port control functions for each mode. The word “same” in Table 12–1 signifies the same control sequence as the WYSE 160/60 column.

Table 12–1 Serial Port Control Functions

| ACK Mode | WYSE | | | | TVI | | | ADDS |
|-------------------------------------|------------------------------|----------------------------|---------|--------|------|------|------|---------------|
| | 160/60 | PCTerm | 150/120 | WY 50+ | 950 | 925 | 910+ | A2 |
| ACK Mode On (default) | ESC e 7 | n/a | same | same | EnH | EnH | EnH | EnH |
| ACK Mode Off | ESC e 6 | n/a | same | same | EnH | EnH | EnH | EnH |
| Answerback Mode | | | | | | | | |
| Answerback Off (default) | ESC e Sp | n/a | | same | n/a | n/a | n/a | EnH |
| Answerback On | ESC e ! | n/a | same | same | n/a | n/a | n/a | n/a |
| Answerback Message | ESC c ; <i>answer</i> Ctrl/Y | | | | | | | |
| | | ESC] <i>answer</i> Ctrl/M | same | same | n/a | n/a | n/a | EnH |
| Send Answerback message – Format 1: | ESC c < | n/a | same | same | n/a | n/a | n/a | EnH |
| Format 2: | Ctrl/E | same | same | same | same | same | same | EnH |
| Conceal Answerback | ESC c = | n/a | same | same | n/a | n/a | n/a | EnH |
| Assign Serial Ports | | | | | | | | |
| S1=comm1 (host) | ESC e 8 | n/a | same | same | EnH | EnH | EnH | EnH |
| S1=comm2 (host) | ESC e 9 | n/a | same | same | EnH | EnH | EnH | EnH |
| Monitor Mode | | | | | | | | |
| Monitor Mode Off (default) | ESC u or ESC X | same | same | same | same | same | same | EnH on or off |
| Monitor Mode On | ESC U | same | same | same | same | same | same | EnH |

(continued on next page)

ASCII Escape Sequences

12.1 ASCII Communications

Table 12–1 (Cont.) Serial Port Control Functions

| Receive Null | WYSE | | | | TVI | | | ADDS |
|--|---------------------|------------------------------|----------------------|--------|-------|------------------------------|------|------|
| | 160/60 | PCTerm | 150/120 | WY 50+ | 950 | 925 | 910+ | A2 |
| Ignore Null Characters from Host (default) | ESC e R | n/a | same | same | EnH | EnH | EnH | EnH |
| Accept Null Characters from Host | ESC e S | n/a | same | same | EnH | EnH | EnH | EnH |
| Set Serial Port Parameters | | | | | | | | |
| Set Comm1 parameters | ESC c 0 | <i>Baud Stop Parity Word</i> | | | ESC { | <i>Baud Stop Parity Word</i> | | |
| | | n/a | same | same | | n/a | n/a | EnH |
| Set Comm2 parameters | ESC c 1 | <i>Baud Stop Parity Word</i> | | | ESC } | <i>Baud Stop Parity Word</i> | | |
| | | n/a | same | same | | n/a | n/a | EnH |
| | <u>Baud (Comm1)</u> | | <u>Baud (Comm2)</u> | | | <u>Description</u> | | |
| | D | | N/A | | | 115200 | | |
| | B | | N/A | | | 76800 | | |
| | C | | N/A | | | 56700 | | |
| | 0 | | @ (4/0) | | | 38400 | | |
| | 1 | | 0 (3/0) | | | 19200 | | |
| | 2 | | 1 (3/1) | | | 9600 | | |
| | 3 | | 3 (3/3) | | | 4800 | | |
| | 4 | | 5 (3/5) | | | 2400 | | |
| | 7 | | 8 (3/8) | | | 1200 | | |
| | 8 | | 9 (3/9) | | | 600 | | |
| | 9 | | : (3/10) | | | 300 | | |
| | <u>Stop</u> | | <u>Description</u> | | | | | |
| | 0 (3/0) | | 1 Stop Bit (default) | | | | | |
| | 1 (3/1) | | 2 Stop Bits | | | | | |
| | <u>Word</u> | | <u>Description</u> | | | | | |
| | 0 (3/0) | | 7 bits | | | | | |
| | 1 (3/1) | | 8 bits (default) | | | | | |
| | <u>Parity</u> | | <u>Description</u> | | | | | |
| | 0 (3/0) | | No Parity (default) | | | | | |
| | 1 (3/1) | | Odd Parity | | | | | |
| | 2 (3/2) | | Mark Parity | | | | | |
| | 3 (3/3) | | Even Parity | | | | | |
| | 4 (3/4) | | Space Parity | | | | | |

(continued on next page)

ASCII Escape Sequences 12.1 ASCII Communications

Table 12–1 (Cont.) Serial Port Control Functions

| Serial Port Handshaking | WYSE | | | | TVI | | | ADDS |
|--|----------------------------|--------|------------------------------|--------|------------------------------|------------------|------------------|------|
| | 160/60 | PCTerm | 150/120 | WY 50+ | 950 | 925 | 910+ | A2 |
| Set Comm1 Receive | ESC c 2 <i>Handshaking</i> | | | | n/a | n/a | n/a | EnH |
| | | n/a | same | same | n/a | n/a | n/a | EnH |
| Set Comm2 Receive | ESC c 3 <i>Handshaking</i> | | | | n/a | n/a | n/a | EnH |
| | | n/a | same | same | n/a | n/a | n/a | EnH |
| Set Comm1 Transmit | ESC c 4 <i>Handshaking</i> | | | | n/a | n/a | n/a | EnH |
| | | n/a | same | same | n/a | n/a | n/a | EnH |
| Set Comm2 Transmit | ESC c 5 <i>Handshaking</i> | | | | n/a | n/a | n/a | EnH |
| | | n/a | same | same | n/a | n/a | n/a | EnH |
| | <u>Handshaking</u> | | <u>Receive Flow Control</u> | | <u>Transmit Flow Control</u> | | | |
| | 0 | | None | | None (default) | | | |
| | 1 | | XON-XOFF/XPC (default) | | XON/XOFF | | | |
| | 2 | | DTR | | DSR | | | |
| | 3 | | XON-XOFF/XPC and DTR | | XON/XOFF and DSR | | | |
| Set Host port Receive to DTR | n/a | Ctrl/N | n/a | n/a | Ctrl/N | Ctrl/N | Ctrl/N | n/a |
| Set Host port Receive to XON/XOFF or XPC | n/a | Ctrl/O | n/a | n/a | Ctrl/O | Ctrl/O | Ctrl/O | n/a |
| Set Duplex Mode | | | | | | | | |
| Full-Duplex On (default) | ESC D F | ESC } | same | same | same | same | same | EnH |
| Half-Duplex On | ESC D H | ESC { | same | same | same | same | same | EnH |
| Set Block Mode | | | | | | | | |
| Block Mode Off (default) | ESC C | same | same | same | Wyse | Wyse | Wyse | EnH |
| Block Mode On | ESC B | same | same | same | same | same or ESC c | same or ESC c | EnH |
| Set Local Mode | | | | | | | | |
| Set Local Mode | n/a | n/a | n/a | n/a | ESC c | n/a | n/a | n/a |
| Set Maximum Transmit Rate Limit | | | | | | | | |
| Transmit Speed | ESC c 6 <i>Max</i> | n/a | same | same | n/a | n/a | n/a | EnH |
| Function Keys | ESC c 7 <i>Max</i> | n/a | same | same | n/a | n/a | n/a | EnH |
| | <u>Max</u> | | <u>Characters Per Second</u> | | | | | |
| | 0 | | 30 | | | | | |
| | 1 | | 50 | | | | | |
| | 2 | | No Limit (default) | | | | | |
| | 3 | | 150 | | | | | |

ASCII Escape Sequences

12.2 Terminal Management

12.2 Terminal Management

Table 12–2 lists the terminal management control functions. The word “same” in Table 12–2 signifies the same control sequence as in the WYSE 160/60 column.

Table 12–2 Terminal Management Control Functions

| Select Terminal Personality | WYSE | | | | TVI | | | ADDS |
|----------------------------------|----------|----------|----------------|--------|-------|-------|-------|------|
| | 160/60 | PCTerm | 150/120 | WY 50+ | 950 | 925 | 910+ | A2 |
| ADDS A2 | ESC ~ % | ESC v % | same as 160/60 | same | Wyse | Wyse | Wyse | Wyse |
| TVI 950 | ESC ~ (| ESC v (| same | same | Wyse | Wyse | Wyse | Wyse |
| TVI 925 | ESC ~ \$ | ESC v \$ | same | same | Wyse | Wyse | Wyse | Wyse |
| TVI 910 | ESC ~ # | ESC v # | same | same | Wyse | Wyse | Wyse | Wyse |
| VT510, 7-bit | ESC ~ < | ESC v < | same | same | Wyse | Wyse | Wyse | Wyse |
| VT510, 8-bit | ESC ~ = | ESC v = | same | same | Wyse | Wyse | Wyse | Wyse |
| VT100 | ESC ~ ; | ESC v ; | same | same | Wyse | Wyse | Wyse | Wyse |
| VT52 | ESC ~ 6 | ESC v 6 | same | same | Wyse | Wyse | Wyse | Wyse |
| WYSE 160/60 | ESC ~ 4 | ESC v 4 | same | same | Wyse | Wyse | Wyse | Wyse |
| WYSE 160/60 PCTerm | ESC ~ 5 | ESC v 5 | same | same | Wyse | Wyse | Wyse | Wyse |
| WYSE 150/120 | ESC ~ 3 | ESC v 3 | same | same | Wyse | Wyse | Wyse | Wyse |
| WYSE 50+ | ESC ~ " | ESC v " | same | same | Wyse | Wyse | Wyse | Wyse |
| Send Terminal ID | | | | | | | | |
| Inquire emulation ID | ESC Sp | n/a | same | same | ESC M | ESC M | ESC M | EnH |
| Set Enhanced Mode | | | | | | | | |
| Enhanced Mode On (EnH) (default) | ESC ~ ! | ESC v ! | same | same | Wyse | Wyse | Wyse | Wyse |
| Enhanced Mode Off | ESC ~ Sp | ESC v Sp | same | same | Wyse | Wyse | Wyse | Wyse |
| Save Set-Up Modes | | | | | | | | |
| To NVM (except Tabs) | ESC c V | n/a | same | same | n/a | n/a | n/a | EnH |
| To NVM with Tabs | ESC c W | n/a | same | same | n/a | n/a | n/a | EnH |
| PCTerm Mode Group ¹ | n/a | ESC m | n/a | n/a | n/a | n/a | n/a | n/a |
| All Modes ² | ESC c T | n/a | same | same | n/a | n/a | n/a | EnH |
| Power On Reset | ESC c X | n/a | same | same | n/a | n/a | n/a | EnH |

¹Sets the following parameters for PCTerm mode:

- Autoscroll = On
- Received CR = CR
- Communication Mode = Full Duplex
- Enhanced Mode = Off
- Wrap EOL = Off
- Attribute = Char

²Sets the parameters shown in Table 11-2.

(continued on next page)

Table 12–2 (Cont.) Terminal Management Control Functions

| | WYSE | | | | TVI | | | ADDS |
|-------------------------------|----------------|-------------|---------|--------|---------------------|-------------|-------------|------|
| | 160/60 | PCTerm | 150/120 | WY 50+ | 950 | 925 | 910+ | A2 |
| Load/Send Time of Day | 160/60 | PCTerm | 150/120 | WY 50+ | 950 | 925 | 910+ | A2 |
| Load Time of Day ³ | ESC c 8 Hr Min | | | | ESC Sp 1 a/p Hr Min | | | EnH |
| | | | same | same | ESC Sp 1 a/p Hr Min | | | EnH |
| Send Time of Day | n/a | ESC Sp 2 | n/a | n/a | ESC Sp 2 | ESC Sp 2 | ESC Sp 2 | n/a |

³Hour ranges from 00 to 23; Minute ranges from 00 to 59 decimal. Entering "00" in hour is displayed as 12 AM. The a/p is a single character—a = AM, p = PM.

12.3 Keyboard Processing

Table 12–3 lists the keyboard processing control functions. The word “same” in Table 12–3 signifies the same control sequences as in the WYSE 160/60 column.

Table 12–3 Keyboard Processing Control Functions

| | WYSE | | | | TVI | | | ADDS |
|----------------------------------|--------------------|--------|---------|--------|-------|-------|-------|-----------------|
| | 160/60 | PCTerm | 150/120 | WY 50+ | 950 | 925 | 910+ | A2 |
| Locking the Keyboard | | | | | | | | |
| Unlock keyboard (default) | Ctrl/N or ESC " | ESC " | same | same | ESC " | ESC " | ESC " | Ctrl/B ESC 6 |
| Lock keyboard | Ctrl/O or ESC | ESC | same | same | ESC | ESC | ESC | Ctrl/D ESC 5 |
| Enable/Disable Key Repeat | | | | | | | | |
| Key Repeat On (default) | ESC e - | n/a | same | same | EnH | EnH | EnH | EnH |
| Key Repeat Off | ESC e , | n/a | same | same | EnH | EnH | EnH | EnH |
| Caps Lock | | | | | | | | |
| Caps Lock off | ESC e ´ | n/a | same | same | EnH | EnH | EnH | EnH |
| Caps Lock on | ESC e & | n/a | same | same | EnH | EnH | EnH | EnH |
| Lock key=Caps Lock (default) | ESC e T | n/a | same | same | EnH | EnH | EnH | EnH |
| Lock key=Shift Lock | ESC e V | n/a | same | same | EnH | EnH | EnH | EnH |
| Lock key=Reverse Lock | ESC e U | n/a | same | same | EnH | EnH | EnH | EnH |
| Keycode Mode | | | | | | | | |
| ASCII Key Codes ¹ | ESC e H | ESC c | same | same | EnH | EnH | EnH | EnH |
| PC Scan Codes | ESC e I | ESC H | same | same | EnH | EnH | EnH | EnH |

¹Default for all but PCTerm mode.

(continued on next page)

ASCII Escape Sequences

12.3 Keyboard Processing

Table 12–3 (Cont.) Keyboard Processing Control Functions

| Keyclick | WYSE | | | | TVI | | | ADDS |
|-------------------------------------|---------------------|----------------------------|---|--------|-------|-------|-------|------|
| | 160/60 | PCTerm | 150/120 | WY 50+ | 950 | 925 | 910+ | A2 |
| On (default) | ESC e % | ESC > | same | same | ESC > | ESC > | ESC > | EnH |
| Off | ESC e \$ | ESC < | same | same | ESC < | ESC < | ESC < | EnH |
| Margin Bell | | | | | | | | |
| Sound Bell | Ctrl/G | same | same | same | same | same | same | same |
| Select Bell tone | ESC c \ <i>Tone</i> | n/a | same | Wyse | n/a | n/a | n/a | EnH |
| | <u><i>Tone</i></u> | <u>Description</u> | | | | | | |
| | 0 | Off | | | | | | |
| | 1 | Low pitch | | | | | | |
| | 2 | High pitch | | | | | | |
| | 3 | High pitch | | | | | | |
| Margin Bell off (default) | ESC e L | ESC n | same | same | EnH | EnH | EnH | EnH |
| Margin Bell on ² | ESC e M | ESC o | same | same | EnH | EnH | EnH | EnH |
| Set Margin Bell at cursor | ESC ` J | n/a | same | same | n/a | n/a | n/a | EnH |
| Set Margin Bell on and set position | n/a | ESC o | n/a | n/a | n/a | n/a | n/a | n/a |
| Modifier Keys | | | | | | | | |
| Request Status Inquiry | n/a | ESC [| n/a | n/a | n/a | n/a | n/a | n/a |
| | | Report: 81(Hex) + <i>a</i> | where <i>a</i> indicates the modifier key being pressed as follows: | | | | | |
| | | <u>Bit</u> | <u>Modifier Key</u> | | | | | |
| | | 0 | Caps lock | | | | | |
| | | 1 | Always 0 | | | | | |
| | | 2 | Always 0 | | | | | |
| | | 3 | Scroll lock On | | | | | |
| | | 4 | Alt | | | | | |
| | | 5 | Ctrl | | | | | |
| | | 6 | Num lock On | | | | | |
| | | 7 | Shift key | | | | | |

²Default = 72 for 80-column mode; 124 for 132-column mode.

(continued on next page)

ASCII Escape Sequences 12.3 Keyboard Processing

Table 12–3 (Cont.) Keyboard Processing Control Functions

| Redefining Keys ³ | WYSE | | | | TVI | | | ADDS |
|------------------------------------|------------------------------|---|--|-----------------------------|---------------------------|------------|-------------|-----------|
| | 160/60 | PCTerm | 150/120 | WY 50+ | 950 | 925 | 910+ | A2 |
| Program Function keys ⁴ | ESC z <i>Fkey Seq</i> DEL | | | | | | | |
| | n/a | same | same | Wyse | Wyse | Wyse | EnH | |
| | <u>Fkey Unshifted</u> | <u>Fkey Shifted</u> | <u>VT Keyboard</u> | <u>Enhanced PC Keyboard</u> | | | | |
| | @ | ` | F1 | F1 | | | | |
| | A | a | F2 | F2 | | | | |
| | B | b | F3 | F3 | | | | |
| | C | c | F4 | F4 | | | | |
| | D | d | F5 | F5 | | | | |
| | E | e | F6 | F6 | | | | |
| | F | f | F7 | F7 | | | | |
| | G | g | F8 | F8 | | | | |
| | H | h | F9 | F9 | | | | |
| | I | i | F10 | F10 | | | | |
| | J | j | F11 | F11 | | | | |
| | K | k | F12 | F12 | | | | |
| | L | l | F13 | | | | | |
| | M | m | F14 | | | | | |
| | N | n | F15 | | | | | |
| | O | o | F16 | | | | | |
| Program Key Direction | 160/60 | PCTerm | 150/120 | WY 50+ | 950 | 925 | 910+ | A2 |
| Program Key Direction | ESC Z <i>Dir Key Seq</i> DEL | same | same | | | Wyse | Wyse | EnH |
| | | ESC <i>FKey Dir Seq</i> | Ctrl-Y | | ESC <i>FKey Dir Seq</i> | Ctrl-Y | | |
| Key-Sent direction | Communication Mode | | Key Definition is Sent to . . . | | | | | |
| | Local | | Terminal screen only | | | | | |
| | Remote | | Host only | | | | | |
| | Normal | | Depending on Comm mode: | | | | | |
| | Full-duplex | | Host only | | | | | |
| | Half-duplex | | Both the host and the terminal screen | | | | | |
| | Block | | Terminal screen only | | | | | |
| | Half Block | | Both the host and the terminal screen | | | | | |
| | <u>Dir</u> | <u>Key Transmission Direction</u> | | | | | | |
| | 0 | Normal | | | | | | |
| | 1 | Remote (default) | | | | | | |
| | 2 | Local | | | | | | |
| | 3 | Normal (TVI950 and WYSE 160/60 PCTerm only) | | | | | | |

³See Table 12–4 for redefinable keys.

⁴*Seq* is an ASCII character data string sequence. Any 7-bit character except "DEL" (Hex 7F) is legal for the sequence.

(continued on next page)

ASCII Escape Sequences

12.3 Keyboard Processing

Table 12–3 (Cont.) Keyboard Processing Control Functions

| | WYSE | | | | TVI | | | ADDS |
|--|-----------------------------|--------|---------|--------|------|------|------|------|
| | 160/60 | PCTerm | 150/120 | WY 50+ | 950 | 925 | 910+ | A2 |
| Inquire Key Direction | ESC Z ~ Key | n/a | same | same | n/a | Wyse | Wyse | EnH |
| Inquiry: | | | | | | | | |
| Response: | <i>Dir Key Sequence</i> DEL | | | | | | | |
| Clear Key Definitions | | | | | | | | |
| Clear Function key direction and definition | ESC z <i>Fkey</i> DEL | n/a | same | same | Wyse | Wyse | Wyse | EnH |
| Set key direction and Clear key definition | ESC Z <i>Dir Key</i> DEL | | | | | | | |
| Clear all redefinable key definitions | ESC c U | n/a | same | same | n/a | Wyse | Wyse | EnH |

Table 12–4 lists the redefinable keys.

Table 12–4 Redefinable Keys

| Emulation | Redefinable Keys | | | |
|--|------------------|----------------|--------------------|---------------------|
| | <u>Unshifted</u> | <u>Shifted</u> | <u>VT Keyboard</u> | <u>EPC Keyboard</u> |
| WYSE 160/60, WYSE 150/120, WYSE 50+, TVI925, and TVI 910 | SP | % | | ESC |
| | ! | & | Tab | Tab |
| | " | ' | Backspace | Backspace |
| | # | (| Remove | |
| | \$ |) | Return | Enter |
| | * | / | Select | Home |
| | + | 0 | ↑ | ↑ |
| | , | 1 | ↓ | ↓ |
| | - | 2 | ← | ← |
| | . | 3 | ⇒ | ⇒ |
| | s | 4 | Enter | Enter (keypad) |
| | q | p | PF4 | Insert |
| | r | w | | Page Down |
| | } | z | PF3 | |
| | 5 | 6 | PF2 | Delete |
| | 7 | 8 | PF1 | |
| | R | X | | Print Screen |
| | : | ; | | Page Up |
| | \ |] | | End |
| | Q | W | F17 | |
| | S | Y | F18 | |
| | T | Z | F19 | |
| | P | V | F20 | |

(continued on next page)

Table 12–4 (Cont.) Redefinable Keys

| Emulation | Redefinable Keys | | | |
|--------------------|-----------------------|-------------|--------------------|-----------------------------|
| TVI 950 | Fkey | Fkey | VT Keyboard | Enhanced PC Keyboard |
| | 1 | < | F1 | F1 |
| | 2 | = | F2 | F2 |
| | 3 | > | F3 | F3 |
| | 4 | ? | F4 | F4 |
| | 5 | @ | F5 | F5 |
| | 6 | A | F6 | F6 |
| | 7 | B | F7 | F7 |
| | 8 | C | F8 | F8 |
| | 9 | D | F9 | F9 |
| | : | E | F10 | F10 |
| | ; | F | F11 | F11 |
| | G | L | F12 | F12 |
| | H | M | F13 | |
| I | N | F14 | | |
| J | O | F15 | | |
| K | P | F16 | | |
| <hr/> | | | | |
| WYSE 160/60 PCTerm | Fkey Unshifted | | VT Keyboard | EPC Keyboard |
| | 1 | ! | F1 | F1 |
| | 2 | @ | F2 | F2 |
| | 3 | # | F3 | F3 |
| | 4 | \$ | F4 | F4 |
| | 5 | % | F5 | F5 |
| | 6 | ^ | F6 | F6 |
| | 7 | & | F7 | F7 |
| | 8 | * | F8 | F8 |
| | 9 | (| F9 | F9 |
| | 0 |) | F10 | F10 |

12.4 Screen Processing

Table 12–5 lists the screen processing control functions. The word “same” in Table 12–5 signifies the same control sequences as in the WYSE 160/60 column.

Table 12–5 Screen Processing Control Functions

| | WYSE | | | | TVI | | | ADDS |
|----------------------------------|--------------------------|-----------------|---------|--------|-----|-----|------|------|
| | 160/60 | PCTerm | 150/120 | WY 50+ | 950 | 925 | 910+ | A2 |
| Video Display Features | | | | | | | | |
| Border Display (Overscan On/Off) | ESC c] <i>Intensity</i> | | | | | | | |
| | | n/a | same | same | n/a | n/a | n/a | EnH |
| Parameters: | <i>Intensity</i> | <i>Overscan</i> | | | | | | |
| | 0 | Off (default) | | | | | | |
| | 1 | On | | | | | | |

(continued on next page)

ASCII Escape Sequences

12.4 Screen Processing

Table 12–5 (Cont.) Screen Processing Control Functions

| Video Display Features | WYSE | | | | TVI | | | ADDS |
|------------------------------------|---|--|----------------|----------------|-------|-------|-------|------|
| | 160/60 | PCTerm | 150/120 | WY 50+ | 950 | 925 | 910+ | A2 |
| Screen Display On (default) | ESC ` 9 | ESC N | same | same | ESC n | ESC n | ESC n | EnH |
| Screen Display Off | ESC ` 8 | ESC O | same | same | ESC o | ESC o | ESC o | EnH |
| Normal background ¹ | ESC ^ 0 | ESC d | same | same | ESC d | ESC d | ESC d | EnH |
| Reverse background | ESC ^ 1 | ESC b | same | same | ESC b | ESC b | ESC b | EnH |
| Screen Saver on (default) | ESC e Q | n/a | same | same | EnH | EnH | EnH | EnH |
| Screen Saver off | ESC e P | n/a | same | same | EnH | EnH | EnH | EnH |
| Scroll Type | | | | | | | | |
| WYSE Mode | ESC ` <i>Scroll</i> | n/a | same | same | n/a | n/a | n/a | EnH |
| Parameters: | <u><i>Scroll</i></u> @ <, = >, ? | <u><i>Scrolling Type</i></u> ² Jump Scroll (default) Slow Smooth Scroll Fast Smooth Scroll | | | | | | |
| TVI - Smooth scroll off | n/a | n/a | n/a | n/a | ESC 9 | ESC 9 | ESC 9 | n/a |
| TVI - Smooth scroll on | n/a | n/a | n/a | n/a | ESC 8 | ESC 8 | ESC 8 | n/a |
| Character Cell | | | | | | | | |
| Select 10 × 16 size (def) | ESC e > | n/a | same | Wyse | EnH | EnH | EnH | EnH |
| Select 10 × 13 size | ESC e ? | n/a | same | Wyse | EnH | EnH | EnH | EnH |
| Column Display | | | | | | | | |
| Select 80-column display (default) | ESC ` : | n/a | same | same | n/a | n/a | n/a | EnH |
| Select 132-column display | ESC ` ; | n/a | same | same | n/a | n/a | n/a | EnH |
| Display Data Lines | | | | | | | | |
| 24 data lines (default) | ESC e (| n/a | same | same | EnH | EnH | EnH | EnH |
| 25 data lines | ESC e) | ESC ^ | same as 160/60 | same as 160/60 | EnH | EnH | EnH | EnH |
| 42 data lines | ESC e * | n/a | same | same | EnH | EnH | EnH | EnH |
| 43 data lines | ESC e + | ESC _ | same as 160/60 | same as 160/60 | EnH | EnH | EnH | EnH |

In ASCII emulation mode, the VT510 displays four types of data lines:

- 24 data lines, 1 status line, and 2 label lines
- 25 data lines, 1 status line, and 1 label line
- 42 data lines, 1 status line, and 2 label lines⁴
- 43 data lines, 1 status line, and 1 label line

¹"WYSE 160/60 PCTerm" and TVI should have Enhanced Mode off.

² Users can change the scrolling rate by entering keys from the keyboard. Pressing Ctrl/Shift/↑ to increase the rate and Ctrl/Shift/↓ to decrease it.

⁴Because of hardware limitations, selecting 42 or 43 data lines forces the screen size to be 53 lines.

(continued on next page)

Table 12–5 (Cont.) Screen Processing Control Functions

| Fill Page with "H"s in PCTerm Mode | WYSE | | | | TVI | | | ADDS |
|---|---------------------|--|-----------------------|--|----------------------------------|-------|-------|------|
| | 160/60 | PCTerm | 150/120 | WY 50+ | 950 | 925 | 910+ | A2 |
| Fill page with "H"s | n/a | ESC F | n/a | n/a | n/a | n/a | n/a | n/a |
| Width-Change-Clear Mode | | | | | | | | |
| Width-change-clear off | ESC e . | n/a | same | same | EnH | EnH | EnH | EnH |
| Width-change-clear on (default) | ESC e / | n/a | same | same | EnH | EnH | EnH | EnH |
| Page Size | | | | | | | | |
| Set Page Size ⁵ | ESC w <i>Length</i> | | same | same | ESC \ <i>Length</i> ⁶ | | | EnH |
| WYSE 160/60, WYSE 50+ Parameters: | <u>Length</u> | <u>ESC \ <i>Length</i>⁶</u> | <u>Size of a Page</u> | <u>Description</u> | | | | |
| | G | | 1*lines | Page number = current screen data lines | | | | |
| | H | | 2*lines | Page number = current screen data lines * 2 | | | | |
| | I | | 4*lines | Page number = current screen data lines * 4 | | | | |
| | J | | * | One page number = screen data lines; the other contains rest of lines in memory. | | | | |
| WYSE 160/60 PCTerm and TVI Parameters: | <u>Length</u> | <u>Size of a Page</u> | <u>Description</u> | | | | | |
| | 1 | | 1*lines | Page number = current screen data lines | | | | |
| | 2 | | 2*lines | Page number = current screen data lines * 2 | | | | |
| | 3 | | 4*lines | Page number = current screen data lines * 4 | | | | |
| | 4 | | * | One page number = screen data lines; the other contains rest of lines in memory. | | | | |
| Display Page | | | | | | | | |
| Display Previous Page ⁷ | ESC w B or ESC J | n/a | same | same | ESC J | ESC J | ESC J | EnH |
| Display Next Page ⁸ | ESC w C or ESC K | n/a | same | same | ESC K | ESC K | ESC K | n/a |
| Display Specific Page | ESC w <i>Page</i> | n/a | same | same | n/a | n/a | n/a | EnH |

⁵ Upon receipt of the Set Page Size command, the terminal:

- Clears the display memory to NUL (0/0) characters.
- Displays first page "page 0."
- Moves the cursor to its home position.
- Changes the split screen to a full screen format.
- Turns off the Protect mode.
- Unlocks the locked line.

⁶Enhanced Mode off.

⁷ In WYSE mode, command "ESC J" works only when the screen is not split. If the screen is split, refer to "Activate Other Window or Page" command. Command "ESC w B" in WYSE modes works when the screen is not split or the split screen is caused by an adjustable split. It does not work when the split screen is a result of a simple split. Users can use local function keys to display the previous page. On a VT keyboard, press Ctrl/Prev; on an Enhanced PC keyboard, press Ctrl/Page Up.

⁸ Users can use a local function key to display the next page. Press Ctrl/N, where N is a number on the numeric keypad key equivalent to the page number, on both VT and Enhanced PC keyboard.

(continued on next page)

ASCII Escape Sequences

12.4 Screen Processing

Table 12–5 (Cont.) Screen Processing Control Functions

| | WYSE | | | | TVI | | | ADDS |
|--|-------------------------|--------|---|--------|----------------------------|-----|------|------|
| | 160/60 | PCTerm | 150/120 | WY 50+ | 950 | 925 | 910+ | A2 |
| Split Screen | | | | | | | | |
| Split screen horizontally | ESC x A <i>Line</i> | n/a | same | same | n/a | n/a | n/a | n/a |
| Adjustable horiz split | ESC x C <i>Line</i> | n/a | same | same | n/a | n/a | n/a | n/a |
| Split screen horizontally and Clear data | ESC x 1 <i>Line</i> | n/a | same | same | n/a | n/a | n/a | n/a |
| Adjustable horiz split screen and Clear data | ESC x 3 <i>Line</i> | n/a | same | same | n/a | n/a | n/a | n/a |
| Lower horiz split | ESC x P | n/a | same | same | n/a | n/a | n/a | n/a |
| Raise horiz split | ESC x R | n/a | same | same | n/a | n/a | n/a | n/a |
| Windows | | | | | | | | |
| Activate upper window | ESC] | n/a | same | same | n/a | n/a | n/a | n/a |
| Activate lower window | ESC } | n/a | same | same | n/a | n/a | n/a | n/a |
| Activate other window or page | ESC J or ESC K | n/a | same | same | n/a | n/a | n/a | n/a |
| Roll window up in page | ESC w E | n/a | same | same | n/a | n/a | n/a | n/a |
| Roll window down in page | ESC w F | n/a | same | same | n/a | n/a | n/a | n/a |
| Redefine screen as one window | ESC x @ | n/a | same | same | n/a | n/a | n/a | n/a |
| Redefine screen as one window and Clear page | ESC x 0 | n/a | same | same | n/a | n/a | n/a | n/a |
| Cursor Drag Mode | | | | | | | | |
| Cursor drag mode on (default) | ESC d) | n/a | same | same | n/a | n/a | n/a | n/a |
| Cursor drag mode off | ESC d (| n/a | same | same | n/a | n/a | n/a | n/a |
| Status Line Display | | | | | | | | |
| Editing Status line on | ESC ` a | n/a | same | same | n/a | n/a | n/a | EnH |
| Standard Status line on (default) | ESC ` b | n/a | same | same | n/a | n/a | n/a | EnH |
| Status line off | ESC ` c | n/a | same | same | n/a | n/a | n/a | EnH |
| | <u>Starts at Column</u> | | <u>Standard Status Line</u> | | <u>Editing Status Line</u> | | | |
| | 26 | | HH:MM AM (or PM) | | PROT (Protect mode is on) | | | |
| | 31 | | | | WRPT (Write protect is on) | | | |
| | 35 | | Column-Row (Cursor) | | | | | |
| | 36 | | | | INS (Insert mode is on) | | | |
| Messages: | <u>Message</u> | | <u>Description</u> | | | | | |
| | LOCK | | Keyboard locked | | | | | |
| | COMP | | In compose process | | | | | |
| | NUM | | NUM LOCK state | | | | | |
| | CAPS | | The Caps Lock key is on | | | | | |
| | 1... | | Page indication (No message displayed for page 0) | | | | | |
| | * | | Monitor mode state | | | | | |
| | FDX | | Full-duplex mode | | | | | |
| | HDX | | Half-duplex mode | | | | | |
| | BLK | | Block mode | | | | | |
| | HBLK | | Half-duplex block mode | | | | | |

(continued on next page)

Table 12–5 (Cont.) Screen Processing Control Functions

| Status Line Display | | | | | | | | |
|---|-----------------------------|--|----------------|----------------|--|-----------|-------|---------|
| | LCL | Local mode | | | | | | |
| | HLD | Hold state | | | | | | |
| | % | Page Printing | | | | | | |
| | > | Autoprint mode | | | | | | |
| | = | Controller print mode | | | | | | |
| | PBSY | Printer is busy or no printer is attached. | | | | | | |
| | PTR | Printer is ready. | | | | | | |
| | <AUX | Terminal is in auxiliary receive mode. | | | | | | |
| Function Key Label Display | | | | | | | | |
| | WYSE | | | | TVI | | | ADDS |
| Computer Message | 160/60 | PCTerm | 150/120 | WY 50+ | 950 | 925 | 910+ | A2 |
| Program/Display computer message | ESC F <i>Message</i> CR | | | | | | | |
| | | n/a | same | same | Wyse | Wyse | Wyse | EnH |
| Clear computer message | ESC F CR | | | | | | | |
| | | n/a | same | same | same | same | same | EnH |
| Field Parameters: | | | | | | | | |
| | Key | Unshifted | Field | Shifted | Key | Unshifted | Field | Shifted |
| Display F key label | ESC z <i>Field Label</i> CR | | | | | | | |
| | | n/a | same | same | Wyse ⁹ | Wyse | Wyse | EnH |
| Clear F key label | ESC z <i>Field</i> CR | | | | | | | |
| | | n/a | same | same | Wyse | Wyse | Wyse | EnH |
| Label Parameters: | Emulation Mode | Column Mode | Maximum Length | | | | | |
| | Hidden | 80 | 9 | | | | | |
| | Hidden | 132 | 7 | | | | | |
| | Embedded | 80 | 8 | | | | | |
| | Embedded | 132 | 7 | | | | | |
| Label Line Display | | | | | | | | |
| | WYSE | | | | TVI | | | ADDS |
| Label Line Display | 160/60 | PCTerm | 150/120 | WY 50+ | 950 | 925 | 910+ | A2 |
| Program/Display computer message on unshifted Label line. | ESC z (<i>Text</i> CR | | | | | | | |
| | | | same | same as 160/60 | ESC f <i>text</i> CR or ESC f <i>text</i> Ctrl-M | | | EnH |
| Program/Display computer message on shifted Label line. | ESC z) <i>text</i> CR | | | | | | | |
| | | n/a | same | same | n/a | n/a | n/a | EnH |
| Clear unshifted Label line. | ESC z (CR | | | | | | | |
| | | ESC f CR or ESC f Ctrl-M | same | same as 160/60 | ESC f CR or ESC f Ctrl-M | | | EnH |

⁹Unshifted key label only; the Shifted Key label is not available for TVI modes.

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ASCII Escape Sequences

12.4 Screen Processing

Table 12–5 (Cont.) Screen Processing Control Functions

| Label Line Display | WYSE | | | | TVI | | | ADDS |
|-----------------------------|------------|--------|---------|--------|-----|-----|------|------|
| | 160/60 | PCTerm | 150/120 | WY 50+ | 950 | 925 | 910+ | A2 |
| Clear shifted Label line. | ESC z) CR | n/a | same | same | n/a | n/a | n/a | EnH |
| Disable shifted Label line. | ESC z DEL | n/a | same | same | n/a | n/a | n/a | EnH |

WYSE and ADDS Enhanced Modes:

There are two distinct label lines when the terminal is using 24 or 42 data lines:

- The upper one is for shifted label line (shifted function key label line).
- The lower one is for unshifted label line (unshifted function key label line).

When using the 25 or 43 data line configuration mode, only one label line is available at a time. By default, it displays the unshifted label line (or unshifted function key label line). This line becomes a shifted label line (or shifted function key label) whenever the **Shift** key is pressed. Releasing the **Shift** key returns the line to be the unshifted display line.

TVI and PCTerm Modes:

Only an unshifted label line (unshifted function label line) is available. To be visible, the label line must be explicitly turned on by the command "Turn on User Line."

For TVI personalities, the label line is displayed only when data line is set to 24 or 42 data lines.

For PCTerm mode, turning on the display line forces the terminal to 24 or 42 data lines. If the cursor is at the 25th or 43rd line before the line is set, then the cursor moves to the same column at line 24 or 42, and the entire data area scrolls up one line. The label line is displayed at the 25th or 43rd line, respectively.

Text Parameter:

The parameter *text* is a character string to be entered in the label line. The allowable size of *text* varies among emulation modes and column modes. In embedded emulation mode, the first character shown on the user line is an attribute space.

| Emulation Mode | Column Mode | Maximum Number | Column Position |
|----------------|-------------|----------------|-----------------|
| Hidden | 80 | 80 | 1–80 |
| Hidden | 132 | 132 | 1–132 |
| Embedded | 80 | 79 | 2–80 |
| Embedded | 132 | 131 | 2–132 |

| User Label Line Display for TVI Mode | WYSE | | | | TVI | | | ADDS |
|---|--------|-------------------|---------|--------|-------|-------|-------|------|
| | 160/60 | PCTerm | 150/120 | WY 50+ | 950 | 925 | 910+ | A2 |
| Turn off User line (default) | n/a | ESC e or ESC h | same | n/a | ESC h | ESC h | ESC h | n/a |
| Turn on User line | n/a | ESC g | n/a | n/a | ESC g | ESC g | ESC g | n/a |

Character Attributes

| | | | | | | | | |
|---|-------------------|---------------------------|------|------|------|------|------|-----|
| Assign character attribute (main display area) | ESC G <i>Attr</i> | ESC G <i>Attribute</i> | same | same | same | same | same | EnH |
|---|-------------------|---------------------------|------|------|------|------|------|-----|

(continued on next page)

Table 12–5 (Cont.) Screen Processing Control Functions

| Parameters: | Attr | Display Attributes | TVI Attr |
|--|------|---|----------|
| Wyse 160/60, 150/120, 50+, and ADDS | SP | Space character | SP |
| | 0 | Normal | 0, p |
| | 1 | Invisible | 1, q |
| | 2 | Blink | 2, r |
| | 3 | Invisible and blink | 3, s |
| | 4 | Reverse | 4, t |
| | 5 | Reverse and invisible | 5, u |
| | 6 | Reverse and blink | 6, v |
| | 7 | Reverse, blink, invisible | 7, w |
| | 8 | Underline | 8, x |
| | 9 | Underline and invisible | 9, y |
| | : | Underline and blink | ;, z |
| | ; | Underline, blink, invisible | ;, { |
| | < | Underline and reverse | <, |
| | = | Underline, reverse, invisible | =, } |
| | > | Underline, reverse, blink | >, ~ |
| | ? | Underline, reverse, blink, invisible | ?, DEL |
| | p | Dim | |
| | q | Dim and invisible | |
| | r | Dim and blink | |
| | s | Dim, blink, invisible | |
| | t | Dim and reverse | |
| | u | Dim, reverse, invisible | |
| | v | Dim, reverse, blink | |
| | w | Dim, reverse, blink, invisible | |
| | x | Dim and underline | |
| | y | Dim, underline, invisible | |
| | z | Dim, underline, blink | |
| | { | Dim, underline, blink, invisible | |
| | | Dim, underline, reverse | |
| | } | Dim, underline, reverse, invisible | |
| | ~ | Dim, underline, reverse, blink | |
| | DEL | Dim, underline, reverse, blink, invisible | |

| PCTerm Mode | <u>Attribute</u> | <u>Display Attributes</u> |
|--------------------|------------------|-------------------------------|
| | 0, @, P, `, p | Normal |
| | 1, A, Q, a, q | Invisible |
| | 2, B, R, b, r | Blink |
| | 3, C, S, c, s | Invisible and blink |
| | 4, D, T, d, t | Reverse |
| | 5, E, U, e, u | Reverse and invisible |
| | 6, F, V, f, v | Reverse and blink |
| | 7, G, W, g, w | Reverse, blink, invisible |
| | 8, H, X, h, x | Underline |
| | 9, I, Y, i, y | Underline and invisible |
| | ;, J, Z, j, z | Underline and blink |
| | ;, K, [, k, { | Underline, blink, invisible |
| | <, L \, l, | Underline and reverse |
| | =, M,], } | Underline, reverse, invisible |
| | >, N, ^, n, ~ | Underline, reverse, blink |

(continued on next page)

ASCII Escape Sequences

12.4 Screen Processing

Table 12–5 (Cont.) Screen Processing Control Functions

| Parameters: | <i>Attr</i> | Display Attributes | | | | TVI <i>Attr</i> | | |
|--|------------------------|---------------------------------------|----------------|-------------------|--------------------------------|--------------------|--------------------|--------------------------|
| | ?, O, _, o, DEL | Underline, reverse, blink, invisible | | | | | | |
| Selecting | | WYSE | | | TVI | | | ADDS |
| Display Attribute Mode | 160/60 | PCTerm | 150/120 | WY 50+ | 950 | 925 | 910+ | A2 |
| Char attribute mode on ¹⁰ | ESC e 1 | n/a | same | n/a | n/a | n/a | n/a | n/a |
| Char attribute mode off | ESC e 0 | n/a | same | n/a | n/a | n/a | n/a | n/a |
| Page attribute mode on ¹¹ | ESC e 2 | n/a | same | same | EnH | EnH | EnH | EnH |
| Line attribute mode on | ESC e 3 | n/a | same | same | EnH | EnH | EnH | EnH |
| Assign display attribute to a message field | ESC A <i>Area Attr</i> | n/a | same | same | ESC \ <i>Area Attr</i> (EnH) | | | EnH |
| Parameters: | <u><i>Area</i></u> | <u>Description</u> | | | | | | |
| | 0 | Data Area | | | | | | |
| | 1 | Label Line | | | | | | |
| | 2 | Terminal message field on Status Line | | | | | | |
| | 3 | Computer message field on Status Line | | | | | | |
| Display Attributes | | | | | | | | |
| Assign write-protect character attribute | ESC ` <i>Wpca</i> | n/a | same | same | n/a | n/a | n/a | EnH or ESC 0 <i>Spca</i> |
| Parameters - WYSE 160/60, WYSE 50+, and ADDS using WYSE sequences:¹² | <u><i>Wpca</i></u> | <u>Description</u> | | | Parameters - ADDS mode† | <u><i>Spca</i></u> | <u>Description</u> | |
| | 6 | Reverse | | | | 0 | Dim | |
| | 7 | Dim (default) | | | | 1 | Blink | |
| | A | Normal | | | | 2 | Invisible | |
| | B | Blink | | | | 3 | Normal | |
| | C | Invisible | | | | 4 | Reverse | |
| | E | Underline | | | | 5 | Underline | |
| | F | Reverse | | | | | | |
| | G | Dim | | | | | | |
| Clear unprotected page to display attribute | n/a | n/a | n/a | ESC ! <i>Attr</i> | n/a | Wyse | Wyse | EnH |
| Request attribute under cursor | n/a | ESC D | n/a | n/a | n/a | n/a | n/a | n/a |

† All the 7-bit ASCII codes are legal in this sequence. Example: "A" turns on the dim attribute, "T" turns on the reverse attribute, "S" turns on dim, blink and reverse attributes.

‡ Example: Dim + Reverse + Invisible reports VTS (8AH) + a.

¹²Assigning parameters "6," "7" or "A" clears previously defined write-protected attributes; "B" through "G" add on top of previous attribute(s) and display a combination of new and old display attributes.

(continued on next page)

Table 12–5 (Cont.) Screen Processing Control Functions

| Response to | WYSE | | | | TVI | | | ADDS |
|---|---|------------------|--|------------|------------------|-----|------|------|
| | 160/60 | PCTerm | 150/120 | WY 50+ | 950 | 925 | 910+ | A2 |
| Display Attributes | | | | | | | | |
| Response:‡ | Two bytes—the Bit for attribute under the cursor, then "a". | | | | | | | |
| | <u>Bit</u> | <u>Attribute</u> | | <u>Bit</u> | <u>Attribute</u> | | | |
| | 0 | Underline | | 4 | Always 0 | | | |
| | 1 | Reverse | | 5 | Always 0 | | | |
| | 2 | Blink | | 6 | Always 0 | | | |
| | 3 | Invisible | | 7 | Dim | | | |
| Assign Line Attributes | | | | | | | | |
| Assign line attributes | ESC G <i>LineAttr</i> | n/a | same | same | n/a | n/a | n/a | EnH |
| Parameters: | <u><i>LineAttr</i></u> @ | | <u>Line Attribute</u> | | | | | |
| | A | | Single height, single width (default) | | | | | |
| | B | | Single height, double width | | | | | |
| | C | | Top-half of double height, single width | | | | | |
| | D | | Bottom-half of double height, single width | | | | | |
| | E | | Top-half of double height, double width | | | | | |
| | | | Bottom-half of double height, double width | | | | | |
| ‡ Example: Dim + Reverse + Invisible reports VTS (8AH) + a. | | | | | | | | |

Table 12–6 lists the data protection control functions. The word “same” in Table 12–6 signifies the same control sequences as in the WYSE 160/60 column.

Table 12–6 Data Protection Control Functions

| Write-Protect Mode | WYSE | | | | TVI | | | ADDS |
|------------------------------------|--------|--------|---------|--------|------|------|------|---------------|
| | 160/60 | PCTerm | 150/120 | WY 50+ | 950 | 925 | 910+ | A2 |
| Write-protect mode off (default) | ESC (| same | same | same | same | same | same | EnH or Ctrl/O |
| Write-protect mode on ¹ | ESC) | same | same | same | same | same | same | EnH or Ctrl/N |
| Protect Mode | | | | | | | | |
| Protect mode off (default) | ESC ` | same | same | same | same | same | same | EnH |
| Protect mode on | ESC & | same | same | same | same | same | Wyse | EnH |

¹ Turning on Write-Protect mode does not start protecting the data. It only defines the range of data that needs to be protected. Not until Protect mode is turned on does the data become protected. Changing personality does not change the Write-Protect mode. Graphic characters range from 1/0 to 1/15, and embedded attributes are automatically write-protected even when Write-Protect mode is off.

ASCII Escape Sequences

12.4 Screen Processing

Table 12–7 lists the cursor control functions. The word “same” in Table 12–7 signifies the same control sequences as in the WYSE 160/60 column.

Table 12–7 Cursor Control Functions

| | WYSE | | | | TVI | | | ADDS |
|-------------------------------|---|-----------------------|---------|------------------|---|-------|-------|------------------|
| | 160/60 | PCTerm | 150/120 | WY 50+ | 950 | 925 | 910+ | A2 |
| Autopage Mode | | | | | | | | |
| On | ESC d + | n/a | same | same | ESC v | ESC v | ESC v | EnH |
| Off (default) | ESC d * | n/a | same | same | ESC w | ESC w | ESC w | EnH |
| Autoscrolling Mode | | | | | | | | |
| On (default) | ESC O | n/a | same | same | n/a | n/a | n/a | EnH |
| Off | ESC N | n/a | same | same | n/a | n/a | n/a | EnH |
| Cursor Display Feature | | | | | | | | |
| Set cursor appearance | ESC ` | ESC . | same as | same as | ESC . <i>Cursor</i> | | | EnH ¹ |
| Parameters: | <u>Cursor</u> | <u>Description</u> | 160/60 | 160/60 | | | | |
| | 0 | Cursor Display Off | | | | | | |
| | 1 | Cursor Display On | | | | | | |
| | 2 | Steady Block Cursor | | | | | | |
| | 3 | Blinking Line Cursor | | | | | | |
| | 4 | Steady Line Cursor | | | | | | |
| | 5 | Blinking Block Cursor | | | | | | |
| End-of-Line Wrap Mode | | | | | | | | |
| On (default) | ESC d / | ESC ~ | same as | same as | n/a | n/a | n/a | EnH |
| Off | ESC d . | ESC 0 | same as | same as | n/a | n/a | n/a | EnH |
| | | | 160/60 | 160/60 | | | | |
| | | | 160/60 | 160/60 | | | | |
| | When the cursor position is located at the bottom and right margin position of the current page with wrap flag on, any displayable character received has the following effect: | | | | | | | |
| | <u>Autopage</u> | <u>Autoscroll</u> | | <u>Page Mode</u> | <u>Cursor Moves to . . .</u> | | | |
| | On | - | | Single | Home position of the active page. | | | |
| | | | | Multiple | Home position of the next page. | | | |
| | Off | On | | Multiple | Left margin of bottom line after a scroll is performed. | | | |
| | Off | Off | | Multiple | Home position of the active page. | | | |

¹ Ctrl/W = Cursor off; Ctrl/X = Cursor on.

(continued on next page)

Table 12–7 (Cont.) Cursor Control Functions

| | WYSE | | | | TVI | | | ADDS |
|------------------------------|-----------------------|------------------------------|-------------------------|----------------|---|------|------|----------------|
| | 160/60 | PCTerm | 150/120 | WY 50+ | 950 | 925 | 910+ | A2 |
| Received CR Mode | | | | | | | | |
| CR (default) | ESC e 4 | ESC 9 | same as 160/60 | same as 160/60 | EnH | EnH | EnH | EnH |
| CRLF | ESC e 5 | ESC 8 | EnH | same as 160/60 | EnH | EnH | EnH | EnH |
| Lock Cursor Line Mode | | | | | | | | |
| On | ESC ` H | n/a | same | same | ESC ! 1 | n/a | n/a | EnH |
| Off (default) | ESC ` I | n/a | same | same | ESC ! 2 | n/a | n/a | EnH |
| Recognize DEL Mode | | | | | | | | |
| On (default) | ESC e E | EnH | same | same | EnH | EnH | EnH | EnH |
| Off | ESC e D | EnH | same | same | EnH | EnH | EnH | EnH |
| Cursor Movement | | | | | | | | |
| Cursor Left (Back Space) | Ctrl/H | same | same | same | same | same | same | Wyse or Ctrl/U |
| | <u>Autopage</u> On | <u>Page Mode</u> Multiple | | | <u>Cursor Moves to . . .</u> Bottom right margin of the preceding page (if any) even though the bottom right margin is protected. Under this command, the Protect mode feature carries through all pages. Refer to Protect Mode for details. | | | |
| | Off | Single | | | Bottom right margin of the active page even though the right margin is protected. | | | |
| Cursor Left (Delete) | DEL | same | same | same | same | same | same | same |
| Cursor Right | Ctrl/L | same | same | same | same | same | same | Ctrl/F |
| | <u>Autopage</u> On | <u>Autoscroll</u> - | <u>Page</u> Multiple | | <u>Cursor Moves to . . .</u> Home position or the first unprotected position (when Protect mode is on) of the next page (if any). Under this command, the Protect mode feature carries through all pages. Refer to Protect mode for details. | | | |
| | Off | On | Single ² | | Left margin of the bottom margin line after a scroll is performed. | | | |
| | Off | Off | Single ³ | | Home position of the active page. | | | |

²Autopage mode is either set to off, or the terminal is in Single Page mode and Autoscroll mode is on.

³Autopage mode is either set to off, or the terminal is in Single Page mode and Autoscroll mode is off.

(continued on next page)

ASCII Escape Sequences

12.4 Screen Processing

Table 12–7 (Cont.) Cursor Control Functions

| | WYSE | | | | TVI | | | ADDS |
|--|---|---------------------|---|----------------|---|------|------|--------|
| | 160/60 | PCTerm | 150/120 | WY 50+ | 950 | 925 | 910+ | A2 |
| Cursor Up | | | | | | | | |
| Cursor Up—No Scroll | Ctrl/K | same | same | same | same | same | same | Ctrl/Z |
| Cursor Up—Scroll (Reverse Linefeed) | ESC j | same | same | same | same | same | Wyse | EnH |
| | This command moves the cursor as follows: | | | | | | | |
| | <u>Autopage</u> | <u>Autoscroll</u> | <u>Page</u> | <u>Protect</u> | <u>Cursor Moves to . . .</u> | | | |
| | - | - | Single | - | (Command is ignored.) | | | |
| | On | - | Multiple | On or Off | Bottom line of the previous page. Under this command, the Protect mode feature carries through all pages. | | | |
| | Off | On | Multiple | Off | Top margin of the active page after a reverse scroll is performed. | | | |
| | Off | On | Multiple | On | (Command is ignored.) | | | |
| | Off | Off | Multiple | - | (Command is ignored.) | | | |
| <hr/> | | | | | | | | |
| Cursor Down | | | | | | | | |
| Cursor Down—No Scroll | Ctrl/V | same | same | same | same | same | same | same |
| Cursor Down—Scroll (Linefeed) | Ctrl/J | same | same | same | same | same | same | same |
| | <u>Autopage</u> | <u>Autoscroll</u> | <u>Page Mode</u> | | <u>Cursor Moves to . . .</u> | | | |
| | Off | Off | - | | Top margin line of the active page. If the destination position is protected, the cursor moves right to the first unprotected position. | | | |
| | On | - | Single | | Top margin line of the active page. If the destination position is protected, the cursor moves right or down to the first unprotected position. | | | |
| | On | - | Multiple | | Top margin line of the next page. Under this command, the Protect mode feature carries through all pages. Refer to Protect Mode for details. | | | |
| | Off | On | Multiple | | Bottom line of the active page after a scroll is performed. | | | |
| <hr/> | | | | | | | | |
| Cursor to Start | | | | | | | | |
| Cursor to start of line | Ctrl/M | same | same | same | same | same | same | same |
| Cursor to start of next line | Ctrl/_ | same | same | same | same | same | same | EnH |
| | <u>Autopage</u> | <u>Page</u> | <u>Cursor Moves to . . .</u> | | | | | |
| | Off | Single ⁴ | Home position of the current page or the first unprotected position of the current page if Protect mode is on. | | | | | |
| | On | Multiple | Home position of the next page or the first unprotected position of the next page if Protect mode is on. Under this command, the Protect mode feature carries through all pages. Refer to Protect Mode for details. | | | | | |

⁴Either Autopage mode or Single Page mode is enabled.

(continued on next page)

Table 12–7 (Cont.) Cursor Control Functions

| Address Cursor | WYSE | | | | TVI | | | ADDS |
|---|--|--------|---------|--------|---|------|------|---------------------------------|
| | 160/60 | PCTerm | 150/120 | WY 50+ | 950 | 925 | 910+ | A2 |
| Cursor to Home | Ctrl/^ or ESC { | Ctrl/^ | same | same | Ctrl/^ | same | same | EnH or Ctrl/A |
| Address Cursor to a specific column (<i>Col</i>) | ESC _ <i>Col</i> | n/a | same | same | ESC] <i>Col</i> | | | EnH or Ctrl/P <i>Col</i> |
| Address Cursor to a specific line | ESC [<i>Line</i> | n/a | same | same | same | same | same | EnH or Ctrl/K <i>Line</i> |
| Address Cursor in Current Page | ESC = <i>Line Col</i> | same | same | same | same | same | same | EnH or ESC Y |
| Address Cursor in specific page | ESC h <i>page</i> | n/a | same | same | n/a | n/a | n/a | EnH <i>Line Col</i> |
| Address Cursor in specific page, line, and column | ESC w @ <i>Page Line Col</i> | n/a | same | same | ESC - <i>Page Line Col</i> ⁵ | | | EnH |
| Address Cursor in specific Window/Page | ESC - <i>Window/Page Line Col</i> ⁶ | same | same | same | EnH | EnH | EnH | EnH |
| Address Cursor in 80/132 column current Page | ESC a <i>Line R Col C</i> | n/a | same | same | ESC d <i>Line R Col C</i> | | | EnH |
| Read Cursor | | | | | | | | |
| Read Cursor address in current Page | ESC ? | same | same | same | same | same | same | EnH |
| Read Window, Page no., and Cursor address | ESC / | same | same | same | same | same | same | EnH |
| Read Cursor address in Current 80/132-col page | ESC b | n/a | same | same | n/a | n/a | n/a | EnH |
| Read Page number and Cursor address | ESC w `, ESC w ., ESC w ,, ESC w ´ | n/a | same | same | n/a | n/a | n/a | EnH |

⁵Enhanced Mode off.

⁶When screen is split, "0" = upper window; "1" = lower window.

Note

The terminal responds to the Read Cursor command in the following format: III R ccc C

The two parameter values, III and ccc, are the 3-byte decimal values for the line/column location of the cursor. For example, "019R010C" indicates the cursor is at line 19, column 10. The sequence with parameters "001" (3/0)(3/0)(3/1) and "001" (3/0)(3/0)(3/1) indicates the cursor is at the home position.

ASCII Escape Sequences

12.4 Screen Processing

Table 12–8 lists the ASCII editing control functions. The word “same” in Table 12–8, Table 12–10, and Table 12–11 signify the same control sequences as in the WYSE 160/60 column.

Table 12–8 ASCII Editing Control Functions

| Local Edit Mode | WYSE | | | | TVI | | | ADDS |
|----------------------------|--------|--------|---------|--------|------|------|------|------|
| | 160/60 | PCTerm | 150/120 | WY 50+ | 950 | 925 | 910+ | A2 |
| Off ¹ (default) | ESC l | n/a | same | same | same | same | same | n/a |
| On ² | ESC k | n/a | same | same | same | same | same | n/a |

¹Duplex Edit Mode On.

²Duplex Edit Mode Off.

In local edit mode, instead of sending keycodes to the host, some function keys send codes directly to the terminal to speed up the editing process. Table 12–9 lists these local edit functions and their operating keys for both the VT keyboard and the Enhanced PC keyboard.

Table 12–9 Local Edit Mode Function Keys

| Function | VT Keyboard | EPC Keyboard | Sequence |
|------------------|--------------------|-----------------------|----------|
| Insert Character | PF1 | | ESC Q |
| Insert Line | Shifted PF1 | | ESC E |
| Delete Character | PF2 | Delete | ESC W |
| Delete Line | Shifted PF2 | Shifted Delete | ESC R |
| Clear Line | PF3 | End | ESC T |
| Clear Screen | Shifted PF3 | Shifted End | ESC Y |
| Insert | | Insert | ESC q |
| Replace | | Shifted Insert | ESC r |
| Next Page | | Page Down | ESC K |
| Previous Page | | Page Up | ESC J |
| Send | | | ESC 7 |
| Print | | Print | ESC P |
| Home | | Shift Home | ESC { |
| Tab | | Shift Tab | ESC I |

Table 12–10 lists the tab stop control functions.

Table 12–10 Tab Stop Control Functions

| Tab Stop Function | WYSE | | | | TVI | | | ADDS |
|---|-----------------|-------------------|----------------|------------------|---|-------|-------|------|
| | 160/60 | PCTerm | 150/120 | WY 50+ | 950 | 925 | 910+ | A2 |
| Clear All Tab Stops | ESC 0 | ESC 3 | same as 160/60 | same as 160/60 | ESC 3 | ESC 3 | ESC 3 | n/a |
| Clear Tab Stop | ESC 2 | same | same | same | same | same | same | EnH |
| Set Tab Stop | ESC 1 | same | same | same | same | same | same | EnH |
| Tabulate Cursor or Field Tab ¹ | ESC i or Ctrl/I | same | same | same | same | same | same | EnH |
| The cursor moves as follows: | | | | | | | | |
| | <u>Autopage</u> | <u>Autoscroll</u> | | <u>Page Mode</u> | <u>Cursor Moves to . . .</u> | | | |
| | On | - | | Single | Top margin line of the active page | | | |
| | On | - | | Multiple | Top margin line of the other page. | | | |
| | Off | On | | Multiple | Bottom margin of the active page after a scroll is performed. | | | |
| | Off | Off | | Multiple | Top margin line of the active page. | | | |
| Backtab or Field Tab ² | ESC I | same | same | same | same | same | same | EnH |
| The cursor moves as follows: | | | | | | | | |
| | <u>Autopage</u> | <u>Autoscroll</u> | | <u>Page Mode</u> | <u>Cursor Moves to . . .</u> | | | |
| | On | - | | Single | Home | | | |
| | On | - | | Multiple | Bottom margin line of the previous page if any. | | | |
| | Off | On | | Multiple | Bottom margin line of the active page. | | | |
| | Off | Off | | Multiple | Bottom margin line of the active page. | | | |

¹Executes "tabulate cursor" when protect mode is off.

²If protect mode is on, this command executes a "field tab" to move the cursor left to the first unprotected character position after the nearest protect field. The tab stop setting is completely ignored. The cursor moves backward from the first position of an unprotected area to the first position of another unprotected area.

Executing a Backtab from an unprotected page to a previous protected page changes its protect mode to "unprotected."

ASCII Escape Sequences

12.4 Screen Processing

Table 12–11 lists the page edit control functions.

Table 12–11 Page Edit Control Functions

| Page Edit Mode | WYSE | | | | TVI | | | ADDS |
|---|--------------------|------------------|-------------------|-------------------|-------------------|-----------------|-----------------|------------------|
| | 160/60 | PCTerm | 150/120 | WY 50+ | 950 | 925 | 910+ | A2 |
| Off (default) | ESC e " | n/a | same | same | ESC O | ESC O | ESC O | EnH |
| On | ESC e # | n/a | same | same | ESC N | ESC N | ESC N | EnH |
| Insert/Replace Mode | | | | | | | | |
| Replace mode On (default) | ESC r | same | same | same | same | Wyse | Wyse | EnH |
| Insert mode On | ESC q | ESC z | same as 160/60 | same as 160/60 | same as 160/60 | Wyse | Wyse | EnH |
| Insert Characters | | | | | | | | |
| Insert Space Character | ESC Q | same | same | same | same | same | same | EnH |
| Insert Line of Spaces | ESC E | same | same | same | same | same | same | EnH or ESC M |
| Insert Column of NULs | ESC c M | n/a | same | same | n/a | n/a | n/a | EnH |
| Deleting Data on Current Page Only | | | | | | | | |
| Delete Cursor Character | ESC W | same | same | same | same | same | same | EnH |
| Delete Cursor Line | ESC R | same | same | same | same | same | same | EnH |
| Delete Cursor Column | ESC c J | n/a | same | same | n/a | n/a | n/a | EnH |
| Erasing Data on Page Function | | | | | | | | |
| Clear Page to NULs | ESC * | same | same | same | same | same | same | EnH |
| Clear Page to spaces | ESC + | n/a | same | same | n/a | n/a | n/a | EnH or Ctrl/L |
| Clear page to write-protected spaces | ESC , | n/a | same | same | n/a | n/a | n/a | EnH |
| Clear unprotected page to write-protected spaces | n/a | ESC , | n/a | n/a | ESC , | ESC , | ESC , | n/a |
| Clear unprotected page to NULs | ESC : | same | same | same | same | same | same | ESC : (EnH) |
| Clear unprotected page to spaces | ESC ; or Ctrl/Z | same or ESC + | same as 160/60 | same as 160/60 | same or ESC+ | same or ESC+ | same or ESC+ | EnH |
| Clear unprotected page to a specific character ¹ | ESC . <i>Char</i> | n/a | same | same | n/a | n/a | n/a | EnH |

¹"*Char*" is an ASCII character. Any 8-bit code is treated as a 7-bit code since the most significant bit of the code is stripped off.

(continued on next page)

Table 12–11 (Cont.) Page Edit Control Functions

| Erasing Data on Page Function (cont.) | WYSE | | | | TVI | | | ADDS |
|--|---------------------|--------|---------|--------|------|------|------|-------|
| | 160/60 | PCTerm | 150/120 | WY 50+ | 950 | 925 | 910+ | A2 |
| Clear unprotected page to NULs from cursor | ESC y | same | same | same | same | same | same | EnH |
| Clear unprotected page to spaces from cursor | ESC Y | same | same | same | same | same | same | ESC k |
| Clear unprotected page foreground to NULs from cursor position | ESC c Q | n/a | same | same | n/a | n/a | n/a | EnH |
| Clear unprotected page foreground to spaces from cursor position | ESC c P | n/a | same | same | n/a | n/a | n/a | EnH |
| Clear unprotected area to end of line with NULs | ESC c L | n/a | same | same | n/a | n/a | n/a | EnH |
| Clear unprotected area to end of line with spaces | ESC c O | n/a | same | same | n/a | n/a | n/a | EnH |
| Clear unprotected line from cursor position to NULs | ESC t | same | same | same | same | same | same | EnH |
| Clear unprotected line from cursor position to spaces | ESC T | same | same | same | n/a | n/a | n/a | ESC K |
| Clear unprotected line foreground from cursor position to NULs | ESC c S | n/a | same | same | n/a | n/a | n/a | EnH |
| Clear unprotected line foreground from cursor position to spaces | ESC c R | n/a | same | same | n/a | n/a | n/a | EnH |
| Clear unprotected position to NULs | ESC c K | n/a | same | same | n/a | n/a | n/a | EnH |
| Clear unprotected column to a specific character ¹ | ESC c I <i>Char</i> | n/a | same | same | n/a | n/a | n/a | EnH |
| Clear column to write-protected space | ESC V | same | same | same | same | same | same | EnH |

¹"*Char*" is an ASCII character. Any 8-bit code is treated as a 7-bit code since the most significant bit of the code is stripped off.

ASCII Escape Sequences

12.4 Screen Processing

Table 12–12 lists the rectangle area control functions.

Table 12–12 Rectangle Area Control Functions

| Draw Rectangle in 80/132 | WYSE | | | | TVI | | | ADDS |
|--|---|---|---------|--------|-----|-----|------|------|
| | 160/60 | PCTerm | 150/120 | WY 50+ | 950 | 925 | 910+ | A2 |
| column Current Page | 160/60 | PCTerm | 150/120 | WY 50+ | 950 | 925 | 910+ | A2 |
| Format 1 | ESC c G <i>Line Col</i> | | | | | | | |
| | | n/a | same | same | n/a | n/a | n/a | EnH |
| Format 2 ¹ | ESC c G <i>Line ~ Col</i> | | | | | | | |
| | | n/a | same | same | n/a | n/a | n/a | EnH |
| Fill Rectangle with a Specific Character in 80/132-column Cursor Page | | | | | | | | |
| Format 1 | ESC c H <i>Line Col Char</i> | | | | | | | |
| | | n/a | same | same | n/a | n/a | n/a | EnH |
| Format 2 ¹ | ESC c H <i>Line ~ Col Char</i> | | | | | | | |
| | | n/a | same | same | n/a | n/a | n/a | EnH |
| Fill unprotected Rectangle with a specific character | | | | | | | | |
| Format 1 | ESC c F <i>Line Col Char</i> | | | | | | | |
| | | n/a | same | same | n/a | n/a | n/a | EnH |
| Format 2 ¹ | ESC c F <i>Line ~ Col Char</i> | | | | | | | |
| | | n/a | same | same | n/a | n/a | n/a | EnH |
| Draw Rectangle² | | | | | | | | |
| Draw rectangle area to right and below cursor. | ESC c N <i>Width Height</i> | | | | | | | |
| | | n/a | same | same | n/a | n/a | n/a | EnH |
| Swap/Copy/Move | | | | | | | | |
| WYSE 160/60 | | | | | | | | |
| Swap, copy, or move the data in a rectangle to another rectangle. | ESC c ^ <i>Action S_page P S_n1 R S_n2 C S_n3 R S_n4 C D_page P D_n1 R D_n2 C</i> | | | | | | | |
| Parameters: | <u>Action</u> | <u>Description</u> | | | | | | |
| | 0 | Swaps data between the source and the destination rectangles. | | | | | | |
| | 1 | Copies the content of the source rectangle to a destination rectangle, preserving the contents of the source rectangle. | | | | | | |
| | 2 | Moves the contents of the source rectangle to destination rectangle, clearing the source rectangle. | | | | | | |
| | <u>Parameter</u> | <u>Description</u> | | | | | | |
| | <i>S_page</i> | Page number of the source rectangle | | | | | | |
| | <i>S_n1</i> | Starting line number of the source rectangle (top left corner) | | | | | | |
| | <i>S_n2</i> | Starting column number of the source rectangle (top left corner) | | | | | | |
| | <i>S_n3</i> | Ending line number of the source rectangle (bottom right corner) | | | | | | |
| | <i>S_n4</i> | Ending column number of the source rectangle (bottom right corner) | | | | | | |
| | <i>D_page</i> | Page number of the destination rectangle | | | | | | |
| | <i>D_n1</i> | Starting line number of the destination rectangle (top left corner) | | | | | | |
| | <i>D_n2</i> | Starting column number of the destination rectangle (top left corner) | | | | | | |

¹Not recommended for 80-column mode.

²Parameters *Line* and *Column* are ASCII characters whose decimal values are the desired numbers plus 31.

(continued on next page)

Table 12–12 (Cont.) Rectangle Area Control Functions

| Swap/Copy/Move | PCTerm | 150/120 | WY 50+ | 950 | 925 | 910+ | A2 |
|--|--------|----------------|----------------|-----|-----|------|-----|
| Swap, copy, or move the data in a rectangle. | n/a | same as 160/60 | same as 160/60 | n/a | n/a | n/a | EnH |

12.5 Printing/Sending Data

This section describes commands to print and send data.

12.5.1 Sending Data

This section describes commands to send a defined area of data on the screen through the main communication port using ASCII control functions. Individual commands address the specific data to be sent.

In send operations, delimiter characters are sent along with data to mark a line end, transfer complete, or the protect data and its area. Table 12–13 lists the possible delimiter types. Depending on the scope of data (line, page) and the type of data (protected, unprotected) that has been sent, different delimiter characters are enclosed. The individual commands explain which delimiter should be sent with each command.

Table 12–13 lists the types of delimiters to send data.

Table 12–13 Send Data Delimiters

| Delimiter Type | Sent . . . |
|---|--|
| End of the line | At the end of each line but not at the end of the page (block). |
| Transfer complete | After each Send Data action, except for a "Send the Cursor Character" command. |
| Field separator | To take the position of the protected field data when "Send Unprotected" command is executed and Protect mode is on. |
| Start protect field and End protect field | To mark the beginning and the ending of a write-protected field of data when Protect mode is on. |

All the send data actions in this section, except "Send the Cursor Character" command, use the following rules:

- The attributes are not sent along with their data. But a Space character (Hex 20) is inserted between two distinct attribute data to indicate the attribute difference.
- During the process of sending characters, the cursor moves to the location of the character being sent.
 - **Protect mode on:** The cursor does not move.
 - **Protect mode off:** The cursor moves to the left margin of the next line.
- Null characters on the screen are not sent.
- Delimiter characters:
 - **TVI modes and WYSE 160/60 PCTerm modes:** Defined by command "Define Delimiters" (Refer to the command for details.)

ASCII Escape Sequences

12.5 Printing/Sending Data

- **Other personalities:** See Table 12–14.

Table 12–14 Delimiters for Other Personalities

| Delimiter | Terminal sends... |
|---------------------------|---|
| End of line | Either "US" or "CRLF" depending on the Set-Up Block End selection. |
| End of transmission | Either "CR" or "ETX" depending on the Set-Up Block End selection. |
| Protected field | A single FS (Hex 1C). |
| Protected field separator | Native mode: "ESC)" and "ESC (" when the protect field attribute is Dim or Normal; "ESC)sp" and "ESC (sp" when the protect field attribute is any other combination. Other modes: "ESC)" and "ESC (" |

- If any line on the screen is locked, then the line is not sent; however, the end of line delimiter is still sent to indicate a line has been skipped.
- If the first character sent is a protected character, then the ESC) sequence is not sent before the first character; if the last character sent is a protected character, then the ESC (sequence is not sent before the terminator.
- If the cursor position is located at the right margin of the bottom margin line and the Protect mode is off:

| Autopage | Autoscroll | Page Mode | Cursor moves to . . . |
|----------|------------|-----------|---|
| On | - | Single | Home position of the active page. |
| On | - | Multiple | Home position of the other page. |
| Off | On | Multiple | Left margin of the bottom line after a scroll is performed. |
| Off | Off | Multiple | Home position of the active page. |

Table 12–15 lists the print/send control functions.

Table 12–15 Print/Send Control Functions

| Function | WYSE | | | | TVI | | | ADDS | |
|--|---|--------------------------------|---------|--------|------|--------------------------------|------|------|-----|
| | 160/60 | PCTerm | 150/120 | WY 50+ | 950 | 925 | 910+ | A2 | |
| Define delimiters | n/a | ESC x <i>Dlmtr Char1 Char2</i> | | | | ESC x <i>Dlmtr Char1 Char2</i> | | | n/a |
| Parameters: | <u><i>Dlmtr</i></u> | <u>Description</u> | | | | | | | |
| | 0 | Protected Field separator | | | | | | | |
| | 1 | Start protect field | | | | | | | |
| | 2 | End protect field | | | | | | | |
| | 3 | End of the line | | | | | | | |
| | 4 | Termination | | | | | | | |
| | Parameters <i>Char1</i> and <i>Char2</i> are ASCII characters. | | | | | | | | |
| | <u>Delimiter</u> | <u>Default ASCII Character</u> | | | | | | | |
| | Field separator | FS NUL (1/12 0/0) | | | | | | | |
| | Start protect field | ESC) (1/11 2/9) | | | | | | | |
| | End protect field | ESC ((1/11 2/8) | | | | | | | |
| | End of the line | US NUL (1/15 0/0) | | | | | | | |
| | Termination | CR NUL (1/13 0/0) | | | | | | | |
| | A NUL character that is defined in a delimiter is not sent out. | | | | | | | | |
| Begin Print/Send | | | | | | | | | |
| Begin Print/Send at Top of Page | ESC d ` | n/a | same | same | n/a | n/a | n/a | EnH | |
| Begin Print/Send at Top of Screen | ESC d & | n/a | same | same | n/a | n/a | n/a | EnH | |
| Sending a Character or Line | | | | | | | | | |
| Send the Cursor Character | ESC M | n/a | same | same | n/a | n/a | n/a | n/a | |
| Send the Cursor Line | ESC 6 | same | same | same | same | same | same | n/a | |
| Send unprotected Cursor Line | ESC 4 | same | same | same | same | same | same | n/a | |
| Sending a Page | | | | | | | | | |
| Send Page | ESC 7 | same | same | same | same | same | same | EnH | |
| Send an unprotected Page | ESC 5 | same | same | same | same | same | same | n/a | |
| Sending a Block | | | | | | | | | |
| Mark Block Beginning | ESC 8 | n/a | same | same | n/a | n/a | n/a | EnH | |
| Mark Block Ending ¹ | ESC 9 | n/a | same | same | n/a | n/a | n/a | EnH | |
| Send Block ² | ESC s | same | same | same | same | same | same | EnH | |
| Send an unprotected Character in a Block | ESC S | same | same | same | same | same | same | EnH | |

¹See Note 1.

²See Note 2.

ASCII Escape Sequences

12.5 Printing/Sending Data

ASCII emulations do not send:

- Initialization codes
- Ending sequences to designated character sets and display attributes
- "Fallbacks" to represent data that cannot be printed by the attached printer

The only factors that affect printing data are data and parity settings.

| Data/Parity Setting | Characters are printed . . . |
|---------------------|--|
| 8-bit | As is |
| 7-bit | After stripping off the most significant bit |

Notes

1. Note on Mark Block Ending:

- **Replace mode on:** "STX" or "ETX" replaces the existing character at the active position and moves the cursor right one position.
- **Insert mode on:** Writing "STX" or "ETX" moves all characters and their attributes one position to the right of the cursor position (inclusive) in the current line without wraparound.

2. Note on Send Block:

- **Protect mode on:** Unprotected data is sent as is; protected data, enveloped between "start of protect field" and "end of protect field" delimiters, is sent.
 - **Protect mode off:** All the data in the range, protected or unprotected, is sent.
-

Table 12–16 lists the printing data control functions.

ASCII Escape Sequences 12.5 Printing/Sending Data

Table 12–16 Printing Data Control Functions

| | WYSE | | | | TVI | | | ADDS |
|---|-----------------------------------|----------------------|-------------------|-------------------|-------------------|--------|--------|--------------------------|
| | 160/60 | PCTerm | 150/120 | WY 50+ | 950 | 925 | 910+ | A2 |
| Autoprint Mode¹ | | | | | | | | |
| Off (default) | Ctrl/T | ESC A | Ctrl/T | Ctrl/T | ESC A or Ctrl/T | | | Ctrl/T |
| On | Ctrl/R | ESC @ | Ctrl/R | Ctrl/R | ESC @ or Ctrl/R | | | Ctrl/R |
| Control Print Mode³ | | | | | | | | |
| Off | Ctrl/T | ESC a | Ctrl/T | Ctrl/T | ESC a | ESC a | ESC a | ESC 4 |
| On | ESC d # or Ctrl/X ² | ESC ´ | same as 160/60 | same as 160/60 | ESC ´ | ESC ´ | ESC ´ | ESC 3 ESC d# (EnH) |
| Aux Receive Mode | | | | | | | | |
| Off (default) | ESC d Sp | n/a | same | same | n/a | n/a | n/a | EnH |
| On | ESC d ! | n/a | same | same | n/a | n/a | n/a | EnH |
| Bidirectional Mode⁴ | | | | | | | | |
| Off (default) | ESC d \$ | Ctrl/T | same as 160/60 | same as 160/60 | Ctrl/T | Ctrl/T | Ctrl/T | EnH |
| On | ESC d % | Ctrl/R | same as 160/60 | same as 160/60 | Ctrl/R | Ctrl/R | Ctrl/R | EnH |
| Print Page to the Cursor Position | | | | | | | | |
| Formatted Page ⁵ | ESC P | same | same | same | same | same | Wyse | EnH |
| Formatted Page (unprotected) | ESC @ | n/a | same | same | n/a | n/a | n/a | EnH |
| Unformatted Page ⁵ | ESC p or ESC L | n/a | same | same | ESC L | n/a | n/a | ESC p |
| Print a Page with Time Message⁵ | | | | | | | | |
| | n/a | ESC L | n/a | n/a | n/a | ESC L | ESC L | n/a |
| Pass a Character to the Printer Port | | | | | | | | |
| | Ctrl/P <i>Char</i> | Wyse | same | same | Wyse | Wyse | Wyse | n/a |
| Define the Page Print Terminator | | | | | | | | |
| | n/a | ESC p <i>Ps Char</i> | n/a | n/a | ESC p <i>Char</i> | | | n/a |

¹ The symbol ">" is displayed in the status line when in Autoprint mode.

² Enhanced mode is off.

³ The symbol "=" is displayed in the status line when in Autoprint mode.

⁴ Turning off Bidirectional mode turns off Aux Receive mode and forces a normal print mode.

⁵ The time prints out in a format such as "TIME AM/PM 00:00." At the end of the time message, the following is sent to the printer port: **NUL Ctrl/F NUL**. The page prints as formatted data. The terminal sends an "ACK" to the host at the end of a print operation if ACK mode is on.

ASCII Escape Sequences

12.5 Printing/Sending Data

12.5.2 Graphics Characters

Table 12–17 lists the graphic characters.

Table 12–17 Graphic Characters

| Graphics Mode | WYSE | | | | TVI | | | ADDS |
|--|--------------------|--------|-------------------|-------------------|-------------------|-------------------|-------------------|------|
| | 160/60 | PCTerm | 150/120 | WY 50+ | 950 | 925 | 910+ | A2 |
| On | ESC H or Ctrl/B | ESC \$ | same as 160/60 | same as 160/60 | ESC \$ or Wyse | ESC \$ or Wyse | ESC \$ or Wyse | EnH |
| Off (default) | ESC H or Ctrl/C | ESC % | same as 160/60 | same as 160/60 | ESC % or Wyse | ESC % or Wyse | ESC % or Wyse | EnH |
| Display Graphic Character | | | | | | | | |
| Display character from the first 32 character set. ¹ | ESC H <i>Char</i> | n/a | same | same | n/a | n/a | n/a | EnH |

¹The parameter *Char* is an ASCII character in the range of Hex 20 to Hex 7E.

With Graphics mode on, all received codes in the range of 00 to 7E are displayed as characters in the range of Hex 00 to Hex 1F in the same character set.

This is done by stripping off the highest 3 bits of the code. For example:

| Receiving . . . | Displays . . . |
|---------------------|--------------------|
| 21, 41, or 61 (Hex) | 01 (Hex) character |
| 2C, 4C, or 6C (Hex) | 0C (Hex) character |
| 31, 51, or 71 (Hex) | 11 (Hex) character |

Most character sets in ASCII emulation contain characters in the range of Hex 00 and Hex 1F. For example, the Native character set contains 16 line-drawing graphics characters from Hex 10 to Hex 1F and 16 CRM characters from Hex 00 to 0F. But in most of the cases, Hex codes 00 to 1F are treated as control codes. To display these graphic characters, Graphic mode has to be turned on.

When the Graphic mode is on, new characters entered have normal attributes regardless of the state of the Write-Protect mode attribute. With Protect mode on, all the entered characters, except CRM characters, are protected.

To design a character font, see Chapter 13.

Defining and Loading ASCII Character Fonts

This chapter defines the ASCII character fonts and describes how to load the fonts.

13.1 Character Sets

In WYSE mode and ADDS Enhanced mode, desired characters can be acquired by loading them from various built-in character sets or by designing them using a pixel pattern*.

13.1.1 PCTerm on US Keyboard

The default and only character set supported for PCTerm on the US Keyboard is the PC International character set. This is a 256-character set, of which the first 128 characters form the PC Standard character set*.

13.1.2 WYSE and ADDS Enhanced Personalities

WYSE mode and ADDS enhanced mode support ten built-in ROM character sets and four *font banks*, which are physical locations in memory. Each character set has 128 characters (Hex 00 to Hex 7F), thus each font bank has the same space allocation.

The character set must be loaded into a font bank to become an "active" character set. Characters cannot be displayed directly by calling their physical locations; they can only be displayed through a series of steps to make them active. First, the primary and secondary logical character sets are defined by pointing to the desired font banks. Then, the active character set is defined for the terminal to display and receive codes. See Table 13–1 on how to display and load character sets.

Table 13–1 Display and Load Character Sets

| Step | Description |
|---|---|
| 1. Load font bank with built-in character set or Define and load character | Load a target character set from one of the ten built-in character sets into a font bank. Design a character and load it into a font bank. |
| 2. Define logical character set | Define primary or secondary character set to point to the font bank. |
| 3. Select active character set | Set active character set to point to either a primary or a secondary character set. |

Notes

WYSE 160: You can display all 512 characters in the four font banks on the screen at the same time.

* Refer to the IBM Code Page 437.

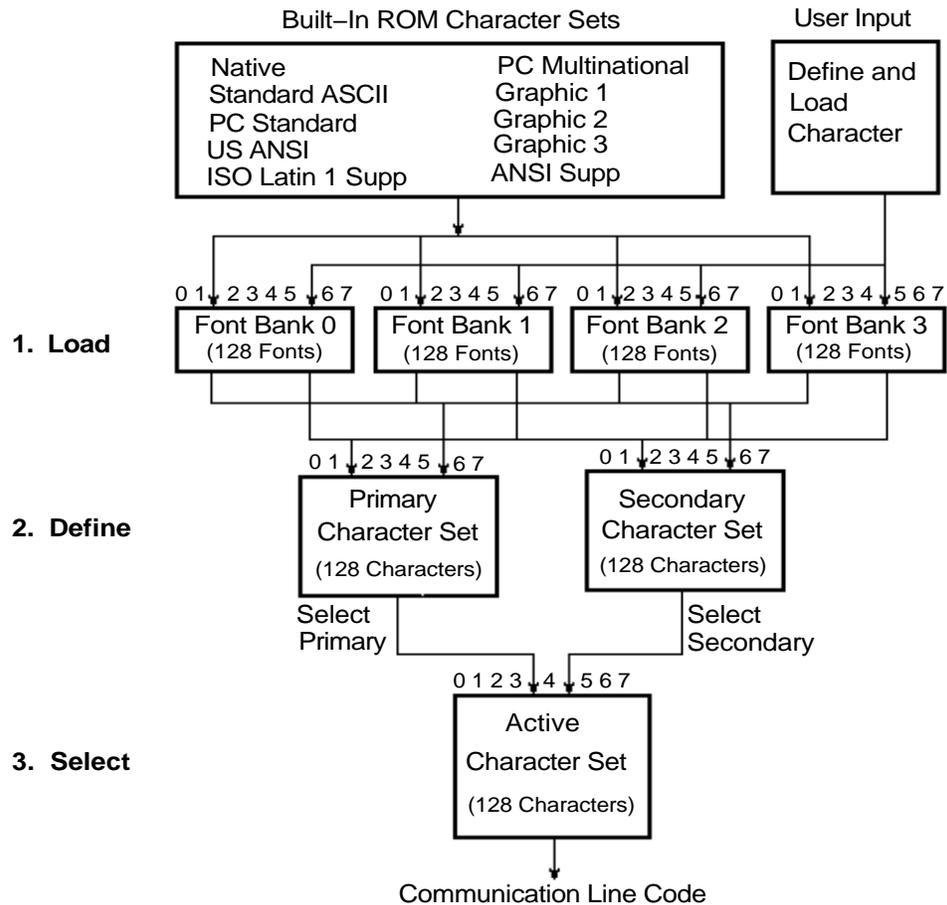
Defining and Loading ASCII Character Fonts

13.1 Character Sets

WYSE 50+: You can only display one font bank on the screen at a time.

Figure 13-1 shows the process for selecting character sets.

Figure 13-1 Process of Selecting Character Sets



MA-0027-93.GRA

The VT510 selects a character set from one of the built-in character sets by the following process. Refer to Table 13-1 for details.

1. Load the character sets into the font banks.
2. Define the primary and secondary character set from the font buffers.
3. Select which character set will be the active characters set.

Defining and Loading ASCII Character Fonts 13.1 Character Sets

Note

Changing a character set in a font bank may change the active character set if the active character set and primary/secondary character set happen to point to the same font bank.

13.2 Loading, Defining, and Selecting Character Sets

Table 13–2 shows how to load, define, and select the character sets. The word “same” in Table 13–2 signifies the same control sequences as in the WYSE 160/60 column.

Table 13–2 Loading Font Bank

| | WYSE | | | | TVI | | | ADDS |
|---|------------------------------------|--------------------------------------|---------|--------|-----|-----|------|------|
| | 160/60 | PCTerm | 150/120 | WY 50+ | 950 | 925 | 910+ | A2 |
| Load Font Bank¹ | ESC c @ <i>Bank Charset</i> | | | | | | | |
| Load ROM-resident character set into one of the four font banks. ² | | n/a | same | same | n/a | n/a | n/a | EnH |
| Parameters: | <u><i>Bank</i></u> | <u><i>Description</i></u> | | | | | | |
| | 0 | Font Bank 0 | | | | | | |
| | 1 | Font Bank 1 | | | | | | |
| | 2 | Font Bank 2 | | | | | | |
| | 3 | Font Bank 3 | | | | | | |
| | <u><i>Charset</i></u> | <u><i>Character Set Selected</i></u> | | | | | | |
| | @ (4/0) or ` (6/0) | Native | | | | | | |
| | A (4/1) or a (6/1) | PC Multinational | | | | | | |
| | B (4/2) or c (6/3) or d (6/4) | Standard ASCII | | | | | | |
| | C (4/3) | Graphics 1 | | | | | | |
| | D (4/4) or b (6/2) | PC standard | | | | | | |
| | E (4/5) | Graphics 2 | | | | | | |
| | F (4/6) | Graphics 3 | | | | | | |
| | G (4/7) or H (4/8) or g (6/7) | US ANSI | | | | | | |
| | N (4/14) or j (6/10) | ISO Latin-1 Supplemental | | | | | | |
| | I (4/9) or e (6/5) | ANSI Supplemental | | | | | | |
| Define Logical Character Set | | | | | | | | |
| Primary Character Set | ESC c B <i>Bank</i> | n/a | same | same | n/a | n/a | n/a | EnH |
| Secondary Character Set | ESC c C <i>Bank</i> | n/a | same | same | n/a | n/a | n/a | EnH |
| Select Active Character Set³ | | | | | | | | |
| Primary Character Set (default) | ESC c D | n/a | same | same | n/a | n/a | n/a | EnH |

¹ If not redefined, the default primary character set is Native/Wyse 50+ in Font Bank 0; the secondary character set is PC Multinational in Font Bank 1.

² Example: To load Bank 1 with the Multinational character set, enter: ESC c @ 1 A. This sequence is sent to the terminal. If ACK mode is on, the terminal returns an ACK to indicate that the font has loaded successfully.

³The default active character set, including that for TVI mode, is Native/Wyse 50+.

(continued on next page)

Defining and Loading ASCII Character Fonts

13.2 Loading, Defining, and Selecting Character Sets

Table 13–2 (Cont.) Loading Font Bank

| Select Active Character Set ³ | | | | | | | | |
|---|---------------------|--------|---------|-------------------|-----|-----|------|------|
| Secondary Character Set | ESC c E | n/a | same | same ⁴ | n/a | n/a | n/a | EnH |
| Automatic Font Loading | | | | | | | | |
| On (default) | ESC e O | n/a | same | same | n/a | n/a | n/a | n/a |
| Off | ESC e N | n/a | same | same | n/a | n/a | n/a | n/a |
| | | WYSE | | | TVI | | | ADDS |
| Clear Font Bank | 160/60 | PCTerm | 150/120 | WY 50+ | 950 | 925 | 910+ | A2 |
| Erase a character set from one of the four font banks. ¹ | ESC c ? <i>Bank</i> | n/a | same | same | n/a | n/a | n/a | EnH |

¹ If not redefined, the default primary character set is Native/Wyse 50+ in Font Bank 0; the secondary character set is PC Multinational in Font Bank 1.

³The default active character set, including that for TVI mode, is Native/Wyse 50+.

⁴See Note on the following page.

13.3 Designing a Character Font

Table 13–3 shows how to design a character font.

Table 13–3 Design a Character Font

| Define and | WYSE | | | | TVI | | | ADDS |
|-------------------------|--------------------------------------|--------|---------|--------|-----|-----|------|------|
| Load a Character | 160/60 | PCTerm | 150/120 | WY 50+ | 950 | 925 | 910+ | A2 |
| Design a character font | ESC c A <i>Bank Pp bb..bb</i> Ctrl/Y | n/a | same | same | n/a | n/a | n/a | EnH |

The sequence in Table 13–3 defines the *bb..bb* string and loads it in the *Pp* position of the *Bank* font bank.

Bank is the font bank that holds a defined character set. Refer to Table 13–2.

Pp is a 2-byte Hex code in the range of 00 to 7F specifying a position in that font bank.

bb...bb is a Hex code string defining the bit pattern of the defined character. The string contains one of the following:

- 16 2-byte Hex codes for a 10 × 16 cell size character
- 13 2-byte Hex codes for a 10 × 13 cell size character
- 10 2-byte Hex codes for a 10 × 10 cell size character

The command aborts if Ctrl/Y in the sequence is received before the expected number of Hex codes in *bb...bb* is received.

Defining and Loading ASCII Character Fonts

13.3 Designing a Character Font

Perform the following steps to draw a graphic character in a 10 × 16 cell:

1. Divide the cell into 10 × 16 pixels and draw the desired font pattern. Observe the following rules:
 - a. Start the pattern from the left column in the cell.
 - b. For an alphanumeric character, the pattern should occupy only the left seven columns; for other graphic characters, the pattern can extend to the eighth column. (The ninth and tenth column follow whatever you place in the eighth column.)
 - c. If possible, leave some space at both the top and bottom pixels to allow for spacing.
2. Turn the font pattern into a value represented as 1s and 0s; where "1" represents a filled pixel, and "0" represents an empty pixel.
3. Encode the bit pattern, 4 bits (a *nibble*) at a time, row by row, into hexadecimal numbers 0 to F. (Do not encode the right two columns.)
4. Form the two nibbles per row into a 2-byte Hex code.
5. Feed the 16 Hex codes into the *bb...bb* string. See the following example.

Load the following character into position 31 (Hex) in Font Bank 3.

| Bit --> | MSB | LSB | Hex Code |
|---------|-----------------|-----|----------|
| | 7 6 5 4 3 2 1 0 | A B | |
| 1 | | | 00 |
| 2 | | | 00 |
| 3 | X X X X X X X X | | FE |
| 4 | X | X | 82 |
| 5 | X | X | 82 |
| 6 | X | X | 82 |
| 7 | X | X | 82 |
| 8 | X X X X X X X X | | FE |
| 9 | X | X | 82 |
| 10 | X | X | 82 |
| 11 | X | X | 82 |
| 12 | X | X | 82 |
| 13 | X X X X X X X X | | FE |
| 14 | | | 00 |
| 15 | | | 00 |
| 16 | | | 00 |
| 17 | | | 00 |

Use the following sequence to load this graphic character:

```
ESC c A 3 31 00 00 FE 82 82 82 82 FE 82 82 82 82 FE 00 00 00 00 Ctrl/Y
```

Once loaded, the font remains in the font bank until:

- The terminal is powered off
- This font bank is explicitly re-loaded or cleared
- This font bank is implicitly re-loaded by changing the terminal's personality or the terminal changes between a 24-line and a 44-line display while Automatic Font Load is on. Refer to Table 13-2.

VT Keyboard Legend Data

This appendix describes the Compose processing, non-spacing diacritical marks, and keyboard layouts for the VT keyboard layouts.

A.1 Compose Processing and Non-spacing Diacritical Marks

Of the new keyboard dialects added to the VT510, only Hebrew and SCS allows three-stroke compose sequences. Pressing "Hebrew" (the `[Compose]` key) initiates a compose sequence. `[Ctrl/Hebrew]` is used to switch between Group 1 and Group 2.

The other new keyboard dialects employ a Group Shift mechanism to access additional characters so there is no `[Compose]` key and no three-stroke compose sequences. Three keyboards have non-spacing diacritical marks in Group 1 or Group 2. These keystrokes initiate a two-stroke "auto-compose" sequence.

Table A-1 lists the VT keyboard non-spacing diacritical marks. The brackets in Table A-1 are not part of the non-spacing diacritical marks.

Table A-1 VT Keyboard Non-Spacing Diacritical Marks

| VT Keyboard ¹ | Acute | Caron | Circumflex | Dieresis | Ring | Tonos |
|--------------------------|-------|-------|------------------|------------------|------------------|------------------|
| Czech VT | ['] | [ˇ] | [^] ² | [¨] | [°] ³ | |
| Greek VT | | | | [¨] ⁴ | | [ˆ] ⁴ |
| Slovak VT | ['] | [ˇ] | [^] ² | [¨] | [°] ³ | |

¹Hebrew, Hungarian, Polish, Romanian, Russian, SCS, Turkish-Q and Turkish-F keyboards have no non-spacing diacritical marks.

²Circumflex over O/o can be produced with caron and O/o.

³Ring over U/u can also be produced with caron and U/u.

⁴Greek iota with diaeresis and accent can be produced by pressing diaeresis, accent, then iota. Greek upsilon with diaeresis and accent can be produced by pressing diaeresis, accent, then upsilon.

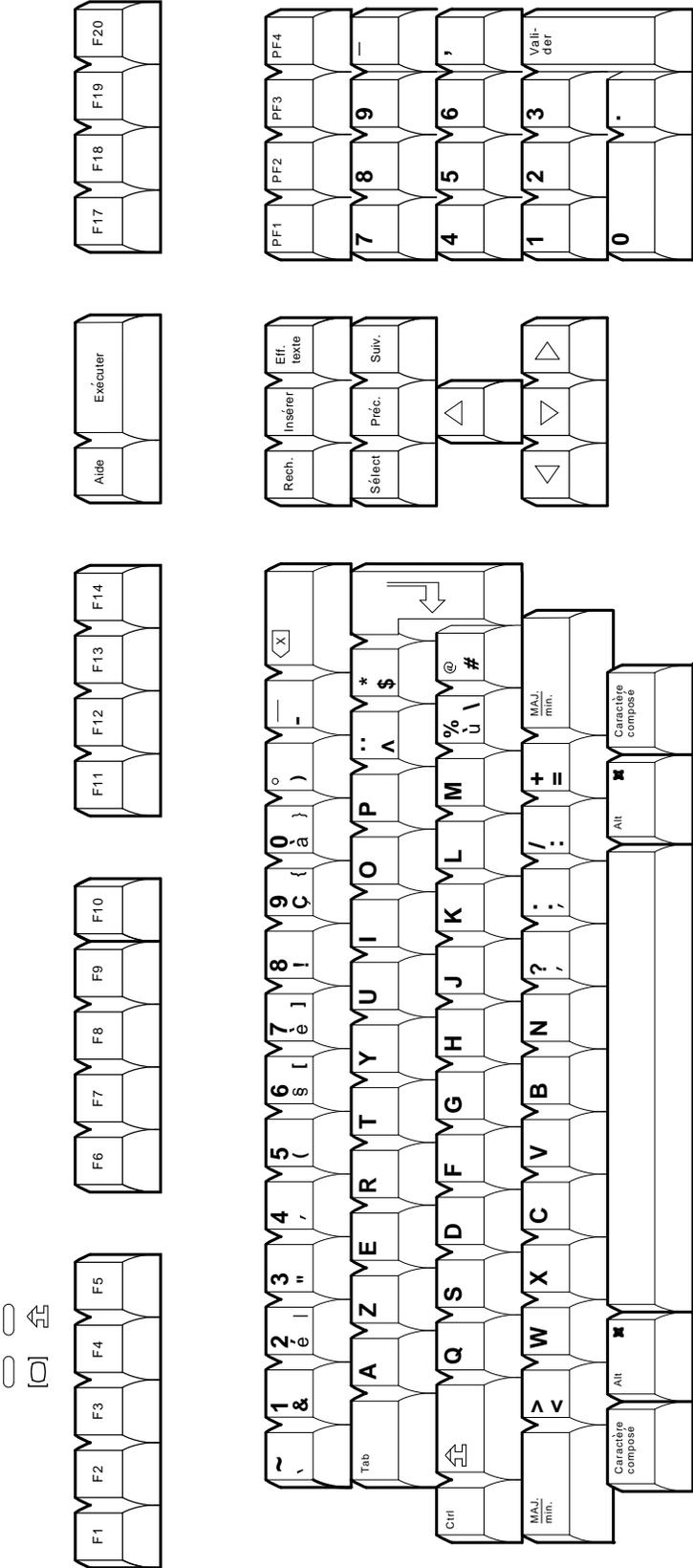
A.2 VT Keyboards

The VT keyboard layouts are shown in the figures that follow:

Note

The keyboards shipped with the product may not look exactly like those illustrated here. Different fonts may be used, and some characters may not look the same.

Figure A-2 Belgian/French VT Keyboard



LJ-03277-T10

VT Keyboard Legend Data

A.2 VT Keyboards

Figure A-3 British/U.K./North American VT Keyboard

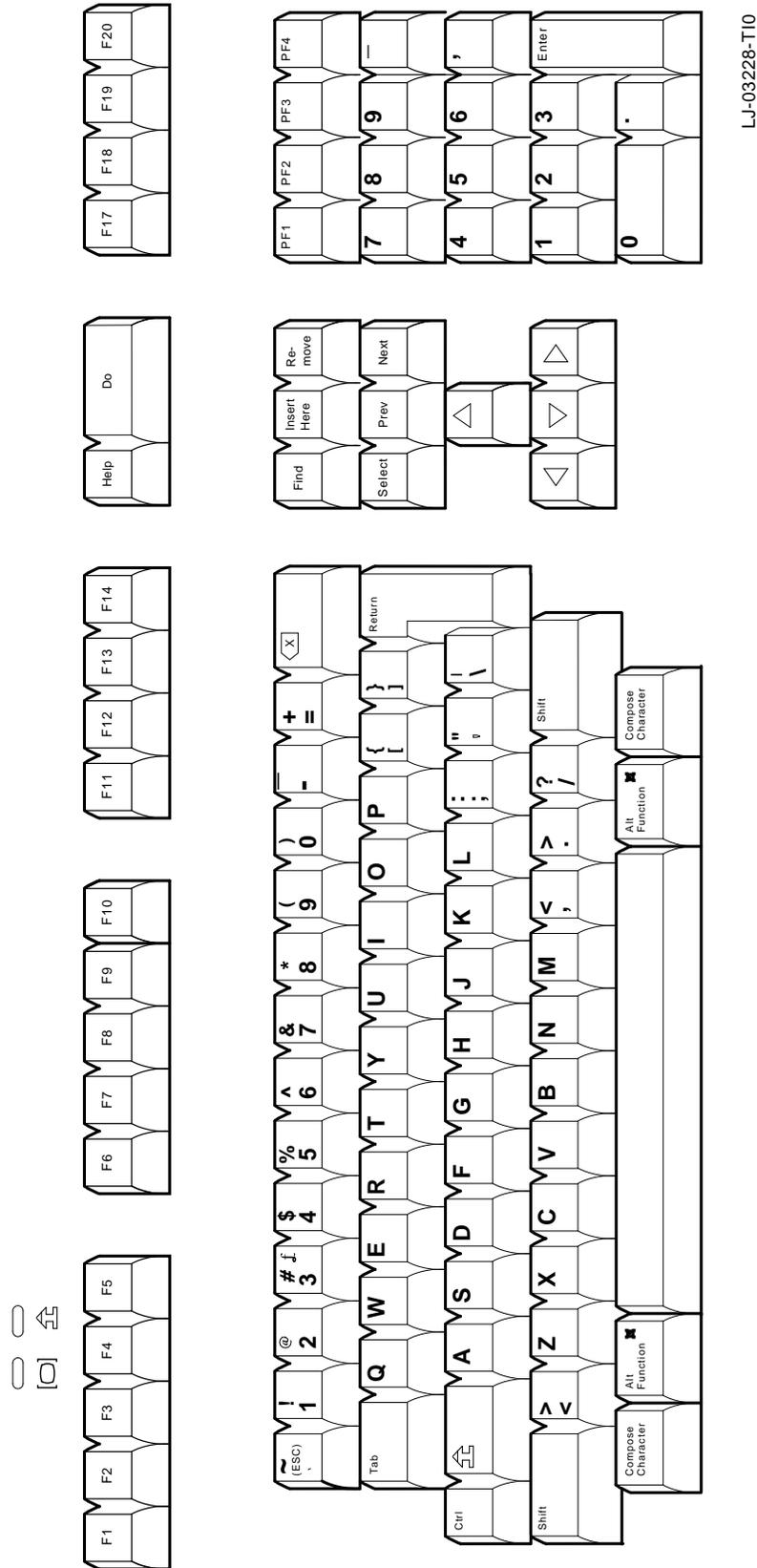
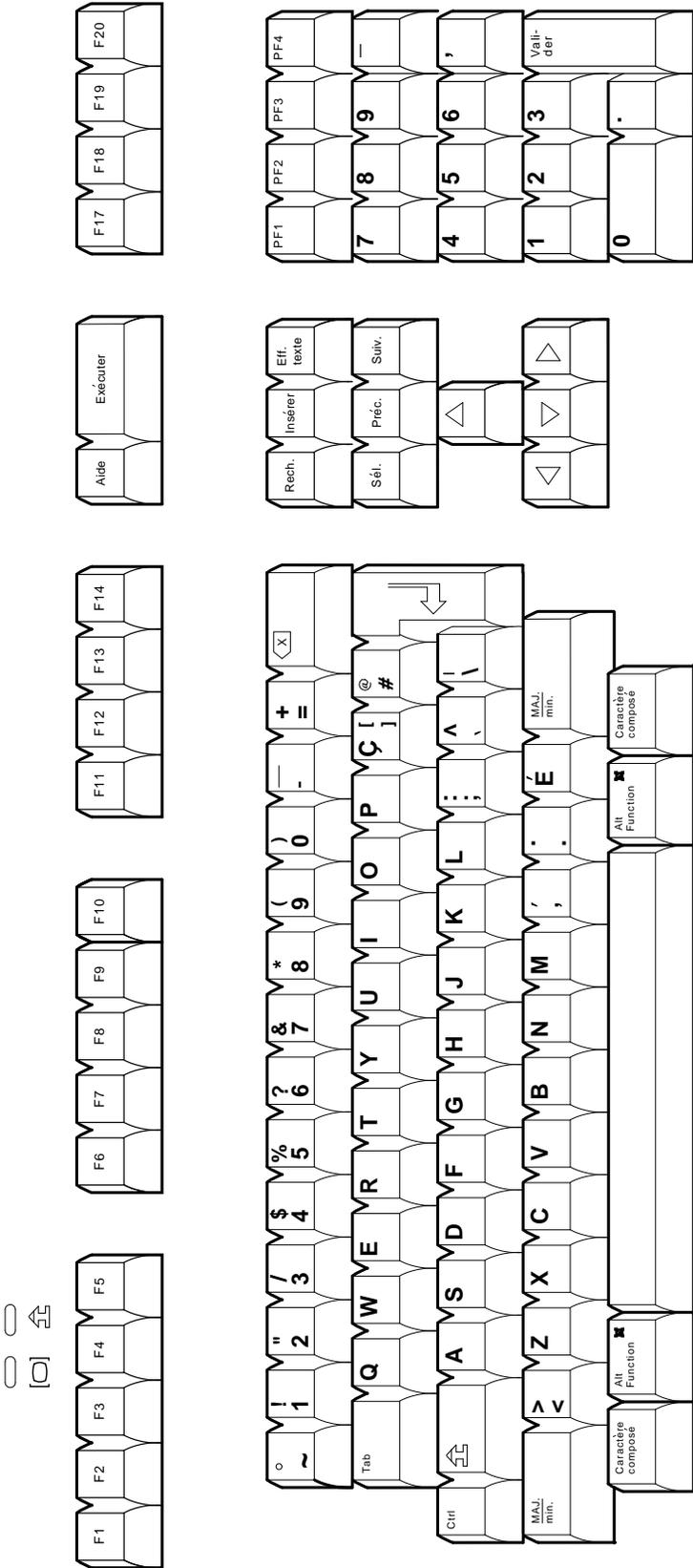


Figure A-4 Canadian-French VT Keyboard



LJ-03230-T10

VT Keyboard Legend Data

A.2 VT Keyboards

Figure A-5 Czech VT Keyboard

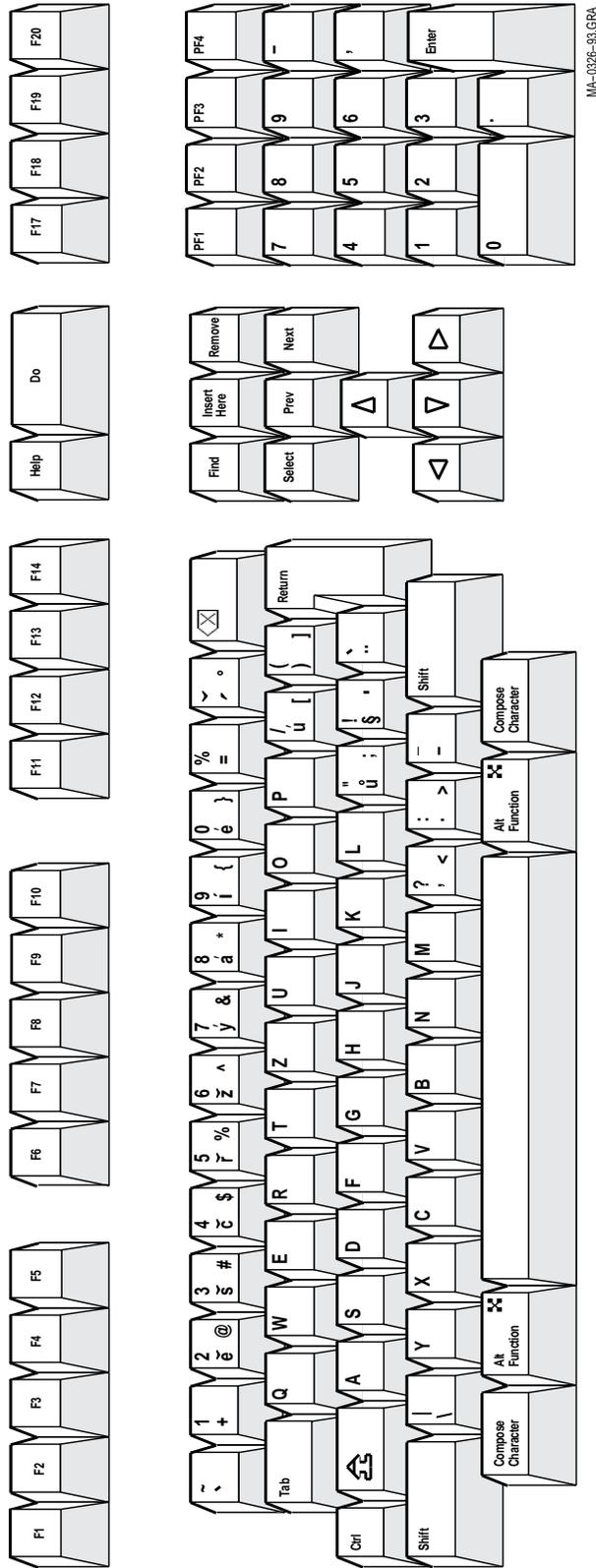
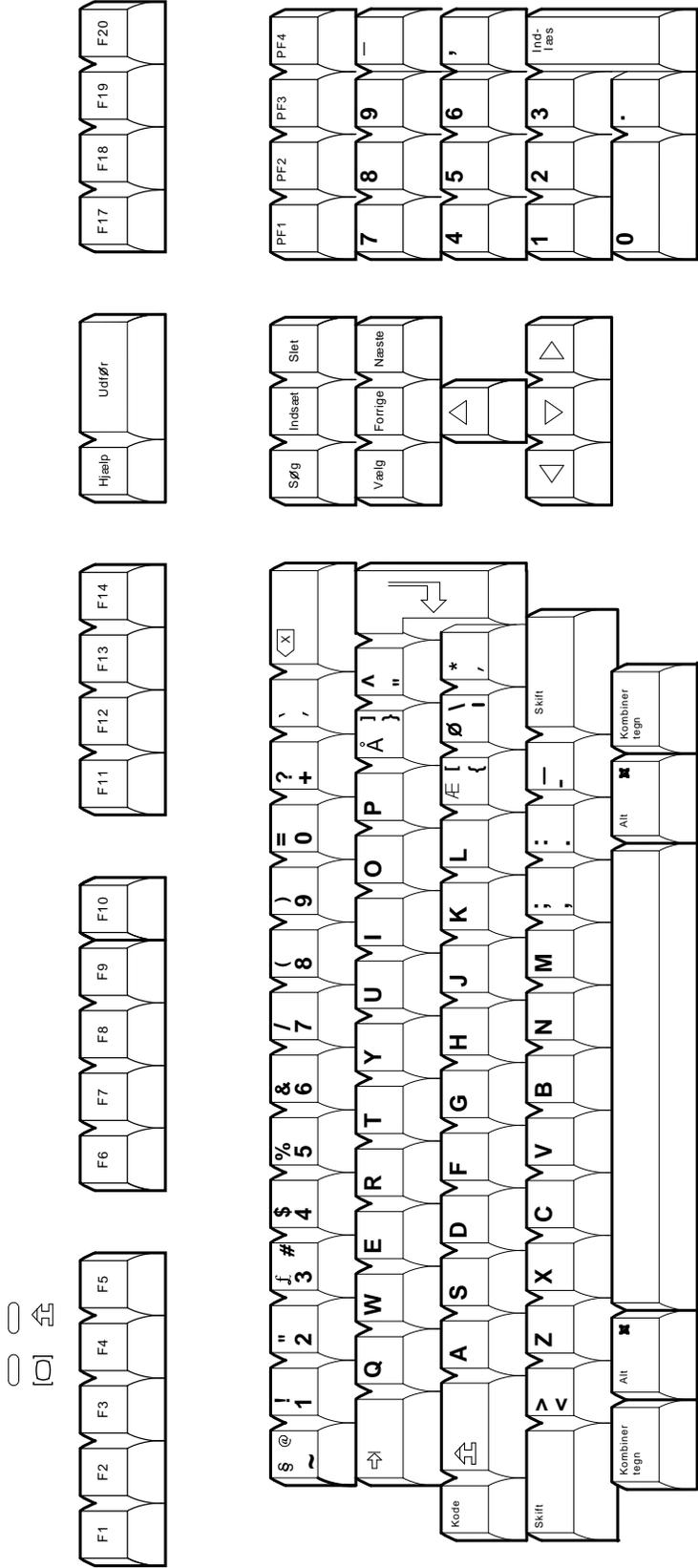
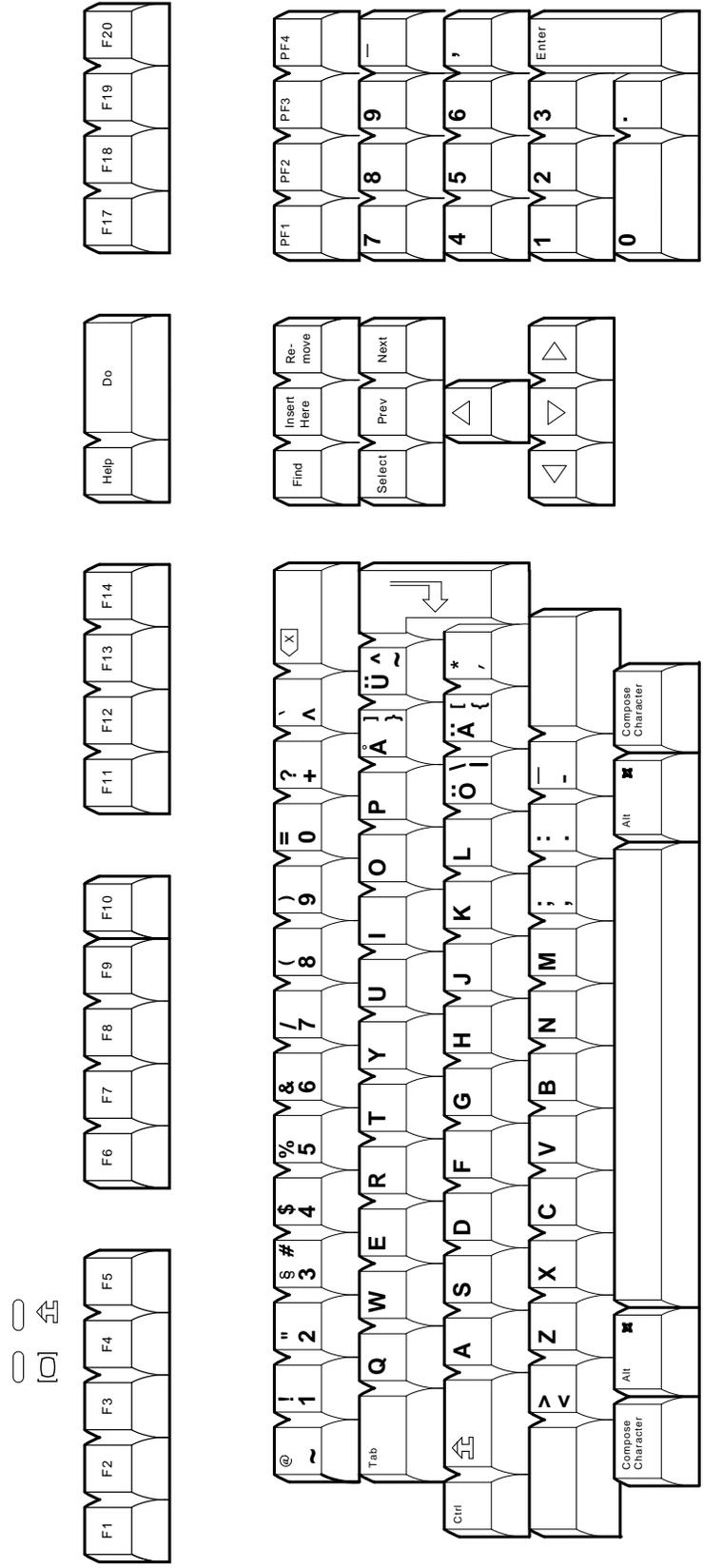


Figure A-6 Danish VT Keyboard



LJ-03278-T10

Figure A-8 Finnish VT Keyboard



LJ-03231-T10

Figure A-10 Greek VT Keyboard

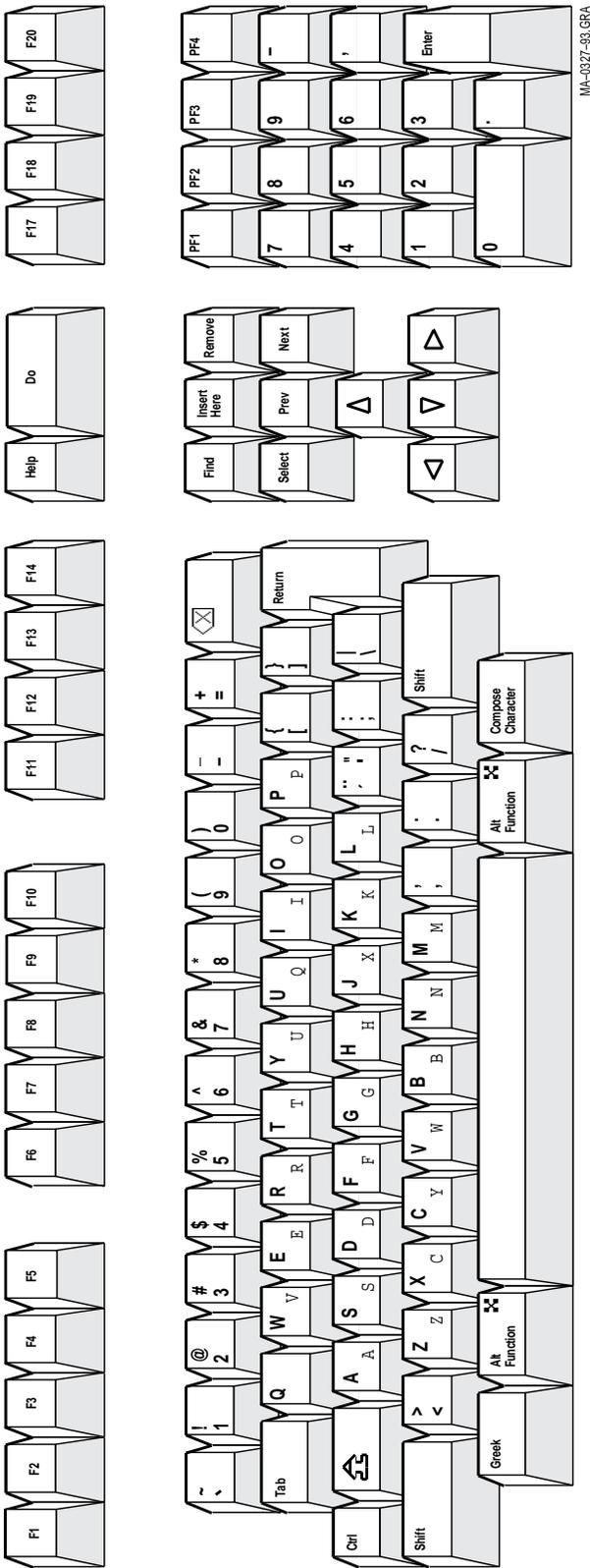
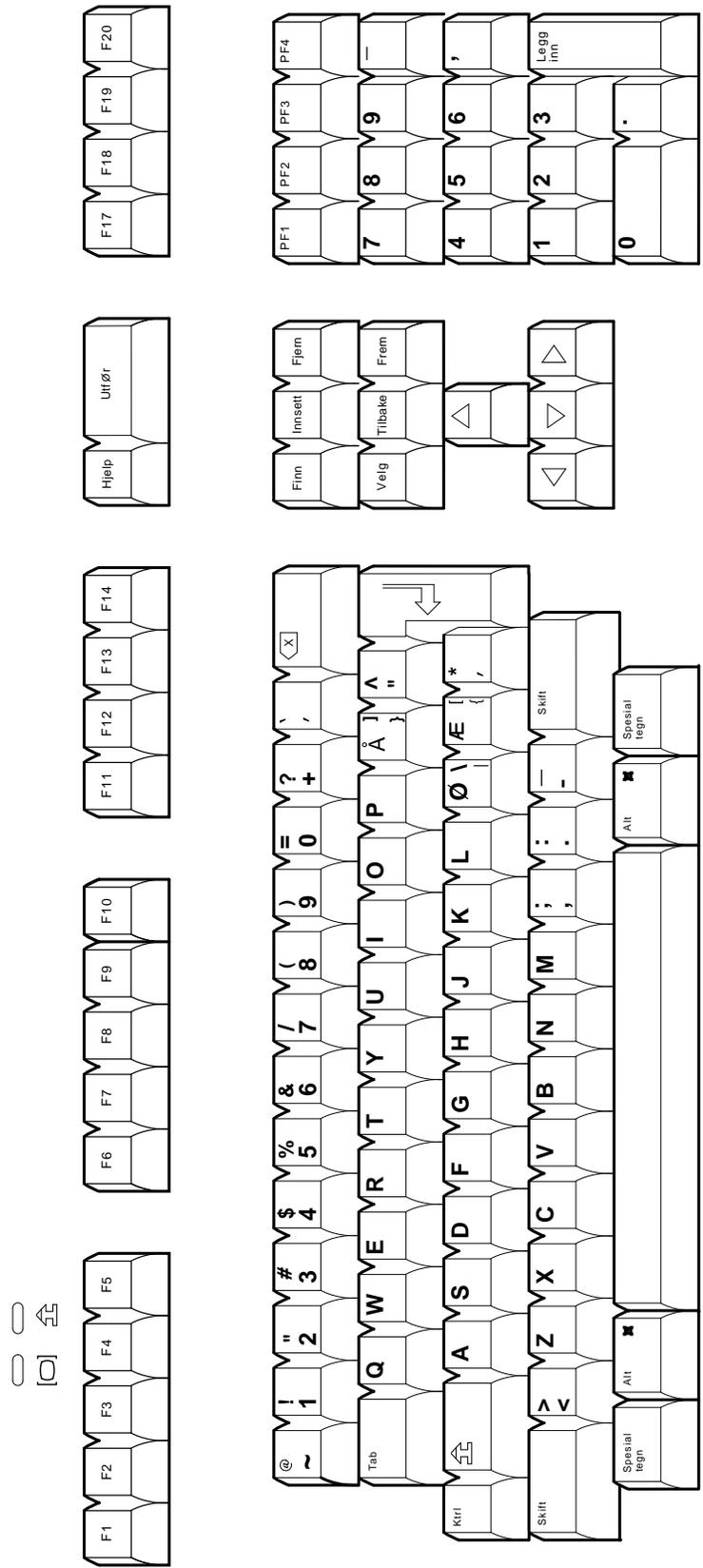


Figure A-14 Norwegian VT Keyboard



LJ-03327-T10

VT Keyboard Legend Data

A.2 VT Keyboards

Figure A-15 Polish VT Keyboard

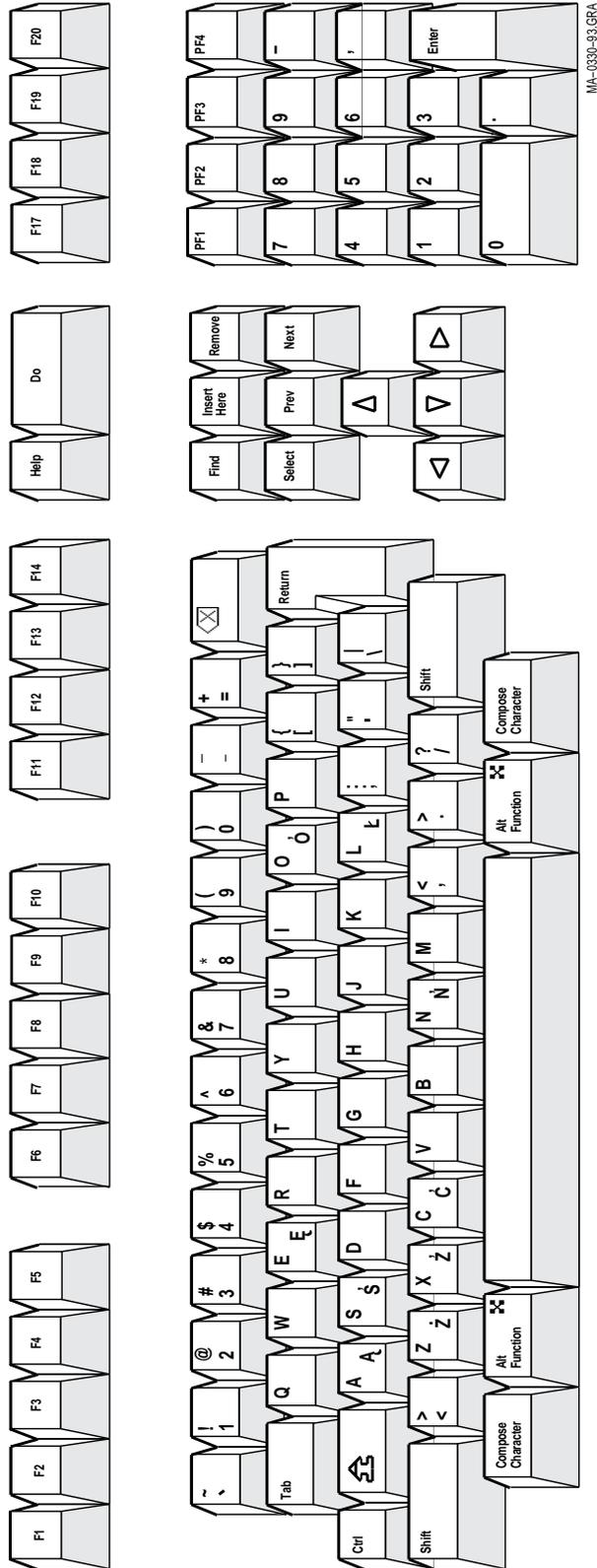
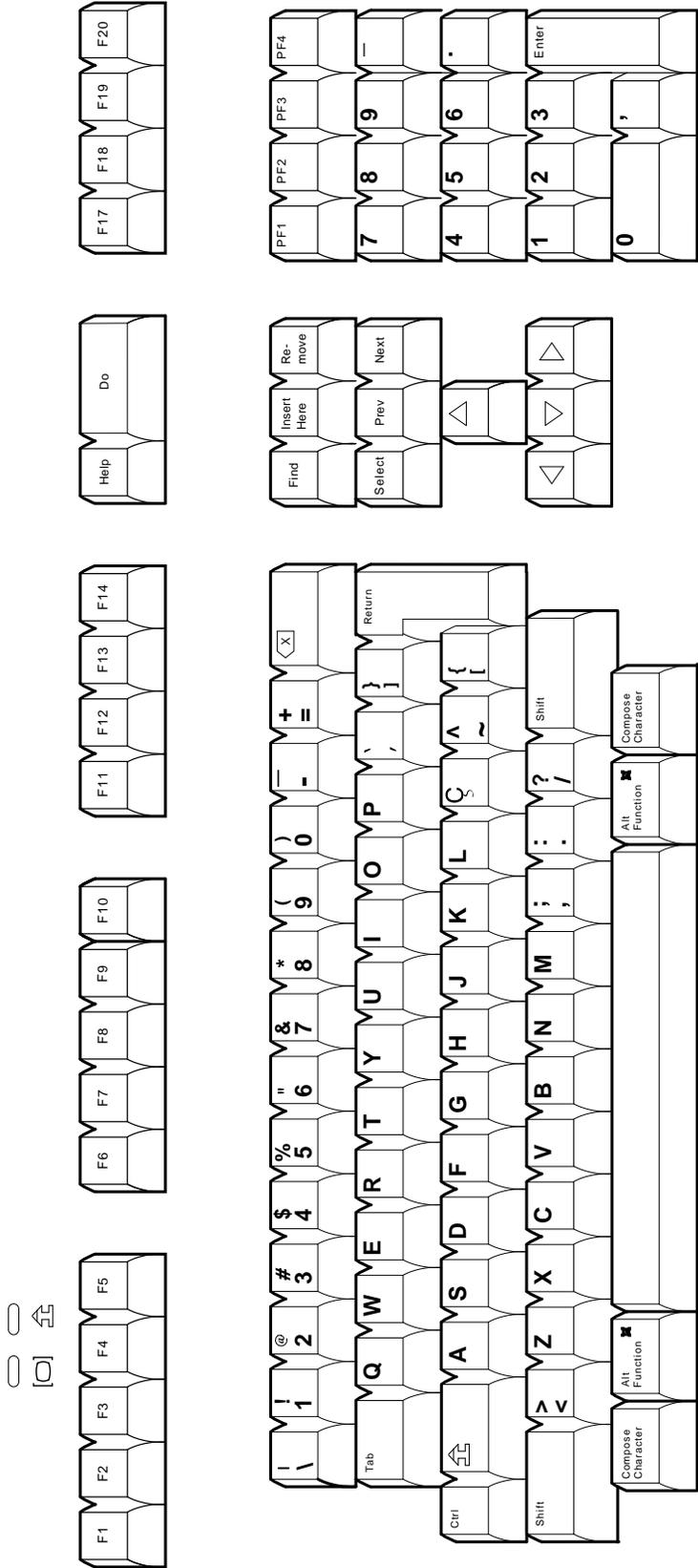


Figure A-16 Portuguese VT Keyboard



LJ-03328-T10

VT Keyboard Legend Data

A.2 VT Keyboards

Figure A-17 Romanian VT Keyboard

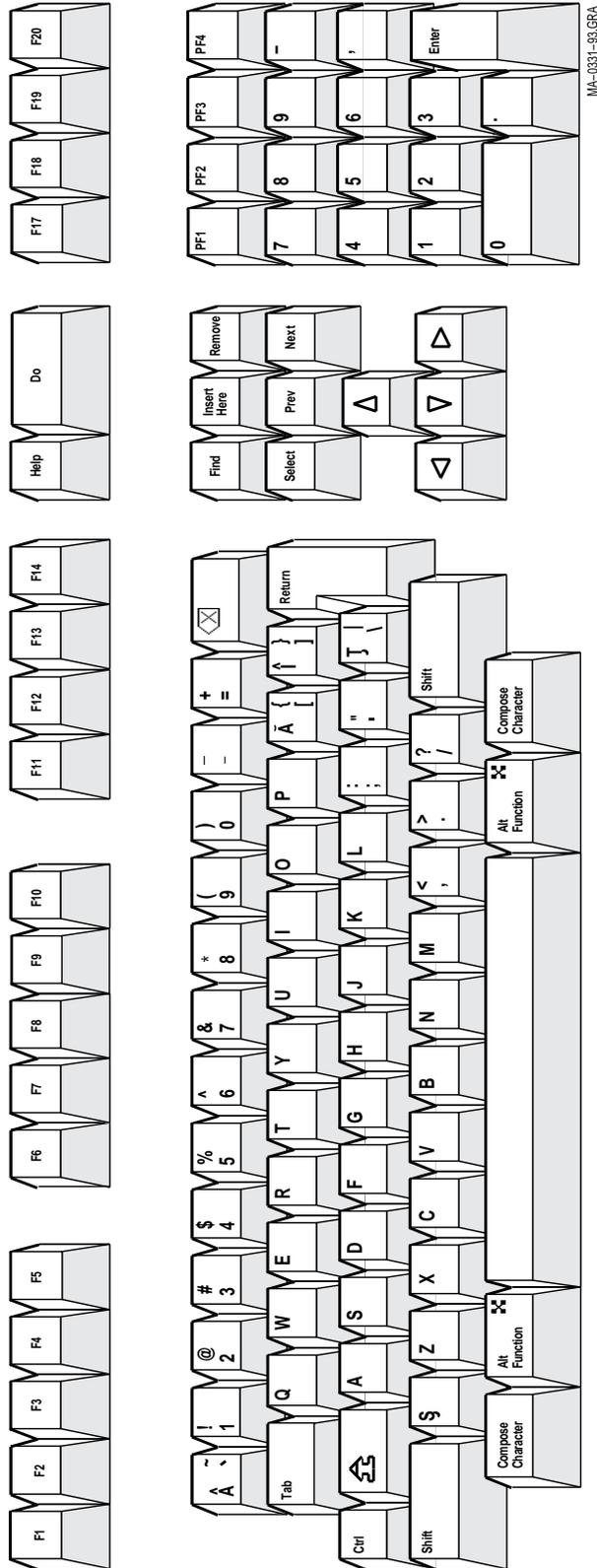
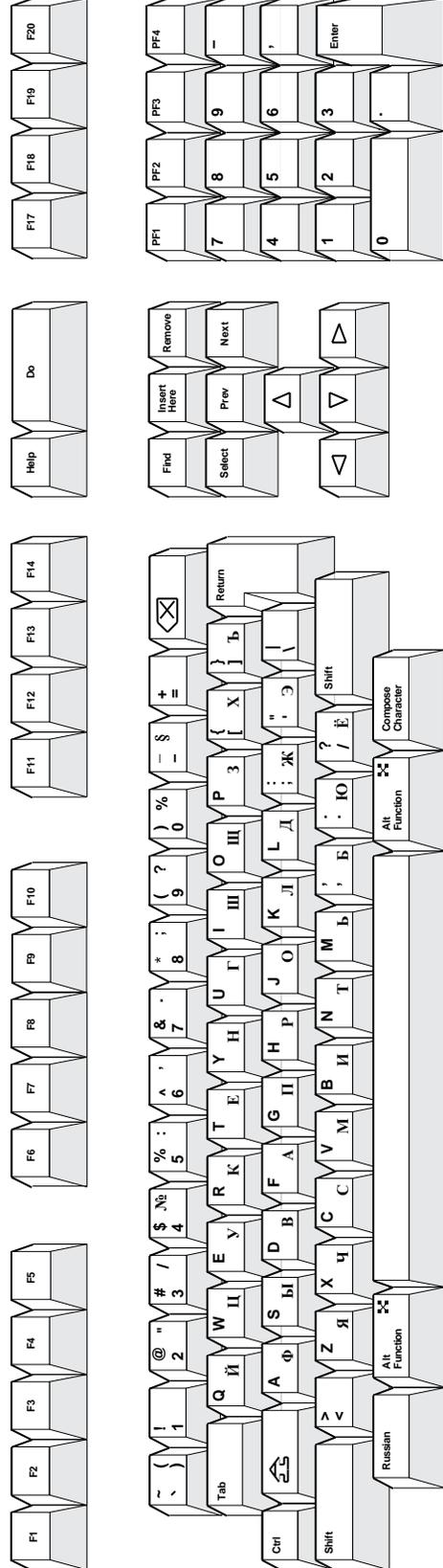


Figure A-18 Russian VT Keyboard



VT Keyboard Legend Data

A.2 VT Keyboards

Figure A-19 SCS VT Keyboard

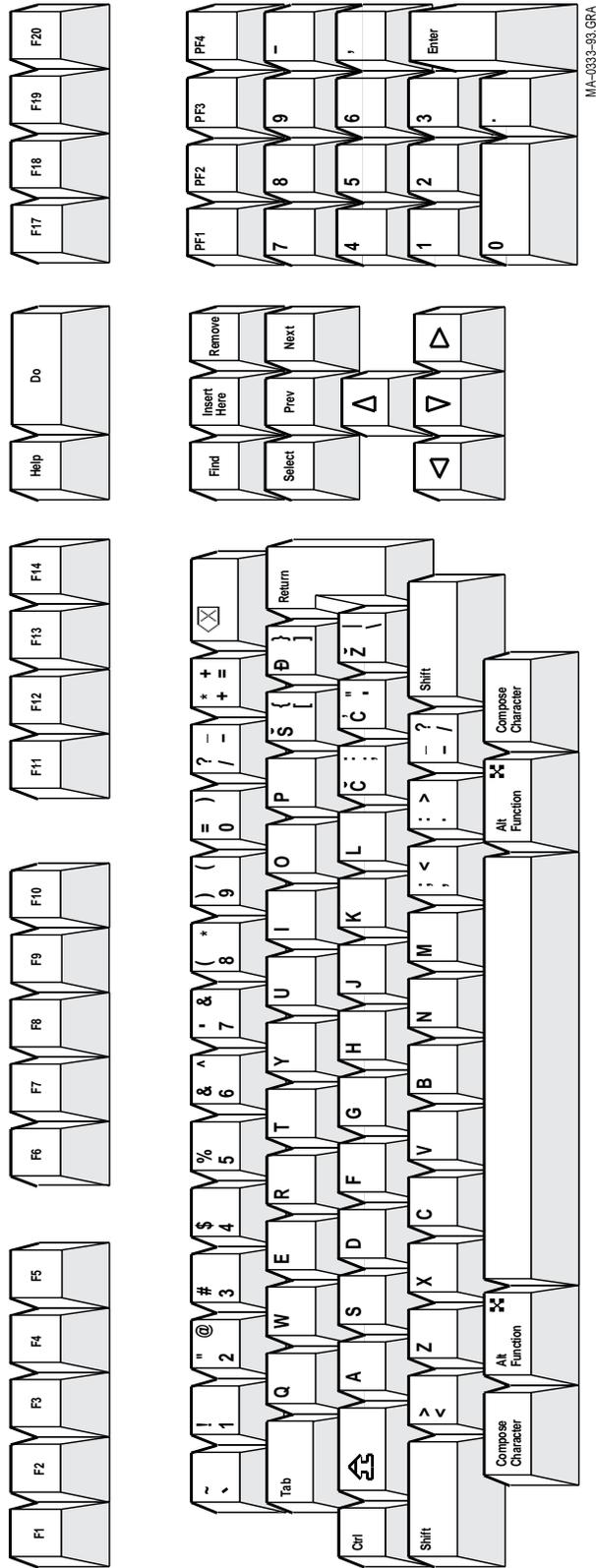


Figure A-20 Slovak VT Keyboard

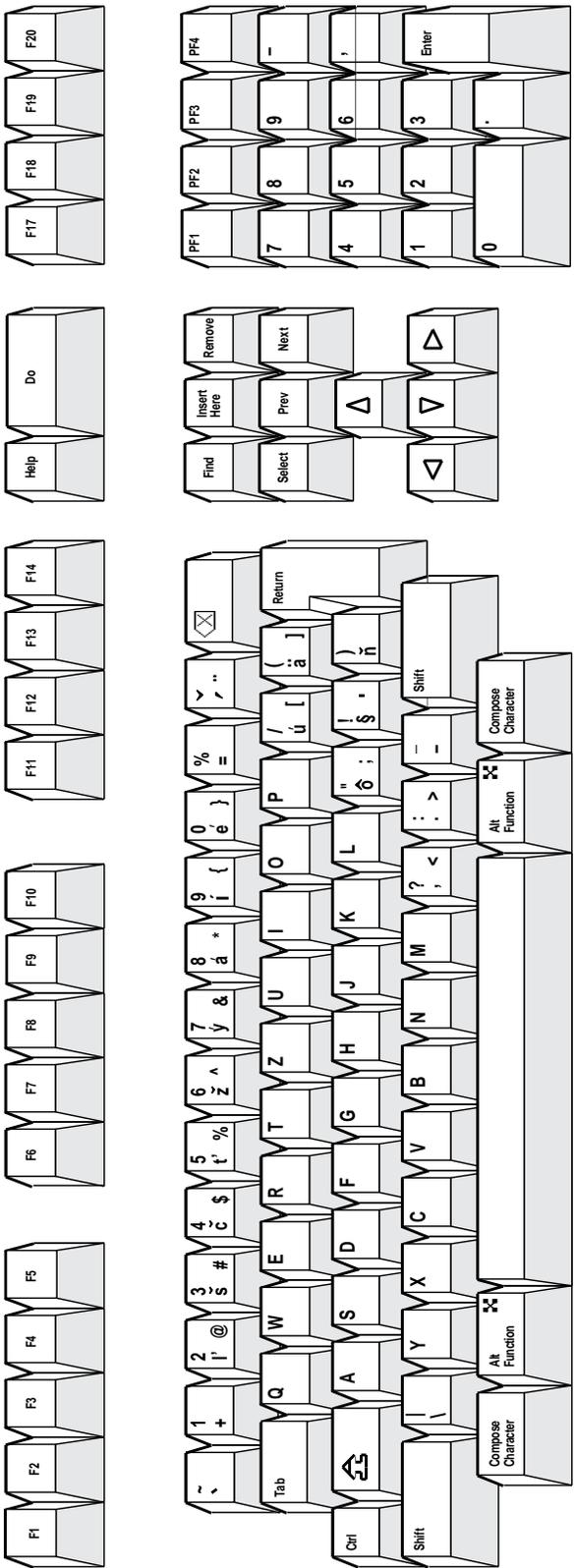
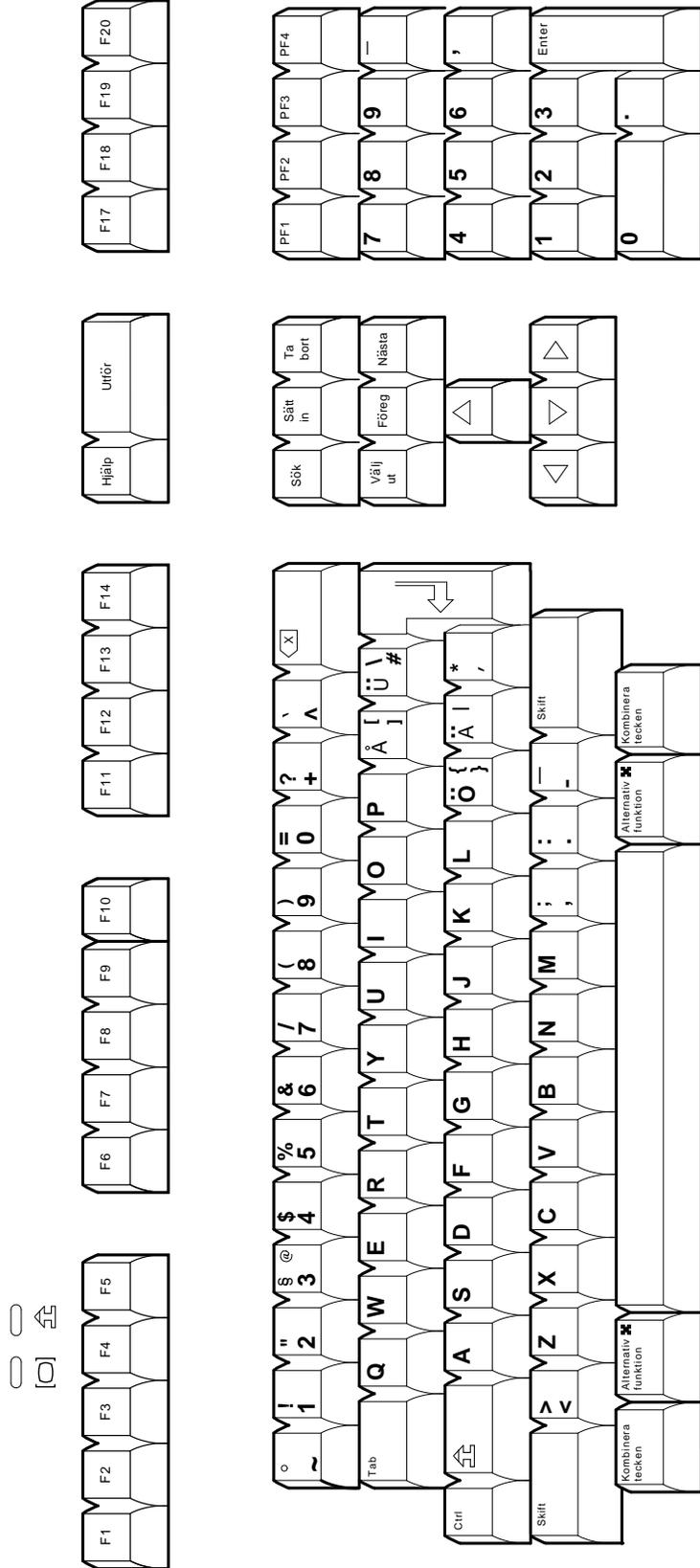
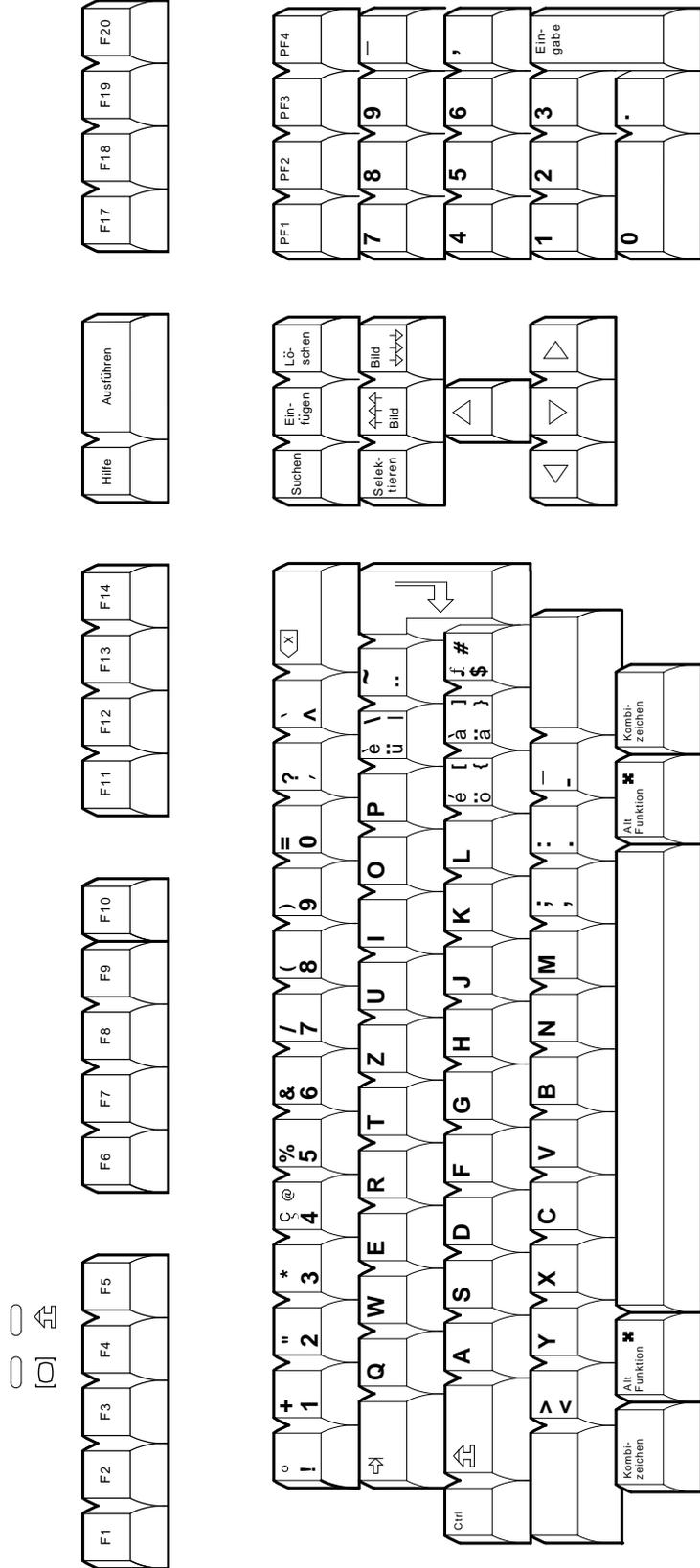


Figure A-22 Swedish VT Keyboard



LJ-09233-T10

Figure A-24 Swiss-German VT Keyboard



LJ-09234-T10

VT Keyboard Legend Data

A.2 VT Keyboards

Figure A-25 Turkish-F VT Keyboard

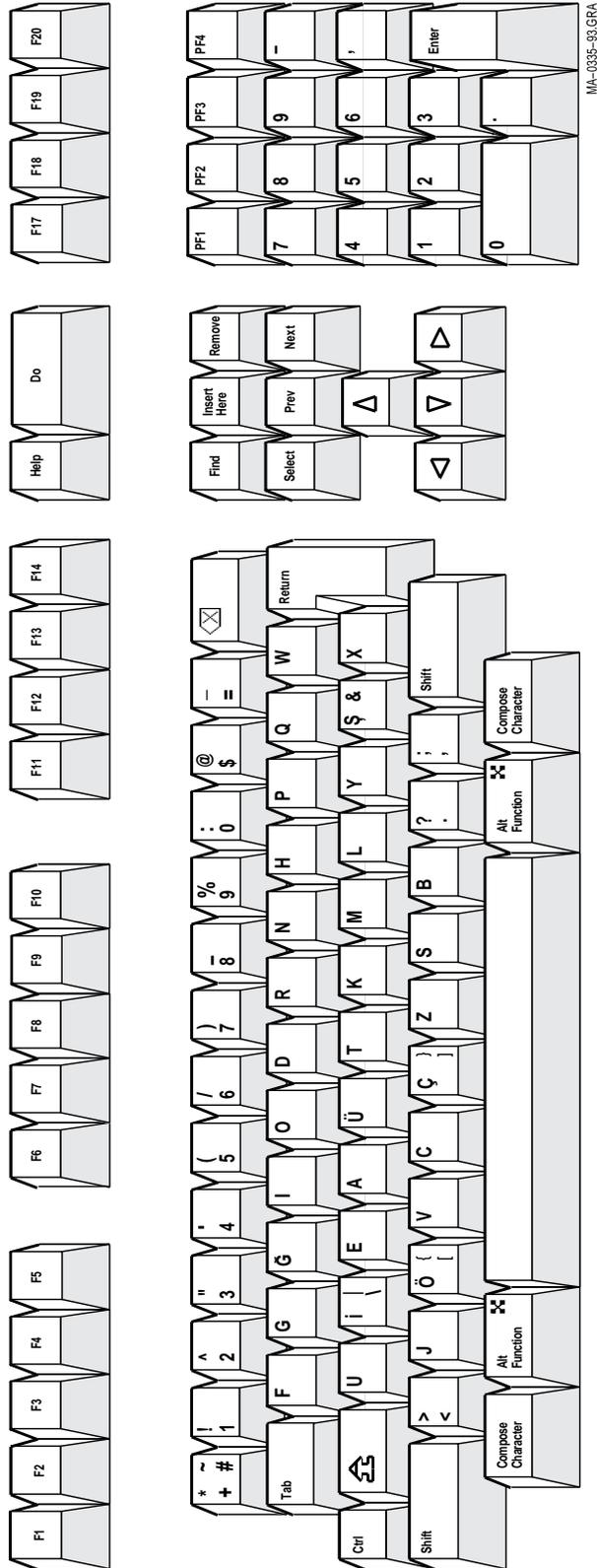
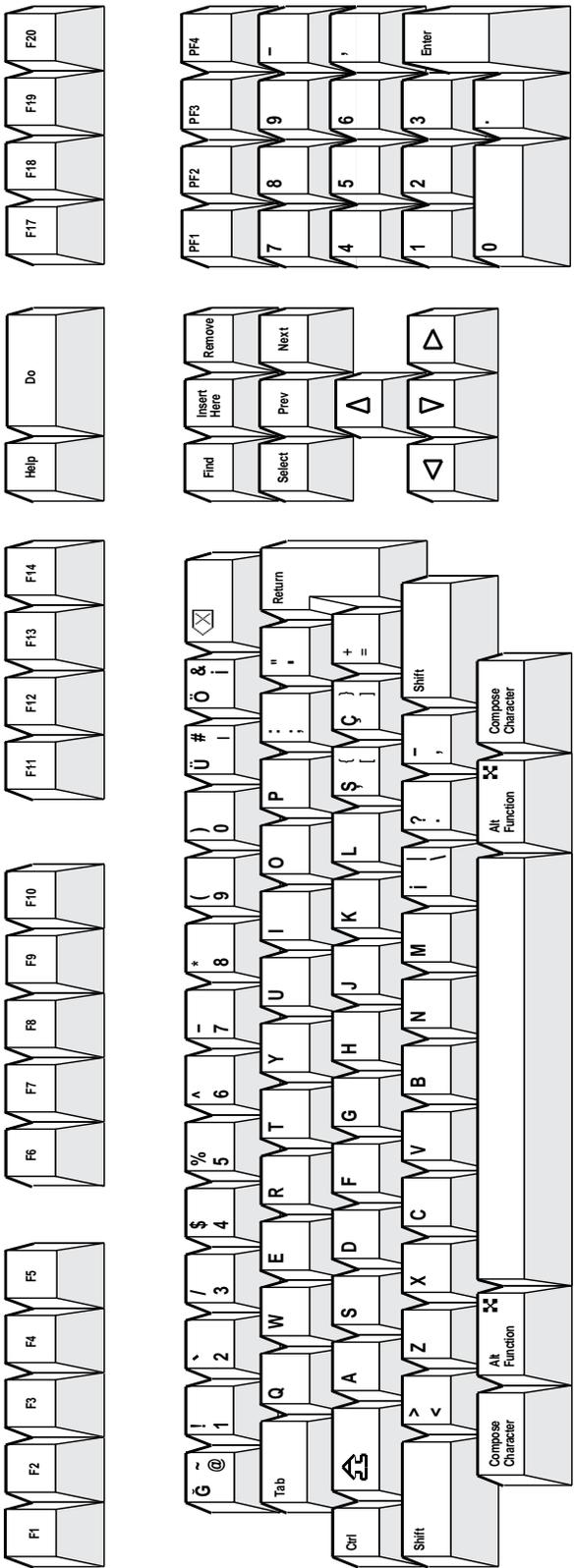


Figure A-26 Turkish-Q VT Keyboard



B

Enhanced PC Keyboards

This appendix shows the non-spacing diacritical marks and the keyboard layouts for VT510 Enhanced PC keyboards.

B.1 Summary of Non-Spacing Diacritical Marks

Table B-1 lists the non-spacing diacritical marks within square brackets [].

Table B-1 Enhanced PC Keyboard Non-Spacing Diacritical Marks

| EPC Keyboard | Acute | Breve | Caron | Cedilla | Circumflex | Dieresis | Dot |
|-------------------|-------|-------|-------|---------|------------|----------|-----|
| Austrian/German | [] | | | | [^] | | |
| Belgian | [] | | | | [^] | [] | |
| Canadian (French) | [] | | | [] | [^] | [] | |
| Czech | [] | | [ˇ] | | | [] | |
| Danish | [] | | | | [^] | [] | |
| Dutch | [] | | | [] | [^] | [] | |
| Finnish | [] | | | | [^] | [] | |
| French | | | | | [^] | [] | |
| Greek | | | | | | [] | |
| Hebrew (none) | | | | | | | |
| Hungarian | [] | [˘] | [ˇ] | [] | [^] | [] | [] |
| Italian (none) | | | | | | | |
| Latin American | [] | | | | [^] | [] | |
| Norwegian | [] | | | | [^] | [] | |
| Polish | [] | | | | | | |
| Portuguese | [] | | | | [^] | [] | |
| Romanian | [] | [˘] | [ˇ] | [] | [^] | [] | [] |
| Russian (none) | | | | | | | |
| SCS (none) | | | | | | | |
| Slovak | [] | | [ˇ] | | | [] | |
| Spanish | [] | | | | [^] | [] | |
| Swedish | [] | | | | [^] | [] | |
| Swiss-French | [] | | | | [^] | [] | |
| Swiss-German | [] | | | | [^] | [] | |
| Turkish-Q | | | | | | | |

(continued on next page)

Enhanced PC Keyboards

B.1 Summary of Non-Spacing Diacritical Marks

Table B-1 (Cont.) Enhanced PC Keyboard Non-Spacing Diacritical Marks

| EPC Keyboard | Double acute | Grave | Ogonek | Ring | Tilde | Tonos |
|-------------------|--------------|-------|--------|------|-------|-------|
| German | | [] | | | | |
| Belgian | | [] | | | [~] | |
| Canadian (French) | | [] | | | | |
| Czech | | [] | | | | |
| Danish | | [] | | | [~] | |
| Dutch | | [] | | | [~] | |
| Finnish | | [] | | | [~] | |
| French | | | | | | |
| Greek | | | | | | [] |
| Hebrew (none) | | | | | | |
| Hungarian | [] | [] | [] | [°] | [~] | |
| Italian (none) | | | | | | |
| Latin American | | [] | | | | |
| Norwegian | | [] | | | [~] | |
| Polish | | | [] | | | |
| Portuguese | | [] | | | [~] | |
| Romanian | [] | [] | [] | [°] | [~] | |
| Russian (none) | | | | | | |
| SCS (none) | | | | | | |
| Slovak | | [] | | | | |
| Spanish | | [] | | | | |
| Swedish | | [] | | | [~] | |
| Swiss-French | | [] | | | [~] | |
| Swiss-German | | [] | | | [~] | |
| Turkish-Q | | [] | | | | |

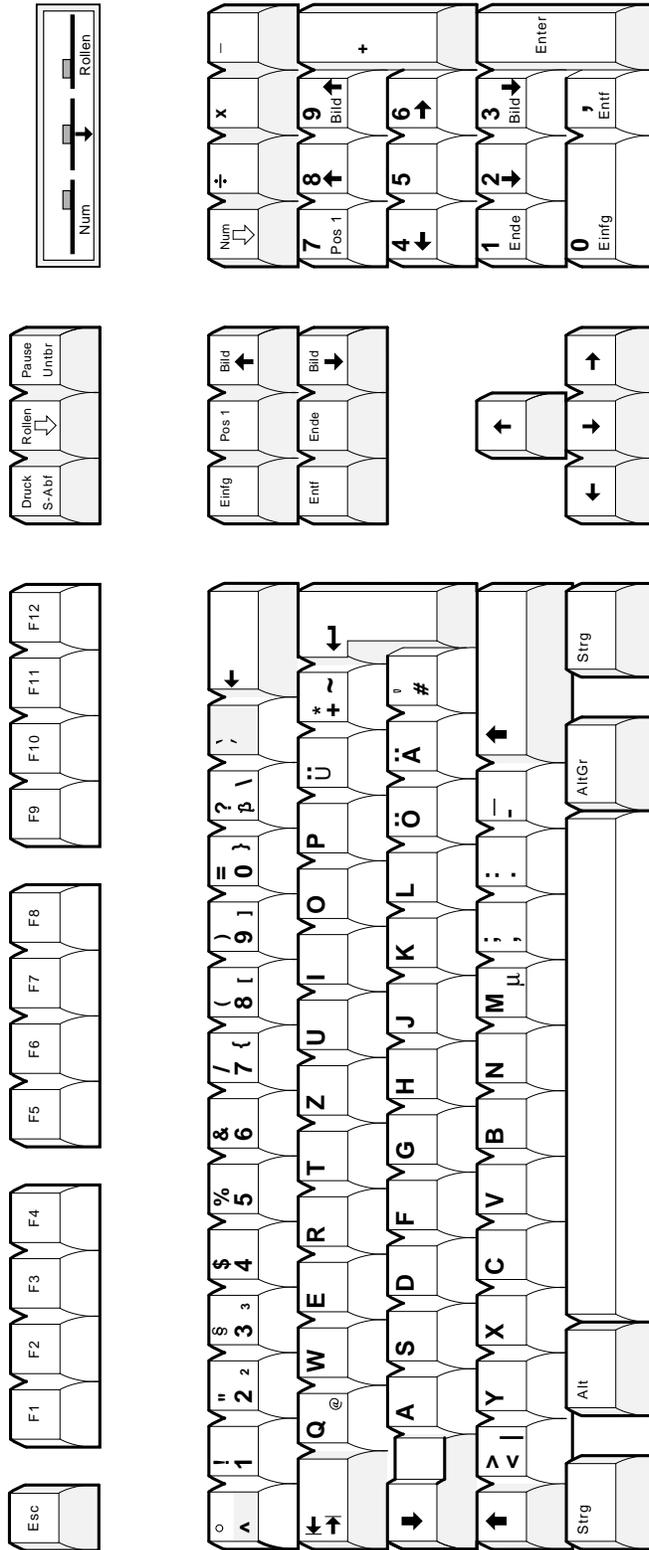
B.2 Enhanced PC Keyboards

The Enhanced PC keyboards for use with the VT510 video terminal are shown in the figures that follow. In the figures, the shading on the keycaps indicates a non-spacing diacritical character. Exceptions: Hebrew, Hungarian, Polish, Romanian, and Russian.

Note

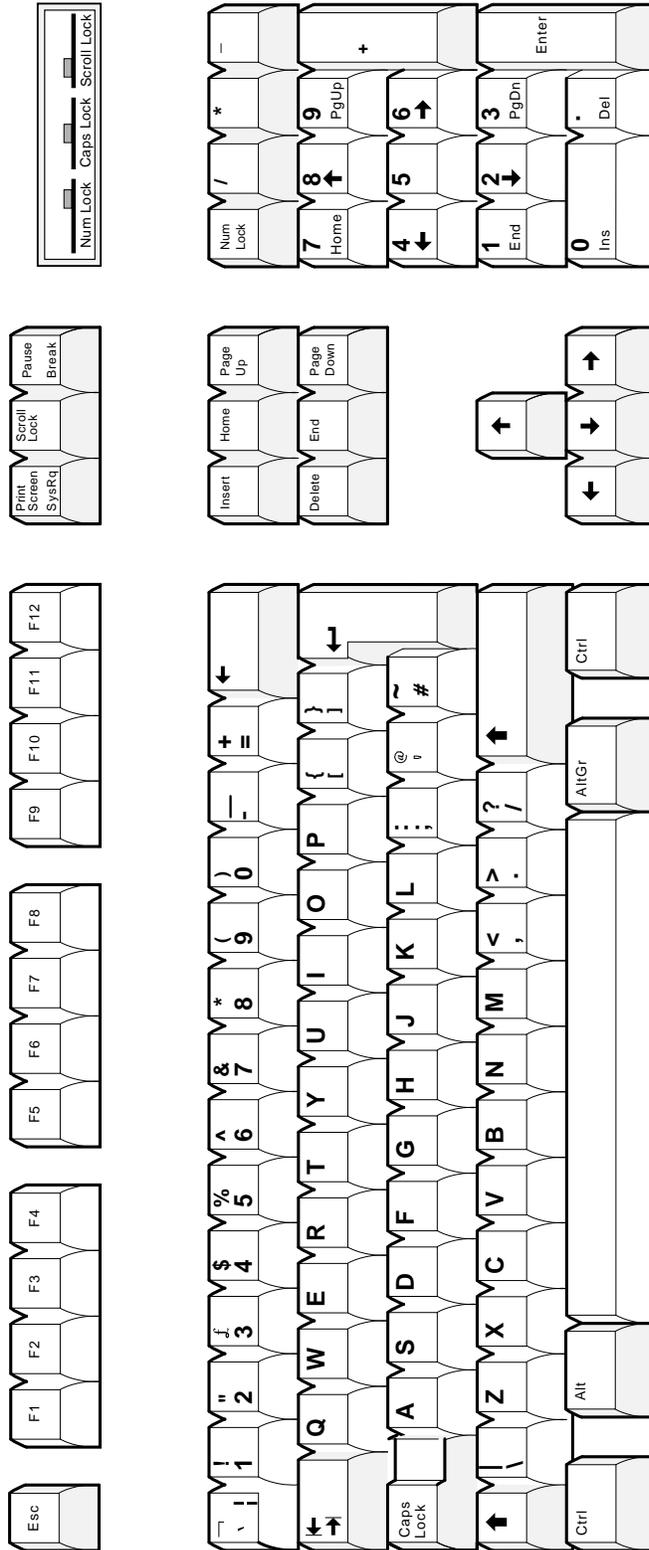
The keyboards shipped with the product may not look exactly like those illustrated here. Different fonts may be used, and some characters may not look the same.

Figure B-1 Austrian/German Enhanced PC Keyboard



LJ-03212-T10

Figure B-3 British/U.K. Enhanced PC Keyboard

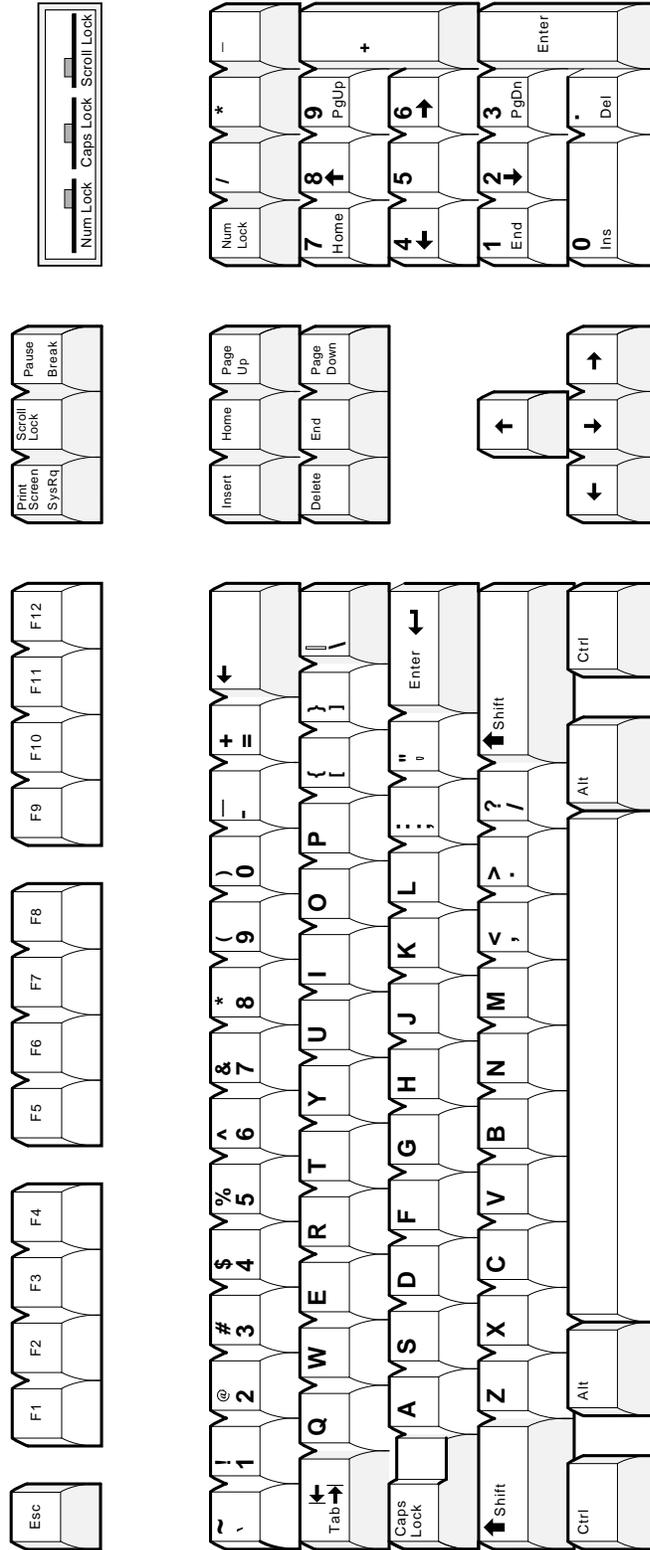


LJ-03219-T10

Enhanced PC Keyboards

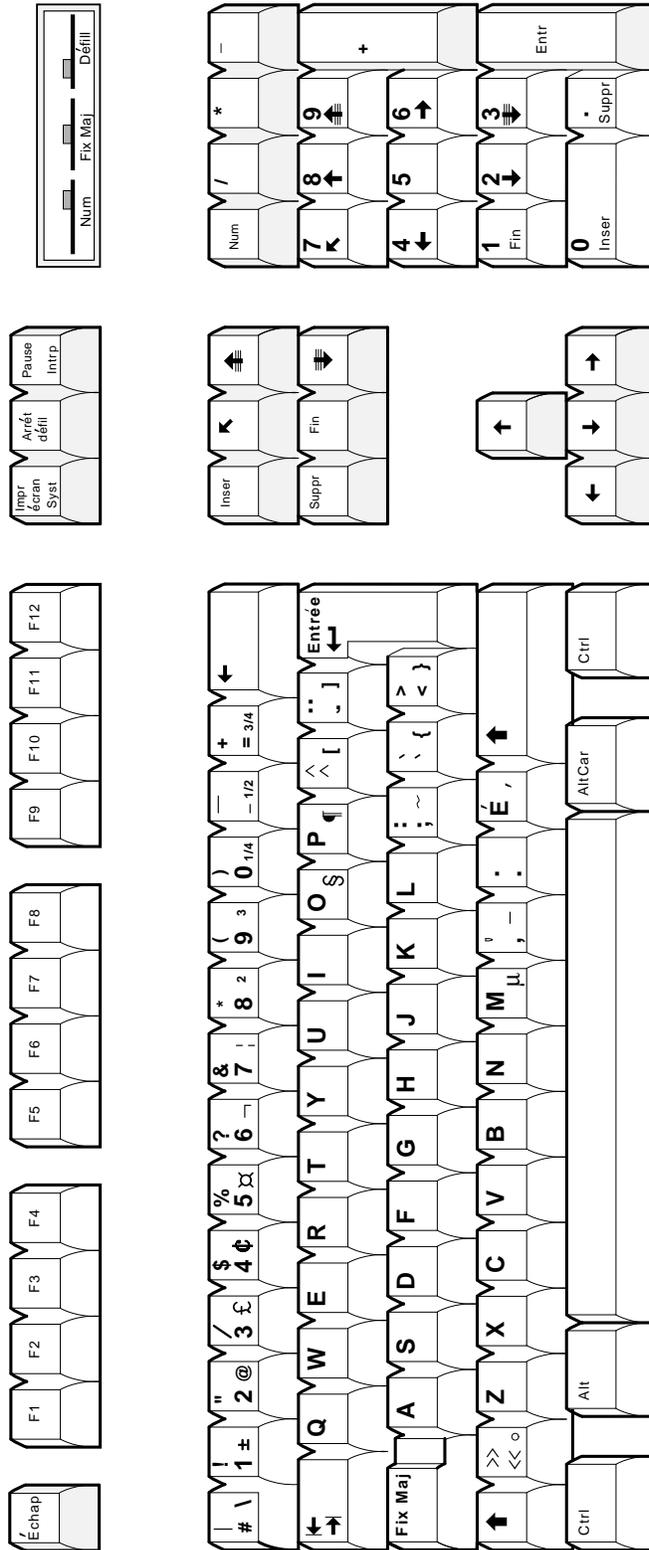
B.2 Enhanced PC Keyboards

Figure B-4 Canadian-English/North American Enhanced PC Keyboard



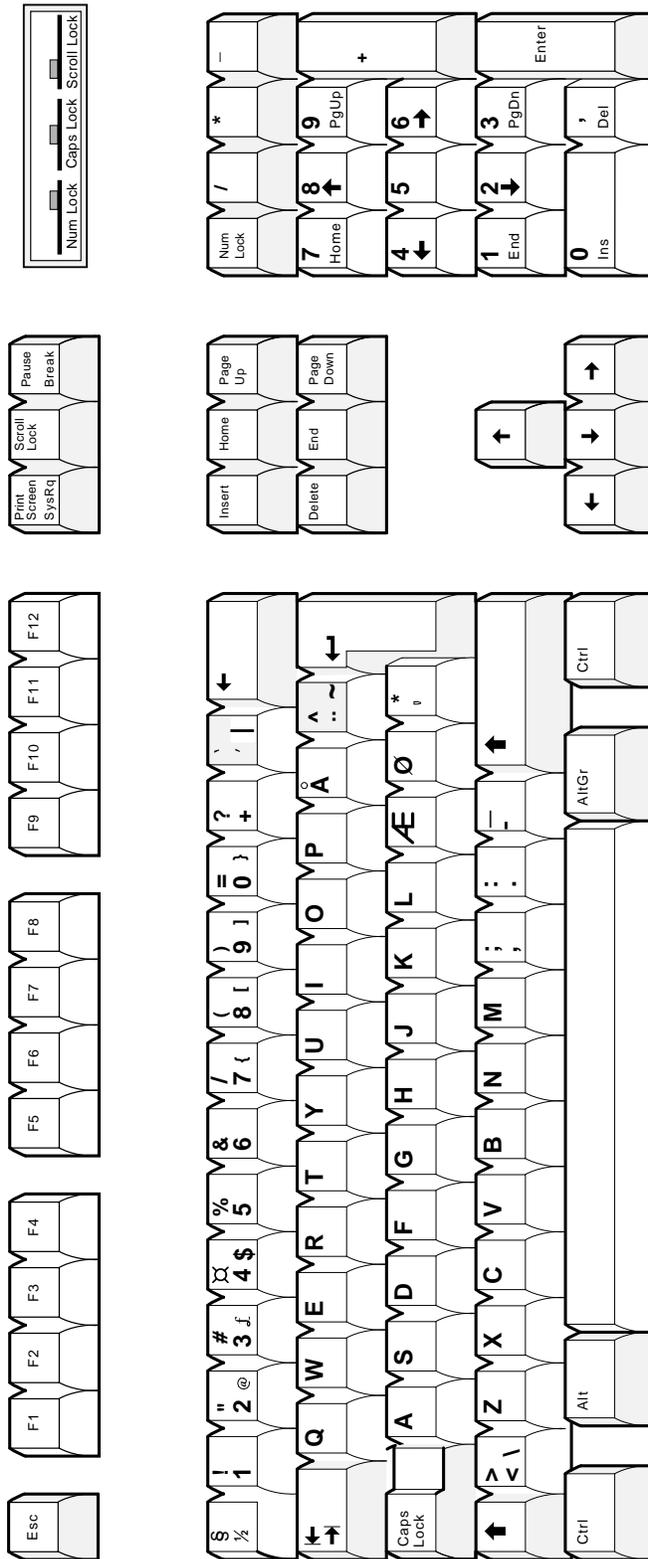
LJ-03218-T10

Figure B-5 Canadian-French Enhanced PC Keyboard



LJ-03225-T10

Figure B-7 Danish Enhanced PC Keyboard

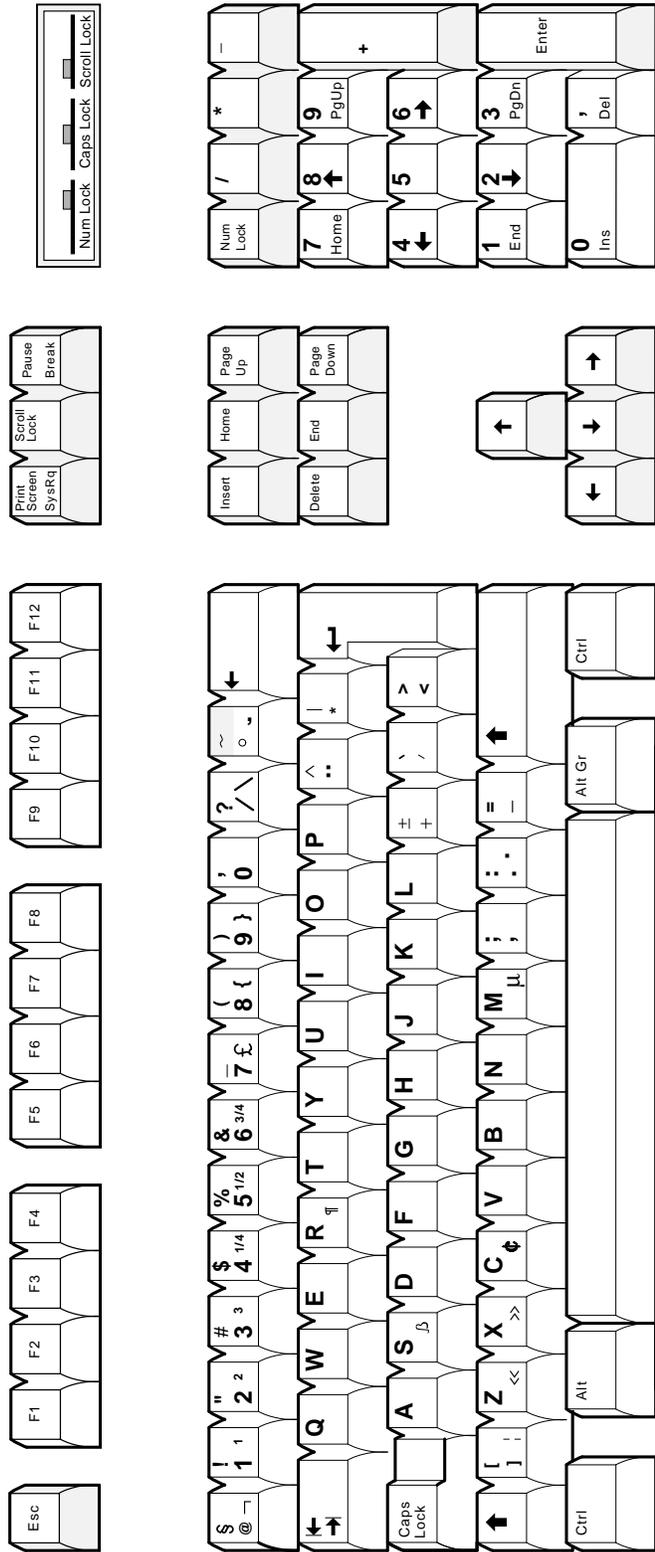


LJ-03222-T10

Enhanced PC Keyboards

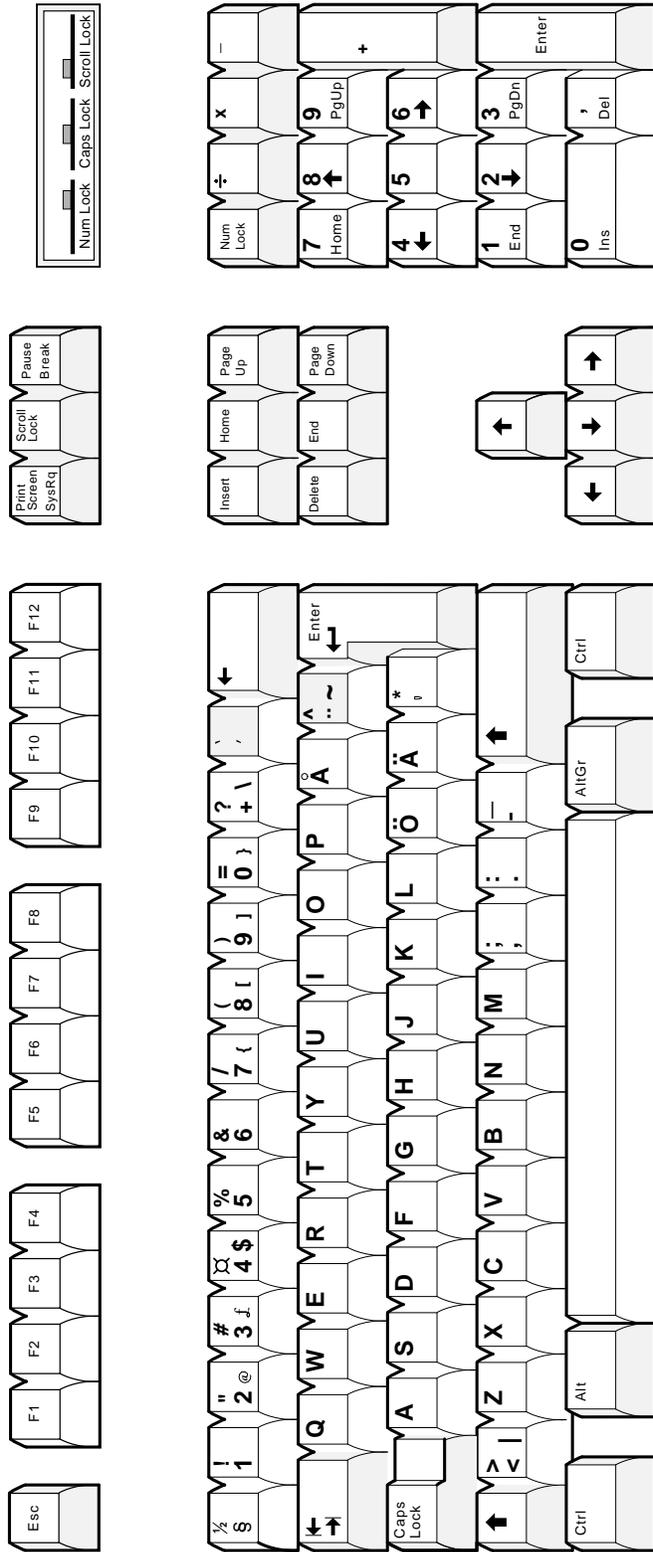
B.2 Enhanced PC Keyboards

Figure B-8 Dutch Enhanced PC Keyboard



LJ-03223-T10

Figure B-9 Finnish Enhanced PC Keyboard

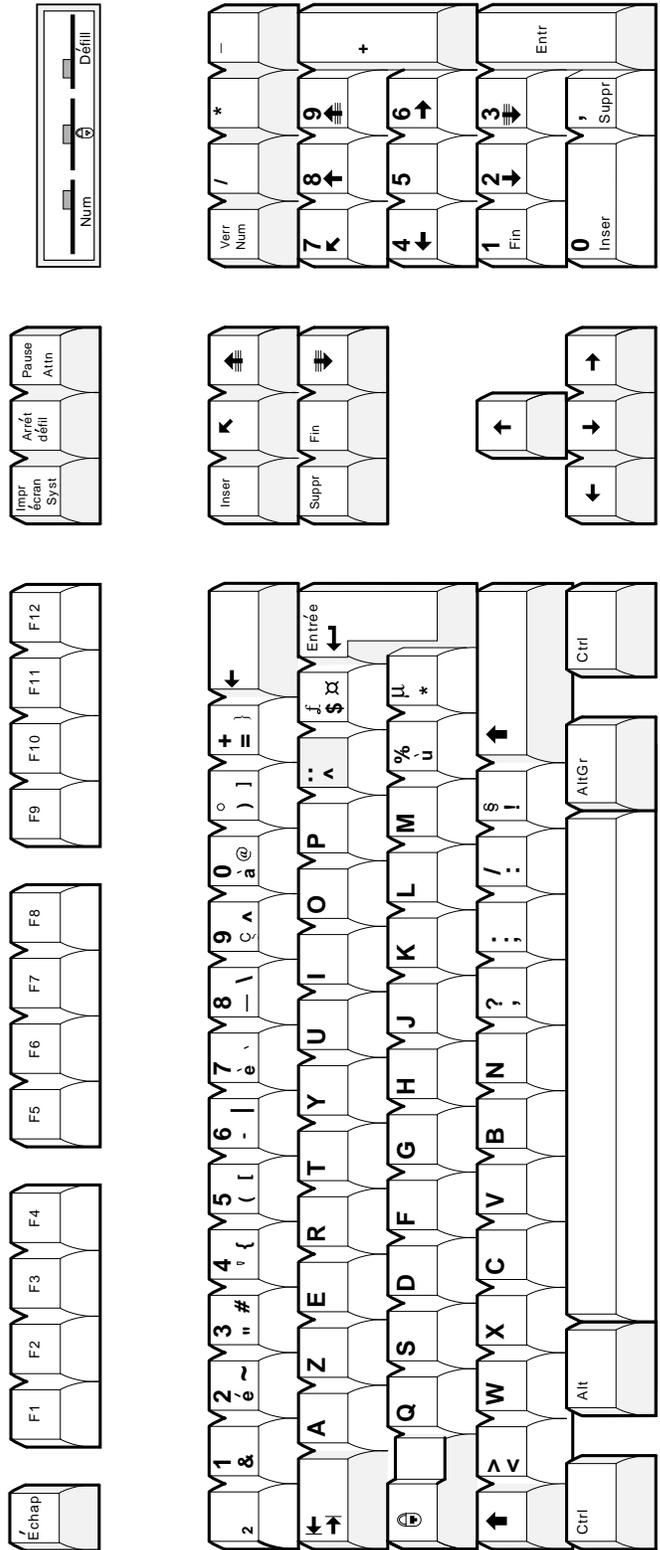


LJ-03210-T10

Enhanced PC Keyboards

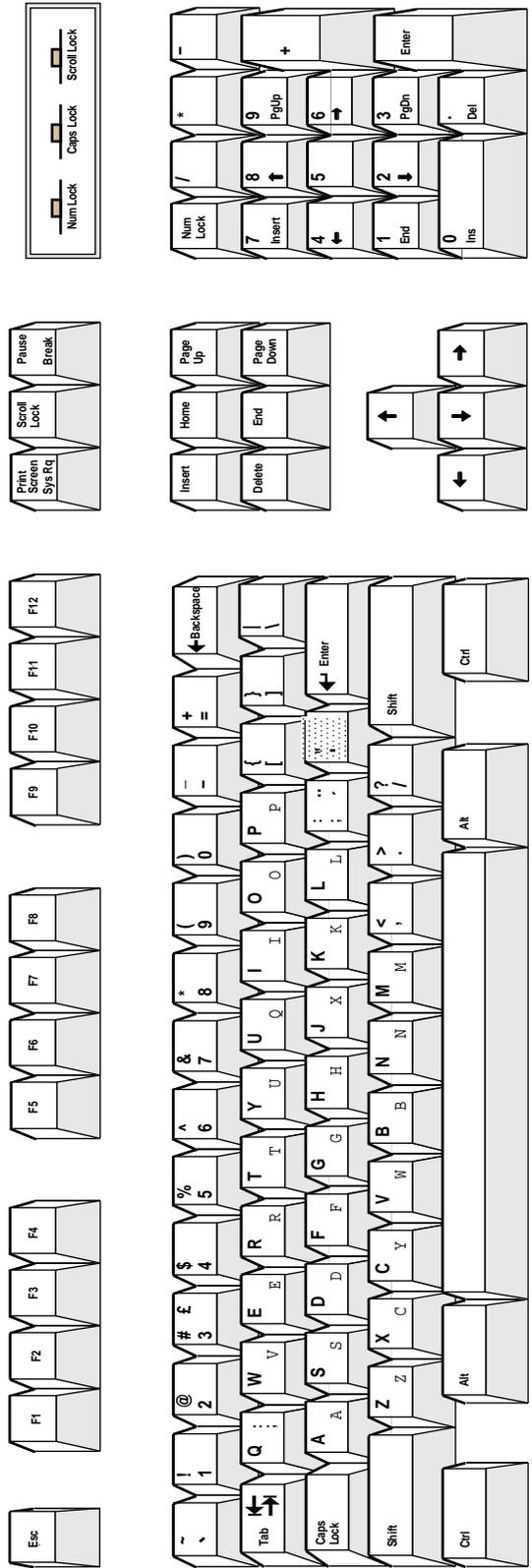
B.2 Enhanced PC Keyboards

Figure B-10 French Enhanced PC Keyboard



LJ-03211-T10

Figure B-11 Greek Enhanced PC Keyboard



MA-0304-83.GRA

Enhanced PC Keyboards

B.2 Enhanced PC Keyboards

Figure B-12 Hebrew Enhanced PC Keyboard

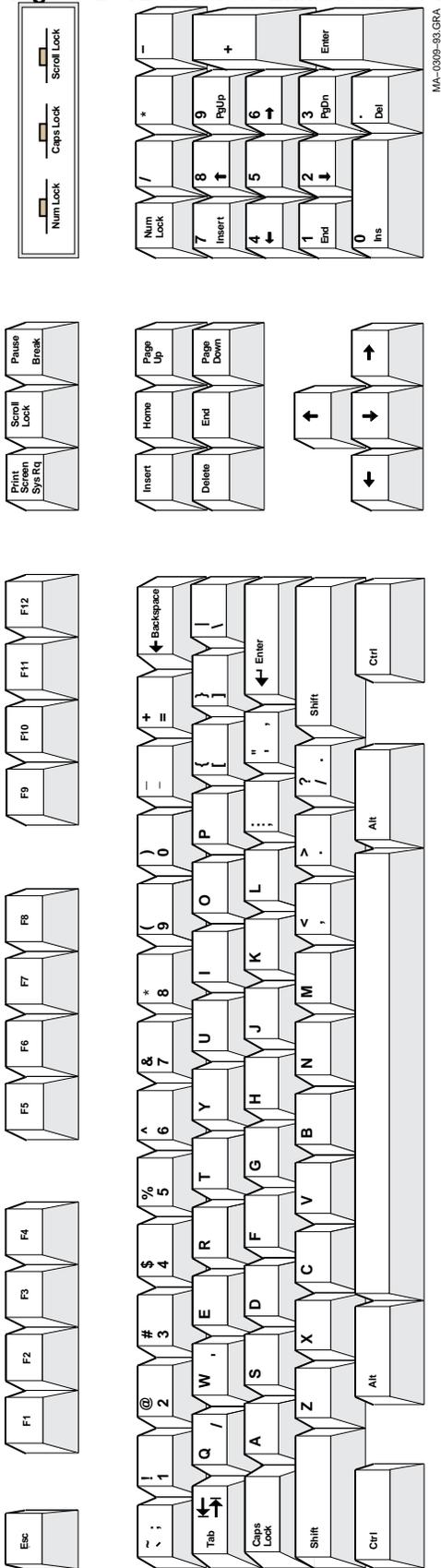
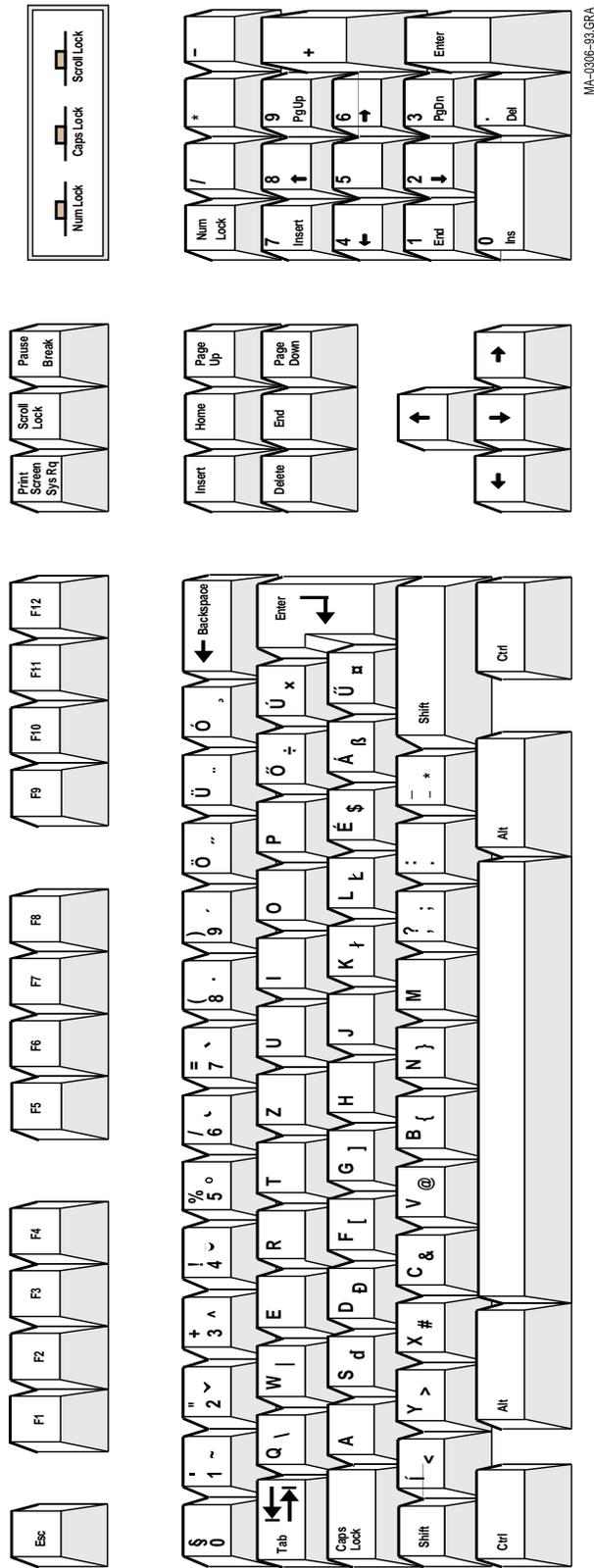


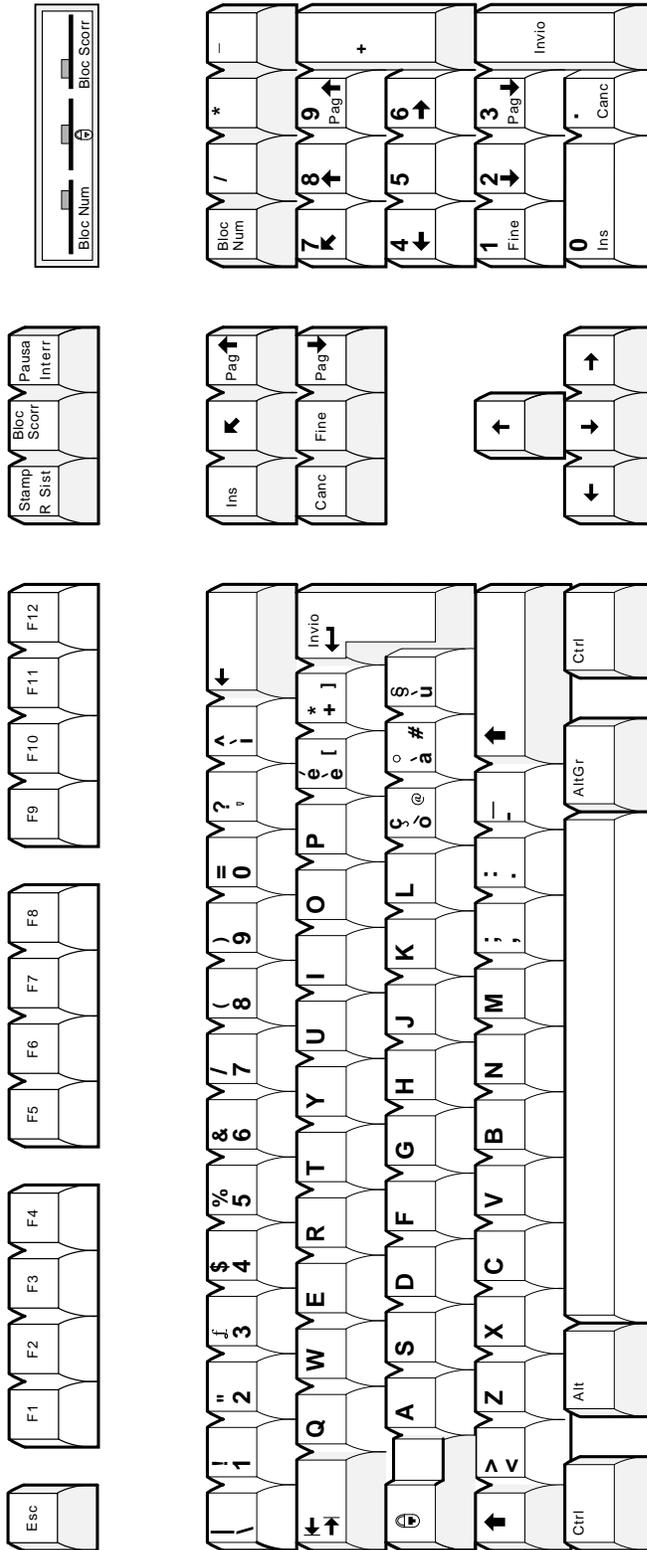
Figure B-13 Hungarian Enhanced PC Keyboard



Enhanced PC Keyboards

B.2 Enhanced PC Keyboards

Figure B-14 Italian Enhanced PC Keyboard

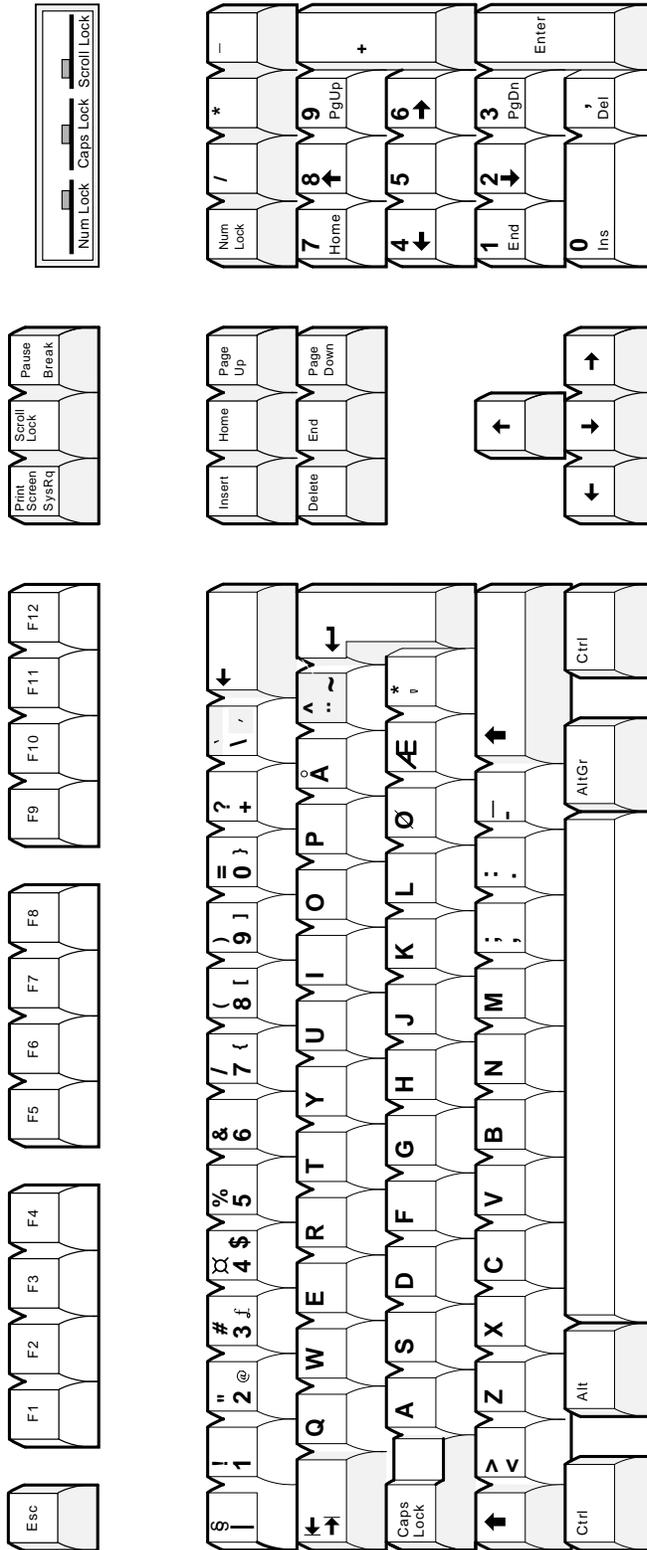


LJ-03213-T10

Enhanced PC Keyboards

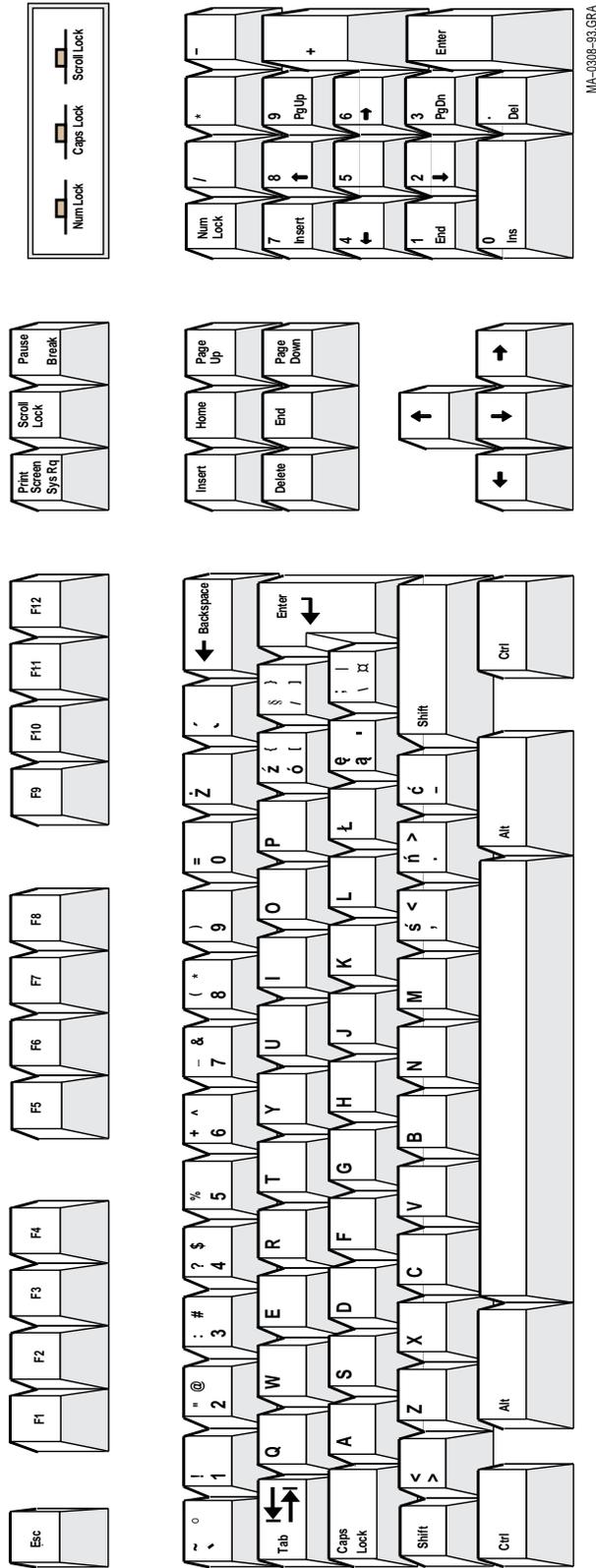
B.2 Enhanced PC Keyboards

Figure B-16 Norwegian Enhanced PC Keyboard



LJ-03214-T10

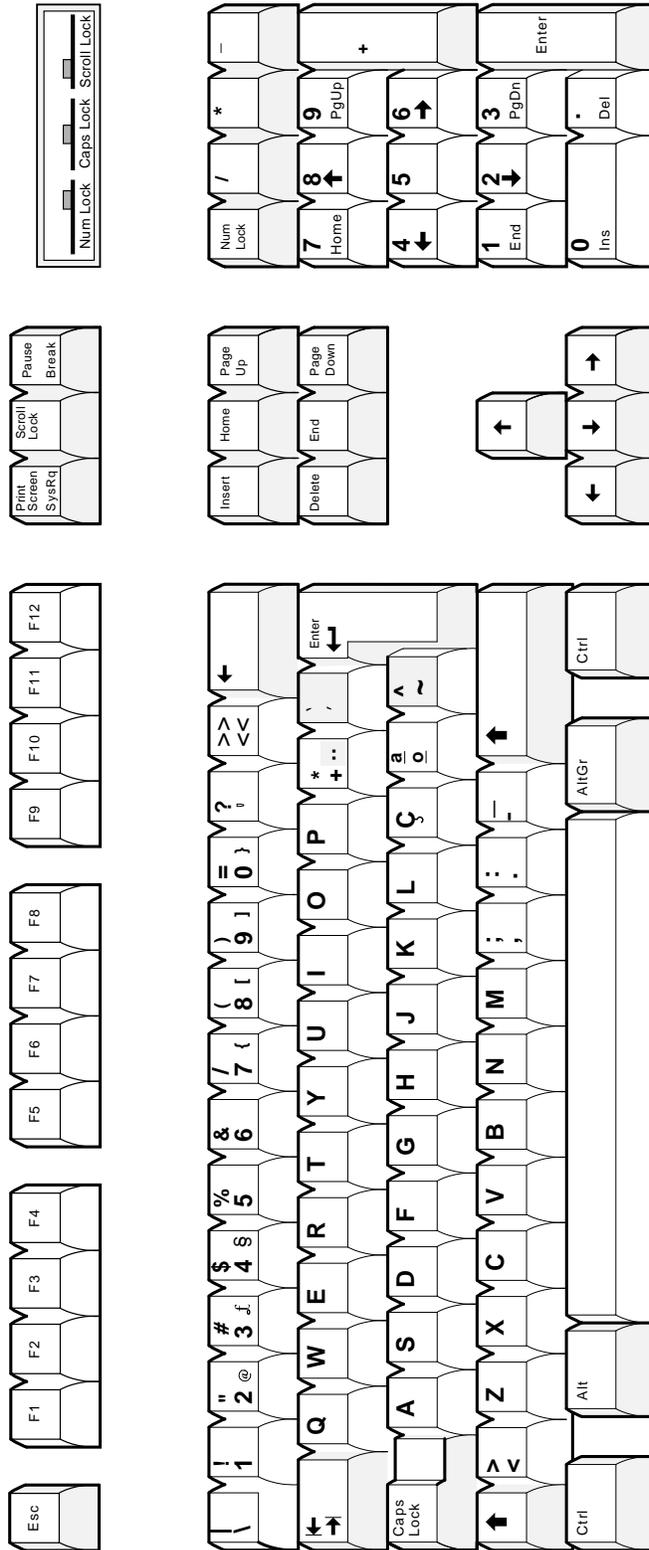
Figure B-17 Polish Enhanced PC Keyboard



Enhanced PC Keyboards

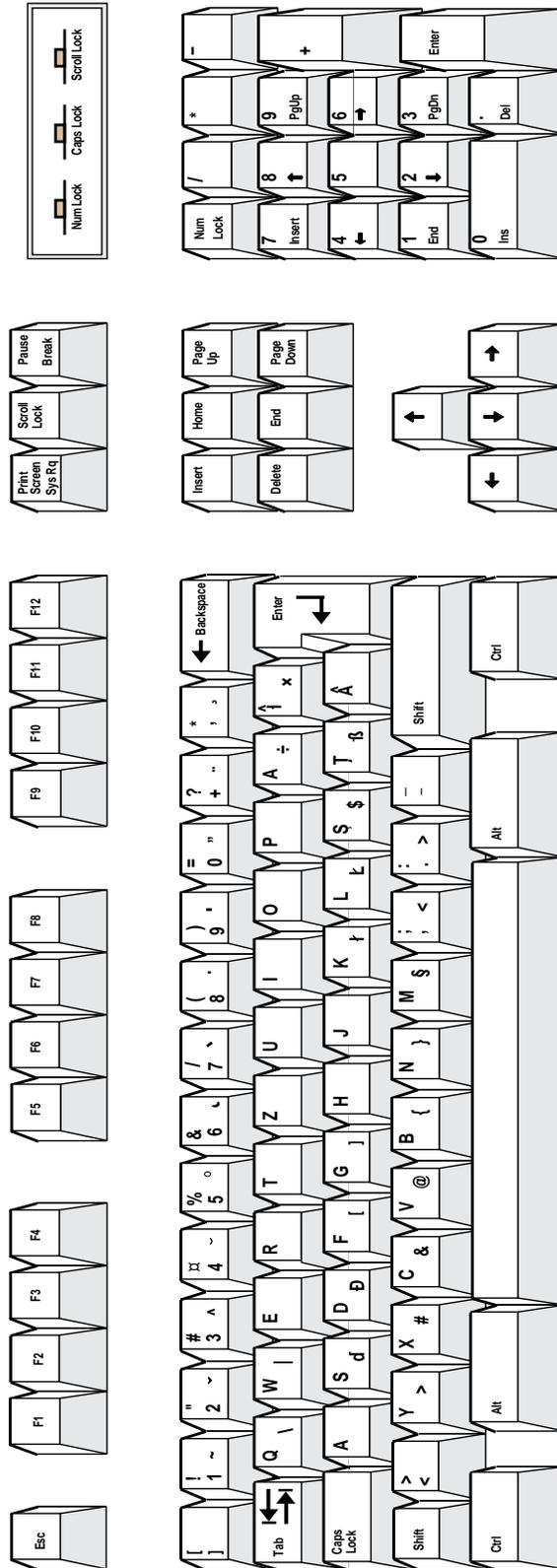
B.2 Enhanced PC Keyboards

Figure B-18 Portuguese Enhanced PC Keyboard



LJ-03215-T10

Figure B-19 Romanian Enhanced PC Keyboard



Enhanced PC Keyboards

B.2 Enhanced PC Keyboards

Figure B-20 Russian Enhanced PC Keyboard

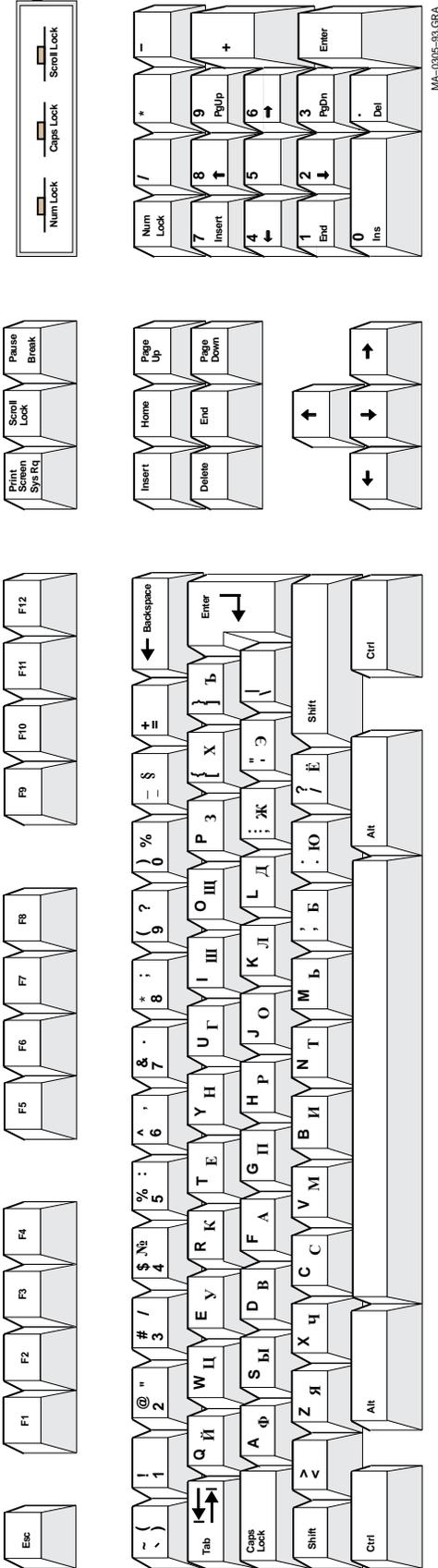


Figure B-21 SCS Enhanced PC Keyboard

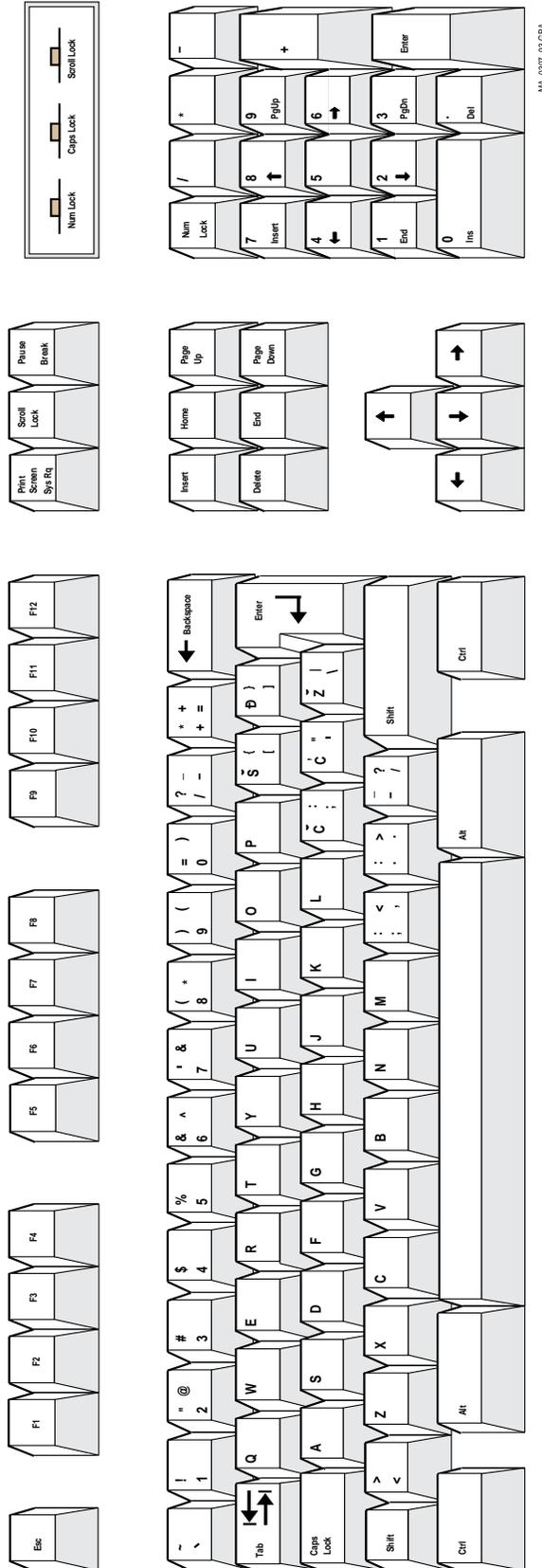
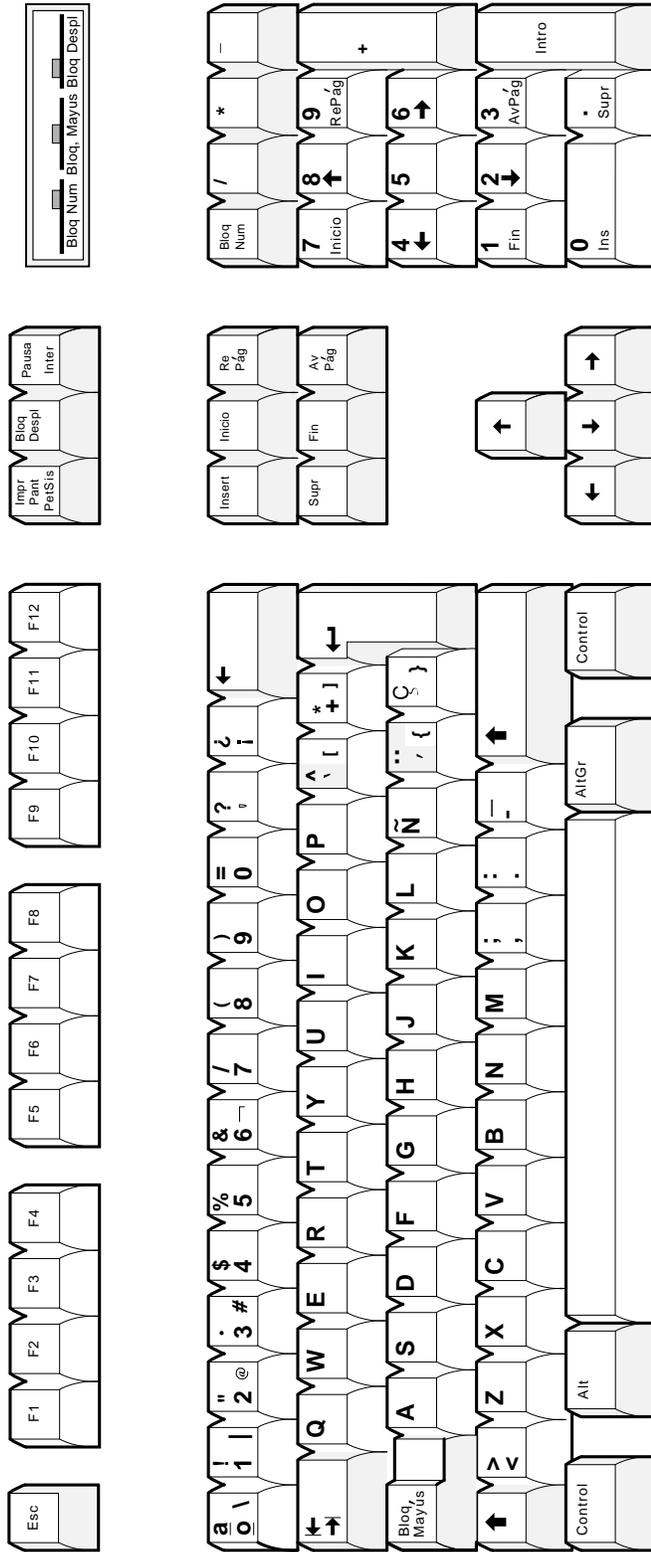
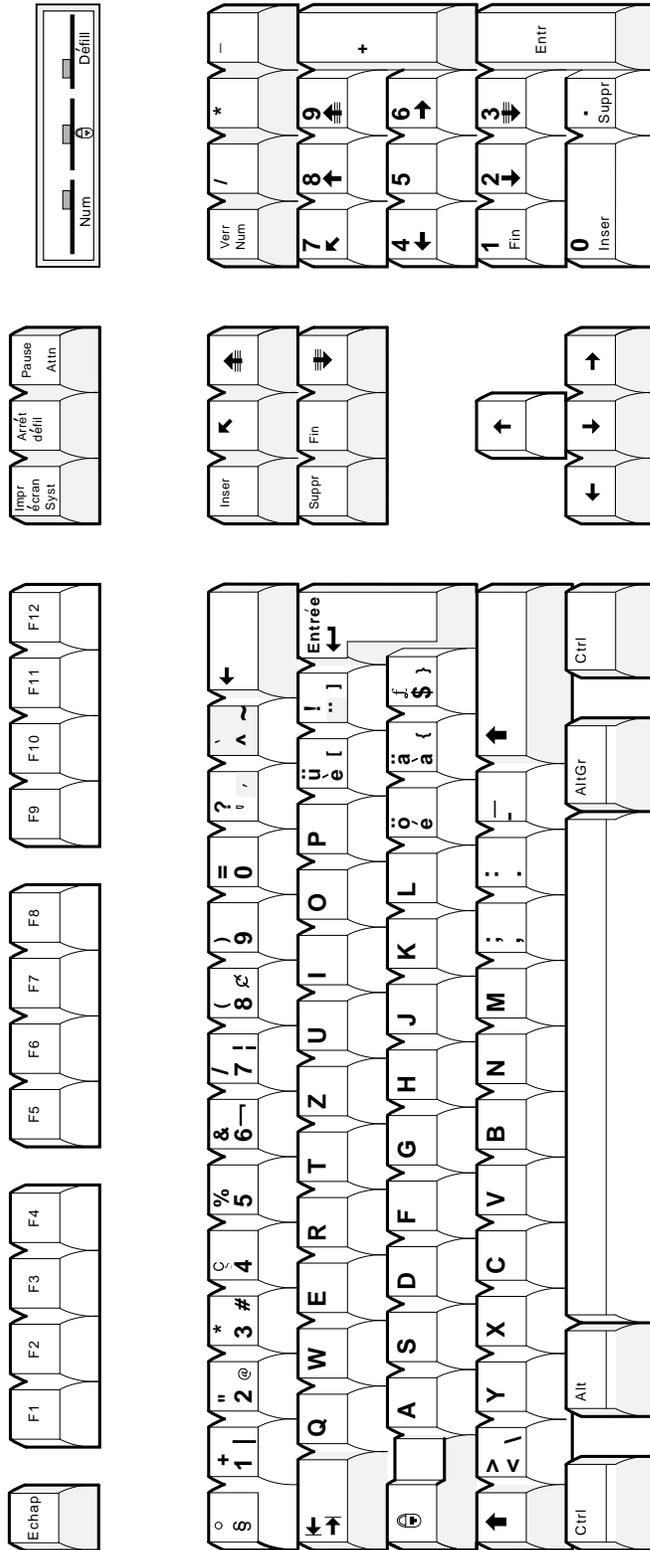


Figure B-23 Spanish Enhanced PC Keyboard



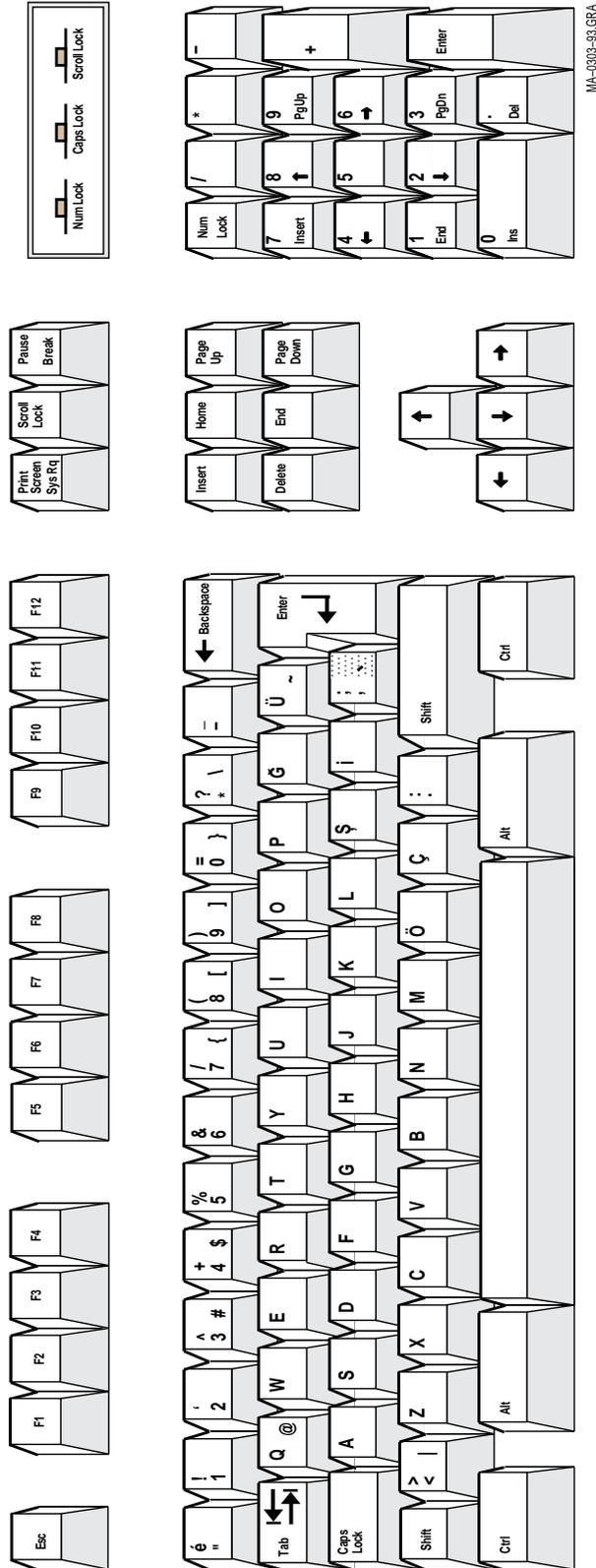
LJ-03217-T10

Figure B-25 Swiss-French Enhanced PC Keyboard



LJ-03224-T10

Figure B-27 Turkish Enhanced PC Keyboard



ASCII Keycodes and Local Functions

C.1 PC Keyboard

Table C-1 through Table C-11 list the keycodes sent by individual keys in each mode for the PC keyboard. The **Alt** key does not effect the keycode sent unless specified.

Table C-1 WYSE and TVI Modes Function Keys for PC Keyboard

| Key | Unmodified | Shift | Ctrl | Shift/Ctrl |
|--------------|------------|--------------------|------------------|-------------------|
| F1 | SOH @ CR | SOH ' CR | 80 (Hex) | 90 (Hex) |
| F2 | SOH A CR | SOH a CR | 81 (Hex) | 91 (Hex) |
| F3 | SOH B CR | SOH b CR | 82 (Hex) | 92 (Hex) |
| F4 | SOH C CR | SOH c CR | 83 (Hex) | 93 (Hex) |
| F5 | SOH D CR | SOH d CR | 84 (Hex) | 94 (Hex) |
| F6 | SOH E CR | SOH e CR | 85 (Hex) | 95 (Hex) |
| F7 | SOH F CR | SOH f CR | 86 (Hex) | 96 (Hex) |
| F8 | SOH G CR | SOH g CR | 87 (Hex) | 97 (Hex) |
| F9 | SOH H CR | SOH h CR | 88 (Hex) | 98 (Hex) |
| F10 | SOH I CR | SOH i CR | 89 (Hex) | 99 (Hex) |
| F11 | SOH J CR | SOH j CR | 8A (Hex) | 9A (Hex) |
| F12 | SOH K CR | SOH k CR | 8B (Hex) | 9B (Hex) |
| Print Screen | ESC P | ESC P | Toggle Autoprint | Toggle Autoprint |
| Scroll Lock | Hold | Hold | Hold | Hold |
| Pause | Disconnect | Send Answerback | Break | Toggle Block Mode |

Table C-2 WYSE and TVI Modes Function Keys for PC Keyboard

| Key | Alt | Alt/Shift | Alt/Ctrl | Alt/Shift/Ctrl |
|--------------|----------|------------|----------|-------------------------|
| Print Screen | Set-Up | Soft Reset | ESC P | Toggle Autoprint (Note) |
| Pause | SOH N CR | SOH n CR | Break | 9E (Hex) (Note) |

ASCII Keycodes and Local Functions

C.1 PC Keyboard

Table C-3 WYSE and TVI Modes Editing Keys for PC Keyboard

| Key | Unmodified | Shift | Ctrl | Shift/Ctrl |
|-----------|------------|-------|-----------------------|----------------------------|
| Insert | ESC q | ESC r | Toggle Insert Mode | Toggle Insert Mode |
| Home | 1E (Hex) | ESC { | Toggle Auto Panning | Home Cursor and Clear Page |
| Page Up | ESC J | ESC J | Display Previous Page | Display Previous Page |
| Delete | ESC W | ESC R | ESC W | ESC R |
| End | ESC T | ESC Y | ESC T | Screen Saver |
| Page Down | ESC K | ESC K | Display Next Page | Display Next Page |

Table C-4 WYSE and TVI Modes Cursor Keys on PC Keyboard

| Key | Unmodified | Shift | Ctrl | Shift/Ctrl |
|-----|------------|-------|-------------------------|-------------------------|
| ↑ | VT | VT† | Roll Active Page Up | Speed Scrolling Rate |
| ↓ | LF‡ | LF | Roll Active Page Down | Slow Scrolling Rate |
| ⇒ | FF | FF | Change Status Line Type | Change Status Line Type |
| ⇐ | BS | BS | BS | BS |

†"ESC j" for VT510/TVI 925 and TVI 950 emulations.

‡"16 (Hex)" for VT510/TVI 925 and TVI 950 emulations.

Table C-5 WYSE and TVI Modes Numeric Keys for PC Keyboard, NumLock = Off

| Key | Unmodified | Shift | Ctrl | Shift/Ctrl |
|-------|-----------------|-----------------|------------------|--------------------------|
| 0 | ESC r | ESC q | Display Page 0 | ESC q |
| 1 | ESC T | ESC Y | Display Page 1 | Toggle Monitor Mode |
| 2 | LF ¹ | LF | Display Page 2 | LF |
| 3 | ESC K | ESC K | Display Page 3 | ESC K |
| 4 | BS | BS | Display Page 4 | BS |
| 5 | 5 | 5 | Display Page 5 | 5 |
| 6 | FF | FF | FF | 6 |
| 7 | 1E (Hex) | ESC { | 1E (Hex) | ESC { |
| 8 | VT | VT ² | VT | VT |
| 9 | ESC J | ESC J | ESC J | ESC J |
| / | / | / | / | / |
| * | * | * | * | * |
| - | - | - | Raise Split Line | Toggle Split Screen Mode |
| + | + | + | + | + |
| . | 7F (Hex) | 7F (Hex) | 7F (Hex) | Print Page |
| Enter | CR | Toggle Keyclick | CR | CR |

¹"16 (Hex)" for VT510/TVI 925 and TVI 950 emulations.

²"ESC j" for VT510/TVI 925 and TVI 950 emulations.

ASCII Keycodes and Local Functions C.1 PC Keyboard

Table C-6 WYSE 160 and TVI Modes Numeric Keys for PC Keyboard, NumLock = On

| Key | Unmodified | Shift | Ctrl | Shift/Ctrl |
|-------|------------|-------|------|------------|
| 0 | 0 | 0 | 0 | 0 |
| 1 | 1 | 1 | 1 | 1 |
| 2 | 2 | 2 | 2 | 2 |
| 3 | 3 | 3 | 3 | 3 |
| 4 | 4 | 4 | 4 | 4 |
| 5 | 5 | 5 | 5 | 5 |
| 6 | 6 | 6 | 6 | 6 |
| 7 | 7 | 7 | 7 | 7 |
| 8 | 8 | 8 | 8 | 8 |
| 9 | 9 | 9 | 9 | 9 |
| / | / | / | / | / |
| * | * | * | * | * |
| - | - | - | - | - |
| + | + | + | + | + |
| . | . | . | . | - |
| Enter | CR | CR | CR | CR |

Table C-7 ADDS A2 Function Keys on PC Keyboard

| Key | Unmodified | Shift | Ctrl (Hex) | Shift/Ctrl (Hex) |
|-----|------------|-----------|------------|------------------|
| F1 | STX 1 CR | STX ! CR | 80 | 90 |
| F2 | STX 2 CR | STX " CR | 81 | 91 |
| F3 | STX 3 CR | STX # CR | 82 | 92 |
| F4 | STX 4 CR | STX \$ CR | 83 | 93 |
| F5 | STX 5 CR | STX % CR | 84 | 94 |
| F6 | STX 6 CR | STX & CR | 85 | 95 |
| F7 | STX 7 CR | STX ' CR | 86 | 96 |
| F8 | STX 8 CR | STX (CR | 87 | 97 |
| F9 | STX 9 CR | STX) CR | 88 | 98 |
| F10 | STX : CR | STX * CR | 89 | 99 |
| F11 | STX ; CR | STX + CR | 8A | 9A |
| F12 | STX < CR | STX , CR | 8B | 9B |

Table C-8 ADDS A2 Editing Keys on PC Keyboard

| Key | Unmodified | Shift | Ctrl | Shift/Ctrl |
|--------|------------|-------|---------------------|----------------------------|
| Insert | ESC q | ESC r | Toggle Insert Mode | Toggle Insert Mode |
| Home | SOH | SOH | Toggle Auto Panning | Home Cursor and Clear Page |

(continued on next page)

ASCII Keycodes and Local Functions

C.1 PC Keyboard

Table C–8 (Cont.) ADDS A2 Editing Keys on PC Keyboard

| Key | Unmodified | Shift | Ctrl | Shift/Ctrl |
|-----------|------------|-------|-----------------------|-----------------------|
| Page Up | ESC J | ESC J | Display Previous Page | Display Previous Page |
| Delete | ESC W | ESC I | ESC W | ESC I |
| End | ESC K | ESC k | ESC K | Screen Saver |
| Page Down | ESC J | ESC J | Display Next Page | Display to Next Page |

Table C–9 ADDS A2 Cursor Keys on PC Keyboard

| Key | Unmodified | Shift | Ctrl | Shift/Ctrl |
|-----|------------|----------|-------------------------|-------------------------|
| ↑ | 1A (Hex) | 1A (Hex) | Roll Active Page Up | Speed Scrolling Rate |
| ↓ | LF | LF | Roll Active Page Down | Speed Scrolling Rate |
| ⇒ | ACK | ACK | Change Status Line Type | Change Status Line Type |
| ⇐ | 15 (Hex) | 15 (Hex) | 15 (Hex) | 15 (Hex) |

Table C–10 ADDS A2 Mode Numeric Keypad Keys on PC Keyboard; NumLock = Off

| Key | Unmodified | Shift | Ctrl | Shift/Ctrl |
|-------|------------|-----------------|------------------|--------------------------|
| 0 | ESC r | ESC q | Display Page 0 | ESC q |
| 1 | ESC K | ESC K | Display Page 1 | Toggle Monitor Mode |
| 2 | LF | LF | Display Page 2 | LF |
| 3 | ESC J | ESC J | Display Page 3 | ESC J |
| 4 | 15(Hex) | 15(Hex) | Display Page 4 | 15(Hex) |
| 5 | 5 | 5 | Display Page 5 | 5 |
| 6 | ACK | ACK | ACK | 6 |
| 7 | SOH | SOH | SOH | SOH |
| 8 | 1A(Hex) | 1A(Hex) | 1A(Hex) | 1A(Hex) |
| 9 | ESC J | ESC J | ESC J | ESC J |
| / | / | / | / | / |
| * | * | * | * | * |
| - | - | - | Raise Split Line | Toggle Split Screen Mode |
| + | + | + | + | + |
| . | 7F (Hex) | 7F (Hex) | 7F (Hex) | Print Page |
| Enter | CR | Toggle Keyclick | CR | CR |

ASCII Keycodes and Local Functions C.1 PC Keyboard

Table C-11 ADDS A2 Mode Numeric Keypad Keys on PC Keyboard; NumLock = On

| Key | Unmodified | Shift | Ctrl | Shift/Ctrl |
|-------|------------|-------|------|------------|
| 0 | 0 | 0 | 0 | 0 |
| 1 | 1 | 1 | 1 | 1 |
| 2 | 2 | 2 | 2 | 2 |
| 3 | 3 | 3 | 3 | 3 |
| 4 | 4 | 4 | 4 | 4 |
| 5 | 5 | 5 | 5 | 5 |
| 6 | 6 | 6 | 6 | 6 |
| 7 | 7 | 7 | 7 | 7 |
| 8 | 8 | 8 | 8 | 8 |
| 9 | 9 | 9 | 9 | 9 |
| / | / | / | / | / |
| * | * | * | * | * |
| - | - | - | - | - |
| + | + | + | + | + |
| . | . | . | . | . |
| Enter | CR | CR | CR | CR |

ASCII Keycodes and Local Functions

C.2 DEC VT Keyboard

C.2 DEC VT Keyboard

Table C–12 through Table C–19 list the keycodes sent by individual keys in each mode for VT keyboards. The Alt key does not effect the keycode sent unless specified.

Table C–12 WYSE and TVI Modes Function Keys for DEC VT Keyboard

| Key | Unmodified | Shift | Ctrl | Shift/Ctrl |
|-----|--------------------|--------------------|--------------------|--------------------|
| F1 | Toggle Hold Screen | Toggle Hold Screen | Toggle Hold Screen | Toggle Hold Screen |
| F2 | ESC P | ESC P | Toggle AutoPrint | Toggle AutoPrint |
| F3 | Setup | Soft Reset | 82 (Hex) | 92 (Hex) |
| F4 | Toggle Block Mode | ESC 7 | Toggle Block Mode | ESC 7 |
| F5 | Break | Disconnect | Send Answerback | Toggle Block Mode |
| F6 | SOH E CR | SOH e CR | 85 (Hex) | 95 (Hex) |
| F7 | SOH F CR | SOH f CR | 86 (Hex) | 96 (Hex) |
| F8 | SOH G CR | SOH g CR | 87 (Hex) | 97 (Hex) |
| F9 | SOH H CR | SOH h CR | 88 (Hex) | 98 (Hex) |
| F10 | SOH I CR | SOH i CR | 89 (Hex) | 99 (Hex) |
| F11 | SOH J CR | SOH j CR | 8A (Hex) | 9A (Hex) |
| F12 | SOH K CR | SOH k CR | 8B (Hex) | 9B (Hex) |
| F13 | SOH L CR | SOH l CR | 8C (Hex) | 9C (Hex) |
| F14 | SOH M CR | SOH m CR | 8D (Hex) | 9D (Hex) |
| F15 | SOH N CR | SOH n CR | 8E (Hex) | 9E (Hex) |
| F16 | SOH O CR | SOH o CR | 8F (Hex) | 9F (Hex) |
| F17 | SOH P CR | SOH p CR | SOH P CR | SOH p CR |
| F18 | SOH Q CR | SOH q CR | SOH Q CR | SOH q CR |
| F19 | SOH R CR | SOH r CR | SOH R CR | SOH r CR |
| F20 | SOH S CR | SOH s CR | SOH S CR | SOH s CR |

Table C–13 WYSE and TVI Modes Editing Keys on DEC VT Keyboard

| Key | Unmodified | Shift | Ctrl | Shift/Ctrl |
|--------|------------|----------|-----------------------|-----------------------|
| Find | n/a | n/a | n/a | n/a |
| Insert | ESC Q | ESC E | ESC Q | ESC E |
| Remove | 7F (Hex) | 7F (hex) | 7F (Hex) | 7F (Hex) |
| Select | n/a | n/a | n/a | n/a |
| Prev | ESC J | ESC J | Move to Previous Page | Move to Previous Page |
| Next | ESC K | ESC K | Move to Next Page | Move to Next Page |

ASCII Keycodes and Local Functions C.2 DEC VT Keyboard

Table C–14 WYSE and TVI Modes Cursor Keys on DEC VT Keyboard

| Key | Unmodified | Shift | Ctrl | Shift/Ctrl |
|-----|-----------------|-----------------|-------------------------|-------------------------|
| ↑ | VT | VT ¹ | Roll Active Page Up | Speed Scrolling Rate |
| ↓ | LF ² | LF | Roll Active Page Down | Speed Scrolling Rate |
| ⇒ | FF | FF | Change Status Line Type | Change Status Line Type |
| ⇐ | BS | BS | BS | BS |

¹"ESC j" for VT510/TVI 925 and TVI 950 emulations.

²"16 (Hex)" for VT510/TVI 925 and TVI 950 emulations.

Table C–15 WYSE and TVI Modes Numeric Keypad PF Keys on DEC VT Keyboard

| Key | Unmodified | Shift | Ctrl | Shift/Ctrl |
|-------|------------|-----------------|--------------------|--------------------------|
| PF1 | ESC Q | ESC E | ESC Q | ESC E |
| PF2 | ESC W | ESC R | ESC W | ESC R |
| PF3 | ESC T | ESC Y | ESC T | Screen Saver |
| PF4 | ESC r | ESC q | Toggle Insert Mode | Toggle Insert Mode |
| 0 | 0 | 0 | Display Page 0 | 0 |
| 1 | 1 | 1 | Display Page 1 | Toggle Monitor Mode |
| 2 | 2 | 2 | Display Page 2 | 2 |
| 3 | 3 | 3 | Display Page 3 | 3 |
| 4 | 4 | 4 | Display Page 4 | 4 |
| 5 | 5 | 5 | Display Page 5 | 5 |
| 6 | 6 | 6 | 6 | 6 |
| 7 | 7 | 7 | 7 | 7 |
| 8 | 8 | 8 | 8 | 8 |
| 9 | 9 | 9 | 9 | 9 |
| - | - | - | Raise Split Line | Toggle Split Screen Mode |
| , | , | , | Lower Split Line | Cursor Drag Mode |
| . | . | . | . | Print Page |
| Enter | CR | Toggle Keyclick | CR | CR |

Table C–16 ADDS A2 Function Keys on DEC VT Keyboard

| Key | Unmodified | Shift | Ctrl | Shift/Ctrl |
|-----|--------------------|--------------------|--------------------|--------------------|
| F1 | Toggle Hold Screen | Toggle Hold Screen | Toggle Hold Screen | Toggle Hold Screen |
| F2 | ESC P | ESC P | Toggle AutoPrint | Toggle AutoPrint |
| F3 | Setup | Soft Reset | 82 (Hex) | 92 (Hex) |
| F4 | Toggle Block Mode | ESC 7 | Toggle Block Mode | ESC 7 |
| F5 | Break | Disconnect | Send Answerback | Toggle Block Mode |
| F6 | STX 6 CR | STX & CR | 85 (Hex) | 95 (Hex) |

(continued on next page)

ASCII Keycodes and Local Functions

C.2 DEC VT Keyboard

Table C-16 (Cont.) ADDS A2 Function Keys on DEC VT Keyboard

| Key | Unmodified | Shift | Ctrl | Shift/Ctrl |
|-----|------------|----------|----------|------------|
| F7 | STX 7 CR | STX ' CR | 86 (Hex) | 96 (Hex) |
| F8 | STX 8 CR | STX (CR | 87 (Hex) | 97 (Hex) |
| F9 | STX 9 CR | STX) CR | 88 (Hex) | 98 (Hex) |
| F10 | STX : CR | STX * CR | 89 (Hex) | 99 (Hex) |
| F11 | STX ; CR | STX + CR | 8A (Hex) | 9A (Hex) |
| F12 | STX < CR | STX , CR | 8B (Hex) | 9B (Hex) |
| F13 | STX = CR | STX - CR | 8C (Hex) | 9C (Hex) |
| F14 | STX > CR | STX . CR | 8D (Hex) | 9D (Hex) |
| F15 | STX ? CR | STX / CR | 8E (Hex) | 9E (Hex) |
| F16 | STX @ CR | STX 0 CR | 8F (Hex) | 9F (Hex) |
| F17 | STX A CR | STX 1 CR | STX A CR | STX 1 CR |
| F18 | STX B CR | STX 2 CR | STX B CR | STX 2 CR |
| F19 | STX C CR | STX 3 CR | STX C CR | STX 3 CR |
| F20 | STX D CR | STX 4 CR | STX D CR | STX 4 CR |

Table C-17 ADDS A2 Editing Keys on DEC VT Keyboard

| Key | Unmodified | Shift | Ctrl | Shift/Ctrl |
|--------|------------|----------|-----------------------|-----------------------|
| Find | n/a | n/a | n/a | n/a |
| Insert | ESC Q | ESC M | ESC Q | ESC M |
| Remove | 7F (Hex) | 7F (Hex) | 7F (Hex) | 7F (Hex) |
| Select | n/a | n/a | n/a | n/a |
| Prev | ESC J | ESC J | Move to Previous Page | Move to Previous Page |
| Next | ESC J | ESC J | Move to Next Page | Move to Next Page |

Table C-18 ADDS A2 Cursor Keys on DEC VT Keyboard

| Key | Unmodified | Shift | Ctrl | Shift/Ctrl |
|-----|------------|----------|-------------------------|-------------------------|
| ↑ | 1A (Hex) | 1A (Hex) | Roll Active Page UP | Speed Scrolling Rate |
| ↓ | LF | LF | Roll Active Page Down | Speed Scrolling Rate |
| ⇒ | ACK | ACK | Change Status Line Type | Change Status Line Type |
| ⇐ | 15 (Hex) | 15 (Hex) | 15 (Hex) | 15 (Hex) |

Table C-19 ADDS A2 Numeric Keypad PFKeys on DEC VT Keyboard

| Key | Unmodified | Shift | Ctrl | Shift/Ctrl |
|-----|------------|-------|-------|------------|
| PF1 | ESC Q | ESC M | ESC Q | ESC M |
| PF2 | ESC W | ESC I | ESC W | ESC I |

(continued on next page)

ASCII Keycodes and Local Functions C.2 DEC VT Keyboard

Table C–19 (Cont.) ADDS A2 Numeric Keypad PFKeys on DEC VT Keyboard

| Key | Unmodified | Shift | Ctrl | Shift/Ctrl |
|-------|------------|-----------------------|--------------------|--------------------------|
| PF3 | ESC K | ESC k | ESC K | Screen Saver |
| PF4 | ESC r | ESC q | Toggle Insert Mode | Toggle Insert Mode |
| 0 | 0 | 0 | Display Page 0 | 0 |
| 1 | 1 | 1 | Display Page 1 | Toggle Monitor Mode |
| 2 | 2 | 2 | Display Page 2 | 2 |
| 3 | 3 | 3 | Display Page 3 | 3 |
| 4 | 4 | 4 | Display Page 4 | 4 |
| 5 | 5 | 5 | Display Page 5 | 5 |
| 6 | 6 | 6 | 6 | 6 |
| 7 | 7 | 7 | 7 | 7 |
| 8 | 8 | 8 | 8 | 8 |
| 9 | 9 | 9 | 9 | 9 |
| - | - | - | Raise Split Line | Toggle Split Screen Mode |
| , | , | , | Lower Split Line | Cursor Drag Mode |
| . | . | . | . | Print Page |
| Enter | CR | Toggle Keyclick State | CR | CR |

C.3 ASCII Local Functions

Table C–20 and Table C–21 list the local functions in ASCII code mode and PC scancode mode. In the tables, keypad is abbreviated as (kpd).

Table C–20 Local Functions in ASCII Code Mode

| Function | DEC VT Layout | EPC Layout |
|-------------------|---------------------|-----------------------------|
| ±Hold Screen | F1 | Scroll Lock |
| Print page | Ctrl/Shift/ . (kpd) | Ctrl/Shift/ . (kpd) |
| Set-Up | F3 | Alt/Print Screen |
| | Caps Lock/F3 | Caps Lock/Print Screen |
| Break | F5 | Ctrl/Pause |
| Hard Reset | Ctrl/F3 in Set-Up | |
| Soft Reset | Shift/F3 | Alt/Shift/Print Screen |
| ±Autoprint Mode | Ctrl/F2 | Ctrl/Print Screen |
| | Ctrl/Shift/F2 | Ctrl/Shift/Print Screen |
| | | Alt/Ctrl/Shift/Print Screen |
| Disconnect | Shift/F5 | Pause |
| Send Answerback | Ctrl/F5 | Shift/Pause |
| Display Next Page | Ctrl/Next | Ctrl/Page Down |

(continued on next page)

ASCII Keycodes and Local Functions

C.3 ASCII Local Functions

Table C–20 (Cont.) Local Functions in ASCII Code Mode

| Function | DEC VT Layout | EPC Layout |
|---------------------------------|--------------------------------|---|
| | Shift/Ctrl/Next | Ctrl/Shift/Page Down |
| Active Other Window | Ctrl/Next or Ctrl/Prev | Ctrl/Page Down or Ctrl/Shift/Page Down or Ctrl/Page Up or Ctrl/Shift/Page Up |
| Display Prev. Page | Ctrl/Prev | Ctrl/Page Up |
| | Shift/Ctrl/Prev | Ctrl/Shift/Page Up |
| Display Page 0 | Ctrl/0 (kpd) | Ctrl/0 (kpd) |
| Display Page 1 | Ctrl/1 (kpd) | Ctrl/1 (kpd) |
| Display Page 2 | Ctrl/2 (kpd) | Ctrl/2 (kpd) |
| Display Page 3 | Ctrl/3 (kpd) | Ctrl/3 (kpd) |
| Display Page 4 | Ctrl/4 (kpd) | Ctrl/4 (kpd) |
| Display Page 5 | Ctrl/5 (kpd) | Ctrl/5 (kpd) |
| ±Block Mode | F4 Ctrl/F4 Shift/Ctrl/F5 | Ctrl/Shift/Pause |
| Change Status Line Display | Ctrl/⇒ Ctrl/Shift/⇒ | Ctrl/⇒ Ctrl/Shift/⇒ |
| ±Insert Mode | Ctrl/PF4 Ctrl/Shift/PF4 | Ctrl/Insert Ctrl/Shift/Insert |
| ±Monitor Mode | Ctrl/Shift/1 (kpd) | Ctrl/Shift/1 (kpd) |
| Screen Saver | Ctrl/Shift/PF3 | Ctrl/Shift/End |
| Speed Scroll Rate | Ctrl/Shift/↑ | Ctrl/Shift/↑ |
| Slow Scroll Rate | Ctrl/Shift/↓ | Ctrl/Shift/↓ |
| Home cursor and Clear Display | | Ctrl/Shift/Home |
| Roll Active Window Up In Page | Ctrl/↑ | Ctrl/↑ |
| Roll Active Window Down In Page | Ctrl/↓ | Ctrl/↓ |
| ±Toggle Split screen | Ctrl/Shift/ - (kpd) | Ctrl/Shift/ - (kpd) |
| Raise Split Line | Ctrl/ - (kpd) | Ctrl/ - (kpd) |
| Lower Split Line | Ctrl/ , (kpd) | n/a |
| Adjust Window to Include Cursor | | Ctrl/Home |
| ±Cursor Drag Mode | Ctrl/Shift/ , (kpd) | n/a |
| ±Caps Lock State | Lock | Caps Lock |
| ±Num Lock State | n/a | NumLock |
| ±Keyclick State | Shift/Enter (kpd) | Shift/Enter (kpd) |

ASCII Keycodes and Local Functions

C.3 ASCII Local Functions

Table C-21 Local Functions in PC Scancode Mode

| Function | DEC VT Layout | EPC Layout |
|---------------------|------------------|---|
| Set-Up | Alt/Print Screen | Caps Lock/Print Screen or Caps Lock/F3 |
| Hard Reset | Ctrl/Shift/F3 | Ctrl/Shift/Select |
| Turn On Block Mode | Compose/PF1 | L Alt/NumLock |
| Turn Off Block Mode | Compose/PF1 | Shift/Ctrl/Pause |

D

ANSI Control Function Index

D.1 ANSI Index by Final Character

This index lists the ANSI host interface commands according to their final character for reference in software programs. Each command has a mnemonic reference, which is in Chapter 5.

Table D-1 ANSI Control Functions Index by Final Character

| Control Function | Description | Reference |
|------------------|--|-----------|
| BEL | Bell | |
| BS | Backspace | |
| ESC # 3 | Double Height Line Top | DECDHL |
| ESC # 4 | Double Height Line Bottom | DECDHL |
| ESC # 5 | Single Width Line | DECSWL |
| ESC # 6 | Double Width Line | DECDWL |
| ESC 6 | Back Index | DECBI |
| ESC 7 | Save Cursor | DECSC |
| ESC 8 | Restore Cursor | DECRC |
| ESC # 8 | Screen Alignment Pattern | DECALN |
| ESC 9 | Forward Index | DECFI |
| ESC xx | Display character xx (hex) (SCO Console) | SCODPCC |
| ESC) 1 | DDD1 - Set DECRLM, DECHEBM, and DEHCCEM | DDD1 |
| ESC) B | DDD2 - ASCII to G1; reset DECRLM2 | DDD2 |
| ESC (1 | DDD3 - ASCII to G0 | DDD3 |
| <hr/> | | |
| A | | |
| <hr/> | | |
| CSI <i>PI</i> A | Cursor Up | CUU |
| CSI <i>Pn</i> a | Horizontal Position Relative | HPR |
| <hr/> | | |
| B | | |
| <hr/> | | |
| CSI <i>PI</i> B | Cursor Down | CUD |

(continued on next page)

ANSI Control Function Index

D.1 ANSI Index by Final Character

Table D–1 (Cont.) ANSI Control Functions Index by Final Character

| Control Function | Description | Reference |
|--|---|-----------|
| C | | |
| CSI <i>Pc C</i> | Cursor Forward | CUF |
| CSI <i>c</i> or CSI <i>0 c</i> | Device Attributes | DA1 |
| CSI ? <i>Psc ; PSl ; ... Psn c</i> | Response to Device Attributes | DA1 |
| CSI <i>> c</i> or CSI <i>> 0 c</i> | Secondary Device Attributes | DA2 |
| CSI <i>> 61; Pv; 0 c</i> | Response to Sec Device Attributes (VT keyboard) | DA2 |
| CSI <i>> 61; Pv; 1 c</i> | Response to Sec Device Attributes (PC keyboard) | DA2 |
| CSI <i>= c</i> or CSI <i>= 0 c</i> | Tertiary Device Attributes | DA3 |
| CSI ? <i>1; 2 c</i> | VT100 terminal ID | DECTID |
| CSI ? <i>1; 0 c</i> | VT101 terminal ID | DECTID |
| CSI ? <i>6 c</i> | VT102 terminal ID | DECTID |
| CSI ? <i>62; 1; 2; 7; 8 c</i> | VT220 North American | DECTID |
| CSI ? <i>62; 1; 2; 7; 8; 9 c</i> | VT220 International | DECTID |
| CSI ? <i>63; 1; 2; 7; 8 c</i> | VT320 North American | DECTID |
| CSI ? <i>63; 1; 2; 7; 8; 9 c</i> | VT320 International | DECTID |
| CSI ? <i>64; 1; 2; 7; 8; 9; 15; 18; 21 c</i> | VT420 North American | DECTID |
| CSI ? <i>64; 1; 2; 7; 8; 9; 15; 18; 21 c</i> | VT420 International | DECTID |
| CSI ? <i>64; 1; 2; 7; 8; 9; 15; 18; 21; 44; 45; 46c</i> | VT510 North American | DECTID |
| CSI ? <i>64; 1; 2; 7; 8; 9; 12; 15; 18; 21; 23; 24; 42; 44; 45; 46 c</i> | VT510 International | DECTID |
| ESC <i>c</i> | Reset to Initial state | RIS |
| D | | |
| CSI <i>Pc D</i> | Cursor Backward | CUB |
| CSI <i>Pn d</i> | Vertical Line Position Absolute | VPA |
| ESC <i>D</i> | Index | IND |
| E | | |
| CSI <i>Pn E</i> | Cursor Next Line | CNL |
| CSI <i>Pn e</i> | Vertical Position Relative | VPR |
| ESC <i>E</i> | Next Line | NEL |
| F | | |
| CSI <i>Pl ; Pc f</i> | Horizontal/Vertical Position | HVP |
| CSI <i>Pn F</i> | Cursor Previous Line | CPL |
| ESC <i>SP F</i> | Send 7-bit C1 Control character to host | S7C1T |
| G | | |
| CSI <i>Pn G</i> | Cursor Horizontal Absolute | CHA |
| CSI <i>Ps g</i> | Clear Tabs | TBC |
| ESC <i>SP G</i> | Send 8-bit C1 Control character to host | S8C1T |

(continued on next page)

ANSI Control Function Index D.1 ANSI Index by Final Character

Table D–1 (Cont.) ANSI Control Functions Index by Final Character

| Control Function | Description | Reference |
|-----------------------------|--|-----------|
| H | | |
| CSI <i>Pl</i> ; <i>Pc</i> H | Cursor Position | CUP |
| CSI <i>Pl...Pn</i> h | Set Mode | SM |
| CSI ? 1 h | Set Cursor Keys mode (application) | DECCKM |
| CSI 2 h | Set Keyboard Action Mode | KAM |
| CSI 3 h | Set Show Control Character Mode | CRM |
| CSI ? 3 h | Set Column Mode (132 columns) | DECCOLM |
| CSI 4 h | Set Insert Mode | IRM |
| CSI ? 4 h | Set Scrolling Mode (smooth) | DECSCLM |
| CSI ? 5 h | Set Screen Mode (light) | DECSCNM |
| CSI ? 6 h | Set Origin Mode (in margins) | DECOM |
| CSI ? 7 h | Set Autowrap Mode | DECAWM |
| CSI ? 8 h | Set Autorepeat mode | DECARM |
| CSI 12 h | Set Send/Receive mode (Local echo off) | SRM |
| CSI ? 18 h | Set Print Form Feed Mode | DECPFF |
| CSI ? 19 h | Set Printer Extent Mode | DECPEX |
| CSI 20 h | Set Line Feed/New Line (NL) | LNM |
| CSI ? 25 h | Set Text Cursor Enable Mode (visible) | DECTCEM |
| CSI ? 34 h | Set Right-to-Left Mode | DECRLM |
| CSI ? 35 h | Set Hebrew Keyboard Map Mode | DECHEBM |
| CSI ? 36 h | Set Hebrew Encoding Mode to 8-bit characters | DECHEM |
| CSI ? 42 h | Set National 7-bit character | DECNRCM |
| CSI ? 57 h | Set N.A./Greek Selection to N.A. | DECNAKB |
| CSI ? 58 h | Set (enter) ProPrinter Emulation Mode | DECIPEM |
| CSI ? 60 h | Set Horizontal Cursor | DECHCCM† |
| CSI ? 61 h | Set Vertical Cursor Coupling | DECVCCM |
| CSI ? 64 h | Set Page Cursor Coupling | DECPCCM |
| CSI ? 66 h | Set Numeric Keypad Mode | DECNKM |
| CSI ? 67 h | Set Backarrow key mode (BS) | DECBKM |
| CSI ? 68 h | Set Data Processing Keys | DECKBUM |
| CSI ? 69 h | Set Vertical Split Screen Mode | DECVSSM |
| CSI ? 73 h | Set Transmit Rate Limiting | DECXRLM |
| CSI ? 81 h | Set Key Position Mode | DECKPM |
| CSI ? 95 h | Set no clear screen on column change | DECNCSM |
| CSI ? 96 h | Set Right-to-Left Copy | DECRLCM |
| CSI ? 97 h | Set CRT Save Mode | DECCRTSM |
| CSI ? 98 h | Set Auto Resize | DECARSM |
| CSI ? 99 h | Set Modem Control Mode | DECMCM |
| CSI ? 100 h | Set Auto Answerback Mode | DECAAM |
| CSI ? 101 h | Set Conceal Answerback Message | DECCANSM |
| CSI ? 102 h | Set Ignore Null Mode | DECNULM |
| CSI ? 103 h | Set Half-Duplex Mode | DECHDPXM |
| CSI ? 104 h | Set Enable Secondary Keyboard Language Mode | DECESKM |
| CSI ? 106 h | Set Overscan Mode | DECOSCNM |
| CSI ? 108 h | Set Num Lock Mode | DECNUMLK |
| CSI ? 109 h | Set Caps Lock Mode | DECCAPSLK |
| CSI ? 110 h | Set Keyboard LED's Host Indicator Mode | DECKLHIM |
| ESC H | Set Horizontal Tabs | HTS |

†Reference not available at this time.

(continued on next page)

ANSI Control Function Index

D.1 ANSI Index by Final Character

Table D–1 (Cont.) ANSI Control Functions Index by Final Character

| Control Function | Description | Reference |
|----------------------|--|-----------|
| I | | |
| CSI <i>Pn</i> I | Cursor Horizontal Forward Tab | CHT |
| CSI <i>Ps</i> i | Media Copy | MC |
| CSI 6 i | Start Printer-to-Host Session | MC |
| CSI 7 i | Stop Printer-to-Host Session | MC |
| CSI ? <i>Ps</i> i | Media Copy (DEC) | MC |
| CSI ? 8 i | Stop Printer-to-Host Session | MC |
| CSI ? 9 i | Start Printer-to-Host Session | MC |
| ESC I Dscs | Designate Character Set | SCS |
| J | | |
| CSI <i>Ps</i> J | Erase in Display | ED |
| CSI ? <i>Ps</i> J | Selective Erase in Display | DECSER |
| K | | |
| CSI <i>Ps</i> K | Erase in Line | EL |
| CSI ? <i>Ps</i> K | Selective Erase in Line | DECSEL |
| L | | |
| CSI <i>Pn</i> L | Insert Line | IL |
| CSI <i>Pl...Pn</i> l | Reset Mode | RM |
| CSI ? 1 l | Reset Cursor Keys mode (Cursor) | DECCKM |
| CSI 2 l | Reset Keyboard Action Mode | KAM |
| CSI ? 2 l | ANSI Mode | DECANM |
| CSI 3 l | Reset Show Control Character Mode | CRM |
| CSI ? 3 l | Reset Column Mode (80 columns) | DECCOLM |
| CSI 4 l | Reset Insert Mode (Replace) | IRM |
| CSI ? 4 l | Reset Scrolling Mode (jump) | DECSCLM |
| CSI ? 5 l | Reset Screen Mode (dark) | DECSCNM |
| CSI ? 6 l | Reset Origin Mode (upper left) | DECOM |
| CSI ? 7 l | Reset Autowrap Mode | DECAWM |
| CSI ? 8 l | Reset Autorepeat mode | DECARM |
| CSI 12 l | Reset Send/Receive mode (Local echo on) | SRM |
| CSI ? 18 l | Reset Print Form Feed Mode | DECPFF |
| CSI ? 19 l | Reset Printer Extent Mode | DECPEX |
| CSI 20 l | Reset Line Feed (LF)/New Line | LNLM |
| CSI ? 25 l | Reset Text Cursor Enable Mode (invisible) | DECTCEM |
| CSI ? 34 l | Reset Right-to-Left Mode | DECRLM |
| CSI ? 35 l | Reset Hebrew Keyboard Map Mode to N.A. | DECHEBM |
| CSI ? 36 l | Reset Hebrew Encoding Mode to 7-bit characters | DEHCEM |
| CSI ? 42 l | Reset Multinational 8-bit characters | DECNRCM |
| CSI ? 57 l | Reset N.A./Greek Selection to Greek | DECNAKB |
| CSI ? 58 l | Reset (return from) ProPrinter Emulation Mode | DECIPEM |
| CSI ? 60 l | Reset Horizontal Cursor | DEHCCM† |
| CSI ? 61 l | Reset Vertical Cursor Coupling | DECVCCM |
| CSI ? 64 l | Reset Page Cursor Coupling | DECPCCM |
| CSI ? 66 l | Reset Numeric Keypad Mode | DECNKM |

†Reference not available at this time.

(continued on next page)

ANSI Control Function Index D.1 ANSI Index by Final Character

Table D–1 (Cont.) ANSI Control Functions Index by Final Character

| Control Function | Description | Reference |
|--|---|-----------------------|
| L | | |
| CSI ? 67 l | Reset Backarrow key mode (DEL) | DECBKM |
| CSI ? 68 l | Reset to Typewriter Keys | DECKBUM |
| CSI ? 69 l | Reset Vertical Split Screen Mode | DECVSSM |
| CSI ? 73 l | Reset Transmit Rate Limiting | DECXRLM |
| CSI ? 81 l | Reset Key Position Mode | DECKPM |
| CSI ? 95 l | Reset no clear screen on column change | DECNCSM |
| CSI ? 96 l | Reset Right-to-Left Copy | DECRLCM |
| CSI ? 97 l | Reset CRT Save Mode | DECRTSM |
| CSI ? 98 l | Reset Auto Resize | DECARSM |
| CSI ? 99 l | Reset Modem Control Mode | DECMCM |
| CSI ? 100 l | Reset Auto Answerback Mode | DECAAM |
| CSI ? 101 l | Reset Conceal Answerback Message Mode | DECCANSM |
| CSI ? 102 l | Reset Ignore Null Mode | DECNULM |
| CSI ? 103 l | Reset Half-Duplex Mode | DECHDPXM |
| CSI ? 104 l | Reset Enable Secondary Keyboard Language Mode to Primary keyboard mapping | DECESKM |
| CSI ? 106 l | Reset Overscan Mode | DECOSCNM |
| CSI ? 108 l | Reset Num Lock Mode | DECNUMLK |
| CSI ? 109 l | Reset Caps Lock Mode | DECCAPSLK |
| CSI ? 110 l | Reset Keyboard LED's Host Indicator Mode | DECKLHIM |
| M | | |
| CSI <i>Pn</i> M | Delete Line(s) | DL |
| CSI <i>Ps</i> ; <i>Ps</i> m | Select Graphic Rendition | SGR |
| ESC M | Reverse Index | RI |
| N | | |
| CSI 0 n | DSR—Operating Status Response | DSR—Op |
| CSI 3 n | DSR—Operating Status Response | DSR—Op |
| CSI 5 n | DSR—Operating Status Request | DSR—Op |
| CSI 6 n | Cursor Position Report Request or DSR—CPR | CPR or DSR—CPR |
| CSI ? 6 n | Extended Cursor Position Request, or DSR—Extended CPR | DECXCPR, DSR—ExCPR |
| CSI ? 10 n | DSR—Printer Port Response | DSR—Print |
| CSI ? 11 n | DSR—Printer Port Response | DSR—Print |
| CSI ? 13 n | DSR—Printer Port Response | DSR—Print |
| CSI ? 15 n | DSR—Printer Port Request | DSR—Print |
| CSI ? 18 n | DSR—Printer Port Response | DSR—Print |
| CSI ? 19 n | DSR—Printer Port Response | DSR—Print |
| CSI ? 20 n | DSR—User-Defined Keys Response | DSR—UDK |
| CSI ? 21 n | DSR—User-Defined Keys Response | DSR—UDK |
| CSI ? 25 n | DSR—User-Defined Keys Request | DSR—UDK |
| CSI ? 26 n | DSR—Keyboard Status Request | DSR—KeyBd |
| CSI ? 27 ; <i>Prr</i> , <i>Pst</i> , <i>Ptyp</i> n | DSR—Keyboard Response | DSR—KeyBd |
| CSI ? 62 n | DSR—Macro Space Report Request | DECDMAC, DSR—MSR |
| CSI ? 63; <i>Pid</i> n | Memory Checksum Report Request or DSR—Memory Checksum Request | DECCKSR, DSR—Mem |

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D.1 ANSI Index by Final Character

Table D–1 (Cont.) ANSI Control Functions Index by Final Character

| Control Function | Description | Reference |
|-------------------------------|--|-------------------|
| N | | |
| CSI ? 70 n | DSR—Data Integrity Report Response | DSR—Data |
| CSI ? 71 n | DSR—Data Integrity Report Response | DSR—Data |
| CSI ? 73 n | DSR—Data Integrity Report Response | DSR—Data |
| CSI ? 75 n | DSR—Data Integrity Report Request | DSR—Data |
| CSI ? Ps n | Response to Device Status Report | DSR |
| ESC N | Single Shift Two | SS |
| ESC n | Locking Shift Two | LS |
| O | | |
| ESC O | Single Shift Three | SS |
| ESC o | Locking Shift Three | LS |
| P | | |
| CSI Pn P | Delete Character | DCH |
| CSI Pn SP P | Page Position Absolute | PPA |
| CSI Pr + p | Secure Reset | DECSR |
| CSI Ps p | Select Set-Up Language | DECSSL |
| CSI Ps SP p | Set Scroll Speed | DECSSCLS |
| CSI Pa \$ p | Request Mode (ANSI) Host to Terminal | DECRQM |
| CSI ? Pd \$ p | Request Mode (DEC) Host to Terminal | DECRQM |
| CSI ! p | Soft Terminal Reset | DECSTR |
| CSI Ps * p | Select ProPrinter Character Set | DECSPPCS |
| CSI Ps) p | Select Digital Printed Data Type | DECSDP |
| CSI 6 Ps1 ; Ps2 ; " p | Select Conformance (Operating) Level | DECSCL |
| CSI Ps1; Ps2 , p | Load Time of Day | DECLTOD |
| DCS Ps \$ p D...D ST | Restore Terminal State | DECRSTS |
| Q | | |
| CSI Pn SP Q | Page Position Relative | PPR |
| CSI Pr * q | Secure Reset Confirmation | DECSR |
| CSI Ps q | Load LEDs | DECLL |
| CSI Ps SP q | Set Cursor Style | DECSCUR |
| CSI Ps " q | Select Character Protection Attribute | DECSA |
| CSI Ps1 , q | Select Terminal ID | DECTID |
| CSI Ps \$ q | Select Disconnect Delay Time | DECSDDT |
| CSI Pfl; PC1; ...Pfn; Pcn + q | Enable Local Functions | DECEL |
| DCS \$ q D...D ST | Request Selection or Setting | DECRQSS |
| ESC Q Fn String | Define Function Key (SCO Console) | SCODFK |
| R | | |
| CSI Pl; Pc R | Response to Cursor Position Report (CSI 6 n) or DSR—CPR | CPR or DSR—CPR |
| CSI Pl; Pc; Pp R | Response to Extended Cursor Position Request (CSI ? 6 n) or DSR—Extended CPR | DEXCPR, DSR—ExCPR |
| CSI Pn SP R | Page Position Backwards | PPB |
| CSI Ps * r | Select Communication Speed | DESCS |
| CSI Ps1; Ps2 * r | Select Communication Speed | DESCS |

(continued on next page)

ANSI Control Function Index D.1 ANSI Index by Final Character

Table D–1 (Cont.) ANSI Control Functions Index by Final Character

| Control Function | Description | Reference |
|---|---|-----------|
| R | | |
| CSI ? <i>Ps1</i> ; <i>Ps2</i> r | Enter/Exit PCTerm Mode | DECPCTERM |
| CSI <i>Ps</i> SP r | Set Key Click Volume | DECSKCV |
| CSI <i>Pt</i> ; <i>Pb</i> r | Set Top and Bottom Margin | DECSTBM |
| CSI <i>Pt</i> ; <i>Pl</i> ; <i>Pb</i> ; <i>Pr</i> ; <i>Ps1</i> ;... <i>Psn</i> \$ r | Change Attribute in Rectangle | DECCARA |
| CSI <i>Pm1</i> ; <i>Pf1</i> ;... <i>Pmn</i> ; <i>Pfn</i> + r | Select Modifier Key Reporting | DECSMKR |
| DCS <i>Ps</i> r D...D ST | Load Banner Message | DECLBAN |
| DCS <i>Ps</i> \$ r D...D ST | Report Selection or Setting | DECRQSS |
| S | | |
| CSI s | Save Current Cursor Position (SCO Console) | SCOSC |
| CSI <i>Pn</i> S | Pan Down | SU |
| CSI <i>Pl</i> ; <i>Pr</i> s | Set Left and Right Margin | DECSLRM |
| CSI <i>Ps</i> \$ s | Select Printer Type | DECSPRTT |
| CSI <i>Ps</i> * s | Select Flow Control Type | DECSFC |
| CSI <i>Ps1</i> ; <i>Ps2</i> ; <i>Ps3</i> ; <i>Ps4</i> * s | Select Flow Control | DECSFC |
| DCS 1 \$ s D...D ST | Reply to Terminal State Report to Host | DECTSR |
| DCS <i>Ps</i> \$ s D...D ST | Reply to Terminal State Report | DECRQTSR |
| T | | |
| CSI <i>Pn</i> T | Pan Up | SD |
| CSI <i>Pn</i> t | Set Lines Per Page | DECSLPP |
| CSI <i>Ps</i> " t | Select Refresh Rate | DECSRFR |
| CSI <i>Ps</i> SP t | Set Warning Bell Volume | DECSWBV |
| CSI <i>Pt</i> ; <i>Pl</i> ; <i>Pb</i> ; <i>Pr</i> <i>Ps1</i> ;... <i>Psn</i> \$ t | Reverse Attribute in Rectangle | DECRARA |
| DCS <i>Ps</i> \$ t D...D ST | Restore Presentation State | DECRSPS |
| U | | |
| CSI u | Restore Saved Cursor Position (SCO Console) | SCORC |
| CSI <i>Pn</i> U | Next Page | NP |
| CSI & u | Request User-Preference Supplemental Set | DECRQUPSS |
| CSI 1 \$ u | Request Terminal State Report | DECTSR |
| CSI <i>Ps</i> \$ u | Request Terminal State Report | DECRQTSR |
| CSI <i>Ps</i> , u | Key Type Inquiry | DECRQKT |
| CSI <i>Ps</i> SP u | Set Margin Bell Volume | DECSMBV |
| CSI <i>Ps</i> * u | Select Communication Port | DECSCP |
| CSI <i>Ps1</i> ; <i>Ps2</i> * u | Select Communication Port | DECSCP |
| CSI <i>Ps</i> " u | Set Transmit Rate Limit | DECSTRL |
| CSI <i>Ps1</i> ; <i>Ps2</i> " u | Set Transmit Rate Limit | DECSTRL |
| DCS 1 \$ u D...D ST | Cursor Information Report | DECCIR |
| DCS 2 \$ u D...D ST | Tab Stop Report | DECTABSR |
| DCS <i>Ps</i> ! u <i>Dscs</i> ST | Assign User-Preference Supp Set | DECAUPSS |
| V | | |
| CSI <i>Pn</i> V | Preceding Page | PP |
| CSI <i>Ps</i> SP v | Set Lock Key Style | DECSLCK |
| CSI " v | Request Displayed Extent | DECRQDE |

(continued on next page)

ANSI Control Function Index

D.1 ANSI Index by Final Character

Table D–1 (Cont.) ANSI Control Functions Index by Final Character

| Control Function | Description | Reference |
|--|---|---------------------|
| V | | |
| CSI <i>Ps1</i> ; <i>Ps2</i> , v | Report Key Type | DECRPKT |
| CSI <i>Pts;Pls;Pbs;Prs;Pps;Ptd;Pld;Ppd</i> \$v | Copy Rectangular Area | DECCRA |
| DCS <i>Ps</i> v D...D ST | Load Answerback Message | DECLANS |
| W | | |
| CSI ? 5 W | Set Tab at every 8 columns | DECST8C |
| CSI <i>Ps</i> + w | Set Port Parameter | DECSPP |
| CSI <i>Ps1</i> ; <i>Ps2</i> , w | Key Definition Inquiry | DECRQKD |
| CSI <i>Ps1</i> ; <i>Ps2</i> ; <i>Ps3</i> ; <i>Ps4</i> + w | Set Port Parameter | DECSPP |
| CSI <i>Ph</i> ; <i>Pw</i> ; <i>Pml</i> ; <i>Pmt</i> ; <i>Pmp</i> ; " w | Report Displayed Extent | DECRPDE |
| CSI <i>Ps</i> \$ w | Request Presentation State Report | DECRQPSR |
| X | | |
| CSI <i>Pn</i> X | Erase Character(s) | ECH |
| CSI <i>Pch</i> ; <i>Pt</i> ; <i>Pl</i> ; <i>Pb</i> ; <i>Pr</i> \$ x | Fill Rectangular Area | DECFRA |
| CSI <i>Ps</i> * x | Select Attribute and Change Extent | DECSACE |
| CSI + x | Program Key Free Memory Inquiry | DECRQPKFM |
| DCS " x D...D ST | Program Function Key | DECPFK |
| Y | | |
| CSI <i>Pa</i> ; <i>Ps</i> \$ y | Report Mode (ANSI) Terminal to Host | DECRPM |
| CSI ? <i>Pd</i> ; <i>Ps</i> \$ y | Report Mode (DEC) Terminal to Host | DECRPM |
| CSI <i>Pid</i> ; <i>Pp</i> ; <i>Pt</i> ; <i>Pl</i> ; <i>Pb</i> ; <i>Pr</i> * y | Request Checksum of Rectangle Area | DECRQCRA |
| CSI 4 ; <i>Ps</i> ; ... ; <i>Ps</i> y | Invoke Confidence Test | DECTST |
| CSI <i>Ps1</i> ; <i>Ps2</i> + y | Program Key Free Memory Report | DECPKFMR |
| DCS " y D...D ST | Program Alphanumeric Key | DECPAK |
| Z | | |
| CSI <i>Pt</i> ; <i>Pl</i> ; <i>Pb</i> ; <i>Pr</i> \$ z | Erase Rectangular Area | DECERA |
| CSI <i>Pid</i> * z | Invoke Macro | DECINVM |
| CSI <i>Pn</i> Z | Cursor Backward Tabulation | CBT |
| CSI <i>Ps</i> + z | Program Key Action | DECPKA |
| DCS <i>Pid</i> ; <i>Pdt</i> ; <i>Pen</i> ! z D...D ST | Define Macro | DECDMAC |
| DCS " z D...D ST | Copy Key Default | DECKD |
| Other Characters | | |
| APC : <i>ppp mm</i> ST | Extended Keyboard Report | DECEKBD |
| CSI <i>Pn</i> @ | Insert Character | ICH |
| CSI <i>Pn</i> * | Select number of lines per screen | DECSNLS |
| CSI \$ | Set 80 columns per page | DECSPP |
| CSI <i>Ps</i> \$ | Set <i>Ps</i> columns per page | DECCOLM |
| CSI 80 \$ | Set 80 columns per page | DECSPP |
| CSI 132 \$ | Set 132 columns per page | DECSPP |
| DCS ! D...D ST | Report Terminal Unit ID, response to Tertiary Device Attributes | DA3 and DECRPTUI |

(continued on next page)

ANSI Control Function Index D.1 ANSI Index by Final Character

Table D–1 (Cont.) ANSI Control Functions Index by Final Character

| Control Function | Description | Reference |
|---|--|------------------------------------|
| Other Characters | | |
| DCS <i>Ps1; Ps2; Ps3</i> <i>D...D</i> ST | User Defined Key | DECUDK |
| DCSP <i>c;Pl;Pm</i> <i>Ky1/St1;...Kyn/Stn</i> ST | User Defined Key | DECUDK |
| ESC | Locking Shift Three Right | LS |
| CSI <i>Pn</i> * { | Macro Space Report Response | DECMSR, DSR–MSR |
| CSI <i>Pt;Pl;Pb;Pr</i> \$ { | Selective Erase Rectangular Area | DECSERA |
| DCS <i>Pfn; Pcn; Pe; Pcmw; Pss; Pu;</i> <i>Pcmh; Pcss</i> { < <i>Dscs</i> > < <i>sixel-font-patterns</i> > ST | Dynamically Redefinable Character Sets Extension (Down-line Load) | DECDDL |
| CSI <i>Pn</i> ' } | Insert Column | DECIC |
| CSI <i>Ps</i> \$ } | Select Active Status Display | DECSASD |
| CSI <i>Ps1; Ps2</i> SP } | Keyboard Language Selection | DECKBD |
| CSI <i>Pk1; Pf1; Pk2; Pf2.....*</i> } | Local Function Key Control | DECLFKC |
| DCS " } <i>D...D</i> ST | Report Function Key Definition | DECRPFK |
| ESC } | Locking Shift Two Right | LS |
| CSI <i>Pn</i> ' ~ | Horizontal Position Absolute | HPA |
| CSI <i>Pn</i> ' ~ | Delete Column(s) | DECDC |
| CSI <i>Ps</i> SP ~ | Terminal Mode Emulation | DECTME |
| CSI <i>Ps</i> \$ ~ | Set Status Display (Line) Type | DECSSDT |
| CSI <i>Ps1 ; Ps2</i> ~ | Function Key | DECFNK |
| DCS " ~ <i>D...D</i> ST | Report all Modifiers/Alphanumeric Key State | DECRPAK |
| DCS <i>Pid!</i> ~ <i>D...D</i> ST | Response to Memory Checksum Report Request | DECRQCRA, DECKSR, or DSR–Mem |
| ESC ~ | Locking Shift One Right | LS |
| ESC (<i>Dscs</i> | G0 94-character set | SCS |
| ESC) <i>Dscs</i> | G1 94-character set | SCS |
| ESC * <i>Dscs</i> | G2 94-character set | SCS |
| ESC + <i>Dscs</i> | G3 94-character set | SCS |
| ESC - <i>Dscs</i> | G1 96-character set | SCS |
| ESC . <i>Dscs</i> | G2 96-character set | SCS |
| ESC / <i>Dscs</i> | G3 96-character set | SCS |
| ESC = | Set Keypad Application Mode | DECKPAM |
| ESC < | Exit ANSI (VT52) Mode | DECANM |
| ESC > | Reset Keypad to numeric characters | DECKPNM |
| S0 | Locking Shift One | LS |

Glossary

ANSI

American National Standards Institute; ANSI character set.

ANSI Terminal

A video terminal that complies with prominent ANSI standards, which usually include:

ANSI X3.4, *ASCII, American Standard Code for Information Exchange*

ANSI X3.41 *Controls for use with ASCII*

ANSI X3.64 *Additional Controls for use with ASCII*

ASCII

American Standard Code for Information Interchange; ASCII character set.

ASCII Terminal

A video terminal that complies with:

ANSI X3.4 *ASCII, American Standard Code for Information Exchange*

ANSI X3.41 *Controls for use with ASCII*

But an ASCII terminal may not comply with control sequences, the protocol defined by ANSI X3.64, *Additional Controls for use with ASCII*.

Character Set

A one-to-one mapping between the character codes and the symbols produced. The differences are as follows:

| Character Set | Character Codes | Control Codes |
|----------------------|------------------------|----------------------|
| ASCII 7-bit | 96 | 32 |
| ASCII 8-bit | 192 | 64 |
| PC | 256 | 0 |
| PCTerm | 256 | 16 (typically) |

Control Codes

Binary codes representing control data, rather than graphic data, to perform non-printable functions, such as tab, form feed, bell, and so on.

- C0 control codes are defined for 7-bit character sets.
- C0 and C1 control codes are defined for 8-bit character sets.

Control Function

A general term for control codes, escape sequences, control sequences, and control strings.

Control Sequence

The ANSI standards define the protocol for extending the meaning of character set data to be control data. As such, a control sequence has a prefix called a *control sequence introducer* (CSI) followed by the command and its parameters. For example, **Esc** [is the CSI used for 7-bit ANSI control sequences.

EPC Keyboard

An Enhanced PC (PCXAL) 101- or 102-key layout keyboard.

Function Key

A key that sends control codes or control sequences that are usually interpreted by a host computer to perform some function. In *PCTerm mode*, a keyboard mapping process in the host computer determines the function to be performed.

Graphic Key

An alphanumeric key.

Keyboard Dialect

A mapping from keystrokes on the main key array to the characters produced. The names of the *keyboard dialects* are based on the geographical region, country, or language for which the keyboard is primarily intended.

Keyboard Language

Another term for a *keyboard dialect*.

Keyboard Layout

A physical arrangement of keys and keycap legends on a keyboard.

Keyboard Scan Codes

The numeric codes transmitted from a keyboard to a terminal or computer. Within a keyboard, scan codes are generated by scanning a physical key array to detect key switch transitions. Scan codes represent the physical position of the keys in the key matrix. The host defines the meaning of the scan codes, mapping them to alphanumeric, function, or “hot” keys for DOS application use.

Local Function Key

A key that invokes a local terminal function (Examples: Print Screen, Set-Up).

MPR II

A Swedish standard that sets limits for low frequency magnetic energy emitted from electronic equipment.

PCTerm

A terminal mode that emulates the console of an industry-standard PC, while communicating with a host over a serial communications line. PCTerm mode allows you to run an application on a host as if the application was running locally on the terminal. In PCTerm mode, the terminal transmits the same PC keyboard *scan codes* that a console keyboard attached to a PC would send.

Soft Key Mapping

The ability to modify the correspondence between keystrokes to character codes or functions for all keys on the keyboard.

Set-Up Summary Line

A line of text that appears at the bottom of the screen any time the terminal is in Set-Up. This line summarizes how the terminal is configured. If the terminal is unable to communicate with a host for some reason, the *Set-Up Summary Line* can be used to quickly find any mismatched settings.

Status Display

A separate logical display that usually appears as a single line near the bottom or top of the screen to provide status information.

User Defined Key

A *function key* that can be reprogrammed by the user or by a control sequence from the host.

VT Keyboard

An LK450 (LK401) 108-key layout keyboard.

XOFF/XON

Control codes that the terminal uses to stop and resume transmission when its receive buffer (or the host's receive buffer) is full or empty.

XPC

A remapping of transmitted XOFF and XON control codes to unused PC scan codes. While in PCTerm mode, these control codes would interfere with the scan codes that the host expects to receive. The terminal, however, still responds to received XOFF and XON control codes.

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