

MicroVMS Workstation User's Guide

Order Number: AA-EZ24C-TN

May 1986

The *MicroVMS Workstation User's Guide* provides instructions for running Version 3.0 of the MicroVMS Workstation software on a MicroVAX workstation.

Operating System and Version:

MicroVMS Version 4.4

Software Version:

MicroVMS Workstation Software
Version 3.0

**digital equipment corporation
maynard, massachusetts**

May 1986

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Contents

Preface

ix

Chapter 1 Getting Started

1.1	Windows	1-1
1.2	The Getting Started Window	1-3
1.3	Menus	1-3
1.4	The Pointer and Pointing Devices	1-4
1.4.1	Using Pointing Devices	1-4
1.4.2	Using the Mouse	1-5
1.4.2.1	Mouse Fallback Keys	1-6
1.4.3	The Tablet Subsystem	1-7
1.4.3.1	Using the Puck	1-8
1.4.3.2	Using the Stylus	1-9
1.5	VAXstation Function Keys	1-10
1.6	The Operator Window	1-11
1.6.1	Using the Operator Window	1-11
1.6.2	Operator Window Functions on Color and Intensity Systems	1-12

Chapter 2 The Workstation Options Menu

2.1	Obtaining Help	2-3
2.2	VT220 Terminal Emulation	2-3
2.3	Tektronix 4010/4014 Terminal Emulation	2-6
2.4	Printing a Portion of the Screen Display	2-7
2.4.1	Changing the Print Destination	2-8
2.5	Workstation Setup Menu	2-9
2.5.1	Automatic Login	2-11
2.5.1.1	Side Effects of Automatic Login	2-11

2.5.2	Color Display Setup	2-12
2.5.2.1	Standard Color Setup on Monochrome Systems	2-13
2.5.2.2	Standard Color Setup on Intensity Systems	2-14
2.5.2.3	Standard Color Setup on Color Systems	2-16
2.5.3	Keyboard Setup	2-17
2.5.4	Pointer Setup	2-19
2.5.5	Preferred Color Setup	2-20
2.5.5.1	Preferred Color Setup on Monochrome Systems	2-21
2.5.5.2	Preferred Color Setup on Intensity Systems	2-21
2.5.5.3	Preferred Color Setup on Color Systems	2-22
2.5.6	Printer Setup	2-22
2.5.7	Screen Saver Period	2-24
2.5.8	Tektronix 4010/4014 Terminal Attributes	2-24
2.5.9	VT220 Terminal Attributes	2-25
2.5.10	Workstation Type	2-28
2.5.11	Use Default Settings	2-28
2.5.12	Restore Last Saved Settings	2-29
2.5.13	Save the Current Settings	2-29
2.5.14	Exit this Menu	2-29
2.6	Modifying the Workstation Options Menu	2-29

Chapter 3 Using Windows

3.1	Logging in to a Terminal-Emulator Window	3-1
3.2	Window Options Menu	3-4
3.2.1	Push Behind	3-5
3.2.2	Pop in Front	3-5
3.2.3	Delete	3-5
3.2.4	Change the Size	3-6
3.2.5	Shrink to an Icon	3-6
3.2.6	Additional Options	3-7
3.2.7	Exit this Menu	3-7
3.3	Cycling the Keyboard	3-8
3.4	Moving a Window	3-8
3.5	Changing Window Size with DCL	3-10

Appendix A VAXstation Support for Tektronix 4010/4014 Terminals

A.1	Implementation	A-1
A.2	Implementation Restrictions	A-2
A.3	Screen Addressing	A-2
A.4	Setup Support	A-3
A.5	ASCII Character Codes	A-3
A.6	Tektronix 4010/4014 Escape Sequences	A-11
A.6.1	Ignored Tektronix 4010/4014 Escape Sequences	A-11
A.6.2	Request Terminal Status	A-11
A.6.3	Select Bypass Condition	A-12
A.6.4	Set Alpha Mode	A-12
A.6.5	Set GIN Mode	A-12
A.6.6	Select Point Plot Mode	A-12
A.6.7	Select Character Size	A-12
A.6.8	Select Vector Patterns	A-13
A.6.9	Set LCE Flag	A-13
A.6.10	Delete Character	A-14
A.6.11	Miscellaneous Escape Sequences	A-14
A.7	Changing Operational Modes	A-14
A.8	Clearing the Screen	A-15
A.9	Bypass Condition	A-16
A.10	Alpha Mode	A-17
A.10.1	Margin Processing	A-17
A.10.2	Character Size	A-18
A.11	Graph Mode	A-18
A.11.1	Line Patterns	A-19
A.11.2	Drawing Command	A-19
A.11.3	Encoding of Coordinates	A-20
A.12	Point Plot Mode	A-20
A.13	Graphics Input Mode	A-21

Appendix B Additional Features of the VT220 Terminal Emulator

B.1	Optional Ways to Modify VT220 Terminal Emulator Features	B-1
B.1.1	Redefining VT220-Emulator Logical Names	B-1
B.1.2	Defining VT220-Emulator Escape Sequences	B-4
B.1.2.1	Operating System Command (OSC) Sequences	B-5
B.1.2.2	Control Sequence Introducer (CSI) Strings	B-11
B.1.2.3	Device Control Sequences (DCS)	B-13
B.1.2.4	How to Create and Invoke Escape Sequences	B-15
B.2	VWS Terminal Mailbox Messages	B-16

Appendix C Compose Sequences

C.1	Composing Characters	C-1
C.1.1	Using a Three-Stroke Compose Sequence	C-2
C.1.2	Using a Two-Stroke Sequence	C-3
C.1.3	Aborting or Restarting a Compose Sequence	C-3

Appendix D National Keyboards for VT220 Emulation

Index

Figures

1-1	Terminal-Emulator Window	1-2
1-2	The Getting Started Window	1-3
1-3	SELECT Button on Mouse	1-6
1-4	Tablet Subsystem	1-7
1-5	Puck, Showing Buttons	1-9
1-6	Stylus, Showing Buttons	1-9
2-1	Workstation Options Menu	2-1
2-2	Workstation Options Menu with Help Option Selected	2-2
2-3	VT220 Terminal Emulation Window	2-4
2-4	Printing a Portion of the Screen	2-8
2-5	The Workstation Setup Menu	2-10
2-6	Display-Background Setup for Monochrome System	2-14

2-7	Window-Background Setup for Intensity System	2-15
2-8	Pointer-Foreground Setup for Color System	2-16
3-1	VT220 Emulator Window with User Name Prompt	3-2
3-2	Menu Icon on Window Banner	3-3
3-3	KB Icon when Keyboard Is Attached	3-4
3-4	KB Icon when Keyboard Is Not Attached	3-4
3-5	Window Options Menu	3-5
3-6	Terminal-Emulator Window Reduced to an Icon	3-7
3-7	Moving a Window	3-9
A-1	Tektronix 4010/4014 Terminal Emulation Transition Diagram	A-15
B-1	Standard Mailbox Message Format	B-16
B-2	Format for Resize Message	B-17
B-3	Format for MOVE message	B-18
D-1	North American	D-2
D-2	British	D-2
D-3	Flemish-Belgian	D-3
D-4	Canadian-French	D-3
D-5	Danish	D-4
D-6	Finnish	D-4
D-7	French	D-5
D-8	German	D-5
D-9	Dutch	D-6
D-10	Italian	D-6
D-11	Norwegian	D-7
D-12	Spanish	D-7
D-13	Swedish	D-8
D-14	Swiss-French	D-8
D-15	Swiss-German	D-9

Tables

2-1	LK201 Command Line-Editing Function Keys for Emulated VT220 Terminals	2-5
2-2	Tektronix 4010/4014 Emulated Terminal Features	2-6
A-1	7-Bit ASCII Codes	A-4
A-2	ASCII Character Code Function Summary	A-5

A-3	Coordinate Encoding Byte Values	A-20
A-4	Shortened Address Capability Transmission Rules	A-20
B-1	VT220 Logical Names	B-2
B-2	VT220 Default Font Specifications	B-4
C-1	Valid Compose Sequences: Multinational Mode	C-4
C-2	Valid Compose Sequences: National Mode	C-7

Preface

This guide describes how to use the MicroVMS Workstation software. It is organized into three chapters and four appendices as follows:


- Chapter 1 provides an overview of the workstation functions and introduces some of the terminology used in the guide.
- Chapter 2 describes the functions of the Workstation Options menu.
- Chapter 3 explains window-management tasks such as creating, moving, and resizing windows.
- Appendix A describes VAXstation support for Tektronix 4010/4014 terminal emulation.
- Appendix B provides additional setup information for VT220 terminal emulation.
- Appendix C provides information on compose-character sequences, including tables for both the multinational and the national character sets.
- Appendix D illustrates the keyboard character configurations for the various languages supported by the VAXstation.

The information in this guide assumes that both the MicroVMS base system and the workstation software have been installed. See the *MicroVMS User's Manual* for instructions on installing the base system. See the *VWS Installation Guide* for instructions on installing the workstation software.

For information on the general use of MicroVMS, see Chapter 3 of the *MicroVMS User's Manual*.

Conventions Used in This Document

This manual uses the following conventions in displaying the syntax requirements of user input to the system and in displaying examples:

Conventions	Meaning
RETURN key	The RETURN key is not always shown in formats and examples. Assume that you must press RETURN after typing a command or other input to the system unless instructed otherwise.
CTRL/x	CTRL followed by a slash followed by a letter means that you must type the letter while holding down the CTRL key. For example, CTRL/B means hold down the CTRL key and type the letter B.
Lists	When a format item is followed by a comma and an ellipsis (,...), you can enter a single item or a number of those items separated by commas. When a format item is followed by a plus sign and an ellipsis (+...), you can enter a single item or a number of those items connected by plus signs. If you enter a list (more than one item), you must enclose the list in parentheses. A single item need not be enclosed in parentheses.
Optional Items	An item enclosed in square brackets ([]) is optional.
Angle Brackets	In examples, angle brackets enclose a syntactic element of user input, such as a key (<2>), a key sequence (<CTRL/Z>), or a parameter (<password>).
Ellipsis . . .	A vertical ellipsis indicates that some of the format or example is not included.
DELETE Key	The key on the VT200 series terminal keyboard that performs the DELETE function is labeled  .
Examples	Examples show both system output (prompts, messages, and displays) and user input. User input is printed in red.

Summary of New and Changed VAXstation Features

The following changes have been made for Version 3.0 of the MicroVMS Workstation software and are reflected in the *MicroVMS Workstation User's Guide*:

- Automatic login—If automatic login is enabled, you only need to log in to the system once. Any terminal-emulator windows you create subsequently will execute your login procedure automatically.
- Color display setup—For color and intensity systems, you can adjust the color shades using the color-setup options in the Workstation Setup menu.

- Mouse fallback mechanism—The pointer on the screen can be moved by using the CTRL and SHIFT keys in conjunction with the arrow keys. When used together with E4, E5, or E6, CTRL/SHIFT performs the same functions as the three mouse buttons.
- The Window Options menu includes a new option, “Shrink to an icon,” which provides a user interface for shrinking windows to icons.
- The banner on the terminal emulator window is always black, regardless of window background color. (In previous versions, the banner was always the reverse of the window background color.) On color and intensity workstations, the default is also black, but can be altered to any desired hue with the color-setup menu.
- The “Print (portion of) screen” option of the Workstation Options menu option includes a change in the mouse SELECT button function. Instead of two separate clicks of the SELECT button, a single *click and hold down* function is used to delineate a portion of the screen for printing.
- The VT100 terminal emulator has been replaced by a VT220 terminal emulator.
- The format and contents of the Workstation Setup menu have changed. Many new options have been added. The options “Window memory size” and “Text scrolling rate” have been removed.



Chapter 1

Getting Started

This chapter introduces the MicroVMS Workstation software (VWS). It assumes that you have installed and started up VWS as described in the *VWS Installation Guide*.

You should read this chapter before using your system, as it will help to familiarize you with the workstation environment.

The information in this guide refers to three types of workstations:

- Monochrome system—supports black and white output only.
- Intensity system—supports shades of grey.
- Color system—supports a full spectrum of color.

Unless otherwise noted, all information in this guide applies to all of these workstation types.

The following sections introduce some basic workstation concepts and terminology.

1.1 Windows

A workstation-software *window* is a rectangular area on the screen that is used for interaction between a user and the software. Windows are used to perform tasks such as the following:

- Emulate a terminal—you can create terminal-emulator windows in which to run your applications. The MicroVMS Workstation offers two kinds of terminal-emulator windows:

VT220 Emulates the features of a physical VT220 terminal and keyboard.

Tektronix 4010/4014 Emulates the features of a physical Tektronix 4010/4014 terminal and keyboard.

You use the terminal-emulator window as a means of logging in to the system; once you are logged in to the terminal emulator, you can use it to

1-2 Getting Started

run applications or to perform other tasks that would normally require a physical terminal.

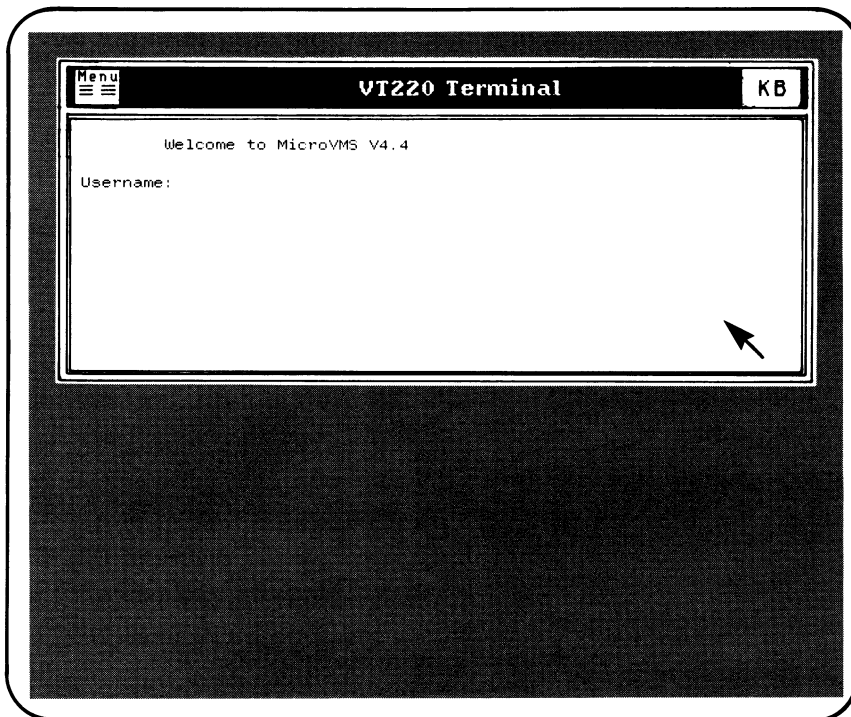
Figure 1-1 shows a terminal-emulator window.

- Provide a menu of task-oriented options—the workstation software uses menu windows that offer predefined options, such as setting up the workstation.
- Display information such as status messages—the workstation software uses windows to display status messages.

Users can employ status-message windows in their applications.

- Provide an area in which an application can perform drawing operations.

Figure 1-1 Terminal-Emulator Window



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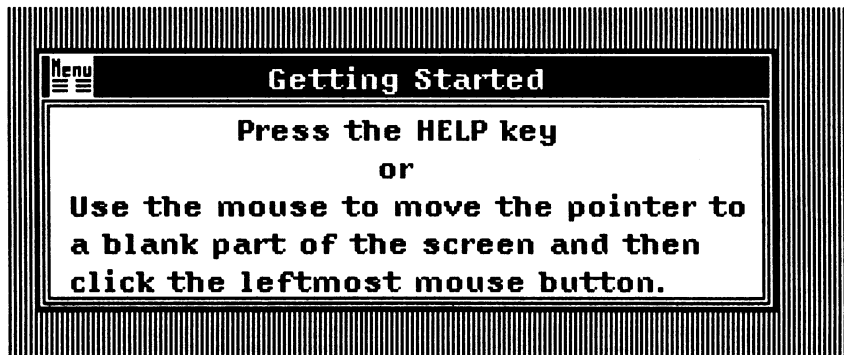
You can have several windows on the screen at one time, each performing a different task. In addition, you can manage these windows in many ways, such as by moving,

resizing, or reducing them to pictorial symbols called *icons*. Chapter 3 of this guide provides detailed information on how to manage windows.

1.2 The Getting Started Window

When there are no other windows on the monitor screen, the VAXstation provides a “Getting Started” window, which appears on the screen when you press any character, arrow, or keypad key.

Figure 1-2 The Getting Started Window



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If you press the HELP key (while no windows are on the screen), a window appears on the screen and provides information about using the VAXstation features.

If you use the mouse as described in the Getting Started window, a window containing the Workstation Options menu appears on the screen.

1.3 Menus

A workstation menu is a user-interface window with selectable options. You will use menus to perform a wide variety of tasks on your workstation. Following are some of the menus you will need to use:

- Workstation Options—the *main menu*, from which other workstation functions are invoked.
- Window Options—provides ways to manage windows, such as popping one to the front of the display.

1-4 Getting Started

- Workstation Setup—provides options for defining workstation setup attributes, such as color display setup.

Although the various menus incorporated throughout the workstation serve different purposes, several of the VWS menus have the following option in common:

Exit this menu

Selecting this option erases (or *deletes*) the menu from the monitor screen.

Chapter 2 of this guide provides detailed information on each of these menus and how to invoke them.

1.4 The Pointer and Pointing Devices

The arrow-shaped cursor on the VAXstation screen is referred to as the *pointer*. You use the pointer to select options from menus and perform various window-management tasks. To move the pointer on the screen, you use a *pointing device*. The *mouse* is an example of a pointing device.

The following sections explain how to get started using the pointer and pointing devices.

1.4.1 Using Pointing Devices

You use a pointing device to move the pointer on the screen and to perform many of the workstation functions, such as selecting menu options and defining workstation characteristics. Your pointing device may be any of the following types:

- Mouse—the round three-button device that is packaged with your workstation.
- Puck—the square four-button device that is included with the optional tablet subsystem.
- Stylus—the pen-shaped device that is included with the optional tablet subsystem.

Each type of pointing device has one button designated as the SELECT button, which you press to invoke menus and to manage windows on the screen. Depending on the task, you use the SELECT button in either of the following ways:

- Click—Press and release (click) the SELECT button.

You click the SELECT button, for example, to invoke the Workstation Options menu.

- Hold Down—Press and hold down the SELECT button, move the pointing device, then release the button.

For example, you hold down the SELECT button while using the pointing device to move a window. (Section 3.4 provides details on moving windows.)

The following sections provide more information on the various pointing devices and the SELECT button.

1.4.2 Using the Mouse

If you are using a mouse as your pointing device, you control the pointer by moving the mouse over a flat surface. Without touching any of the buttons on the mouse, slowly move the mouse and watch the pointer move. You will find it easiest to position the pointer when you move the mouse with a steady motion.

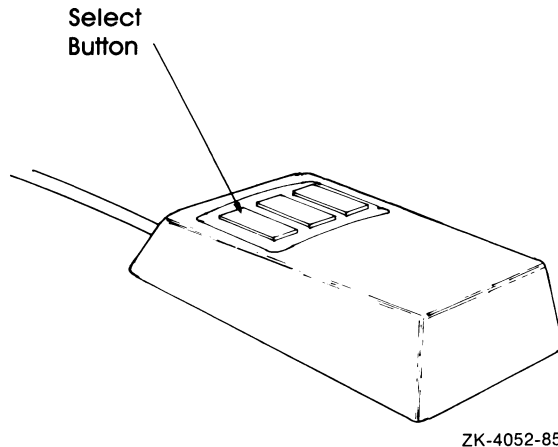
The mouse determines its pointer position by *relative* means. That is, when you use the mouse, the pointer movement on the monitor screen is determined by how far (and in what direction) the mouse is moved from one point to another. The travel of the ball underneath the mouse is the critical factor, as opposed to the location of the mouse itself on a coordinate plane.

If you run out of surface space, pick up the mouse, put it further back on the surface, and then continue moving the mouse in the same direction. With a little practice, you will soon have control over the pointer movement.

By default, the leftmost button on the mouse is the SELECT button and the remaining buttons are reserved for applications. (Applications may define functions and associate them with the buttons.) However, you can reverse the order with the Pointer setup menu, so that the rightmost button is the SELECT button (see Section 2.5.4).

Figure 1-3 shows the default SELECT button on the mouse.

Figure 1-3 SELECT Button on Mouse



1.4.2.1 Mouse Fallback Keys

You can perform most of the mouse functions by using the following key combinations:

- CTRL/SHIFT/↑ —moves the pointer upward on the screen.
- CTRL/SHIFT/↓ —moves the pointer downward on the screen.
- CTRL/SHIFT/← —moves the pointer to the left.
- CTRL/SHIFT/→ —moves the pointer to the right.
- CTRL/SHIFT/E4—performs the same functions as the mouse SELECT button.
- CTRL/SHIFT/E5—acts as center button on mouse (reserved for applications).
- CTRL/SHIFT/E6—acts as the right (3rd) button on mouse (reserved for applications).

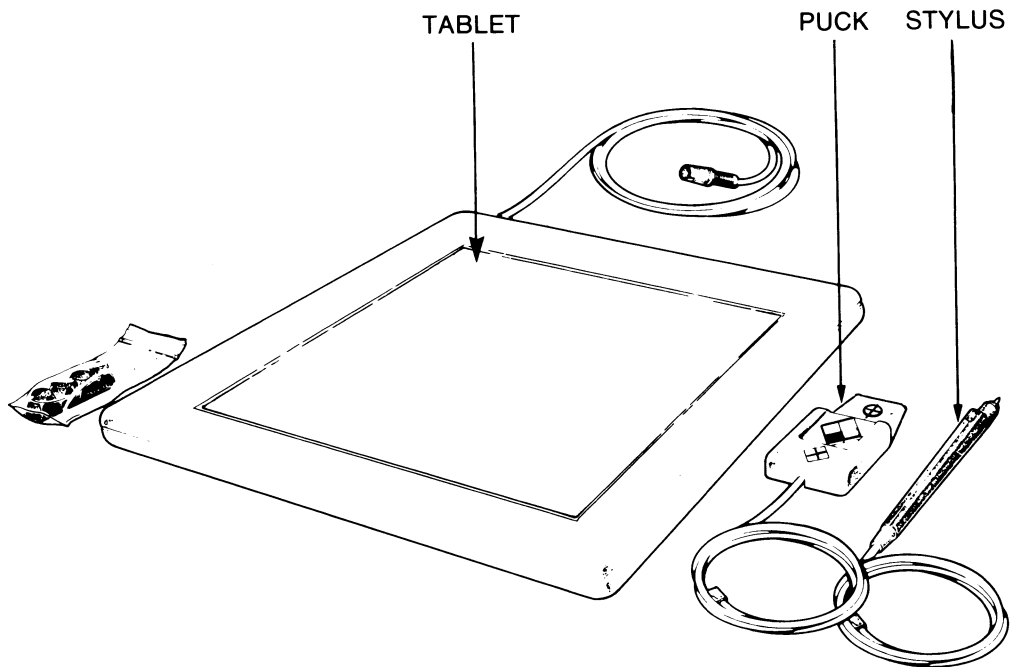
If for any reason the mouse should become inoperable, you can use these key combinations to invoke menus, select options, or perform application-defined functions.

1.4.3 The Tablet Subsystem

If your VAXstation is equipped with the tablet subsystem, you can use either the four-button puck (the mouselike device) or the two-button stylus (the penlike device) to move the pointer on the screen and to create windows. Unlike the mouse, which can be used on any flat surface, the puck or stylus can be used only in conjunction with the tablet.

Figure 1-4 illustrates the tablet subsystem.

Figure 1-4 Tablet Subsystem



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Also unlike the mouse, which determines its pointer position by *relative* means, the tablet subsystem uses *absolute* means. When you use the mouse with your VAXstation, the pointer movement on the monitor screen is determined by how far (and in what direction) the mouse is moved from one point to another. The travel of the ball underneath the mouse is the critical factor, as opposed to the location of the mouse itself on a coordinate plane.

1-8 Getting Started

The tablet, on the other hand, is a magnetic sensing device that plots coordinates and correlates them to a point on the VAXstation screen. The area contained within the grooves on the tablet surface represents the screen area of the VAXstation monitor. When you place the puck or stylus over this area of the tablet, the sensing device relays the coordinates of its location to the VAXstation, which then positions the pointer on the screen accordingly. Note that although the tablet area contained within the grooves measures 12 inches by 12 inches, the active area is 11 by 11 inches. The top and left borders of the active area each lie 1 inch inside the grooves.

You use the puck or stylus in much the same manner as you would use the mouse; however, both the puck and the stylus allow you to control the pointer more accurately. The puck includes a cross-hair indicator that you can use, for example, to trace an existing pattern or design. (Because the tablet system is a magnetic sensing device, you can place a piece of paper over the tablet surface.) The cross hair is the portion of the puck that pinpoints the coordinate position on the tablet.

The stylus allows for even greater control because of its size and shape. You can use it, for example, to draw on the VAXstation screen.

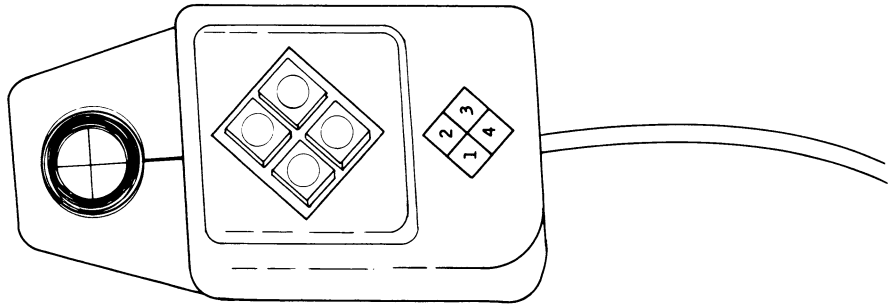
You can alternate between the stylus and the puck at any time during a session. Note that if you do, however, you should also power up the tablet subsystem in order for the tablet to determine the correct number of buttons on the pointing device. Otherwise, the buttons may not perform their normal functions. To power up the tablet, simply unplug it from the monitor cable and then plug it in again.

1.4.3.1 Using the Puck

You will notice that the puck has four buttons, as opposed to the mouse's three buttons. A diagram on the puck indicates the numbering, as shown in Figure 1-5.

By default, the button numbered 1 on the puck is the SELECT button (corresponding to the leftmost button on the mouse), and the remaining three buttons are reserved for use in applications. However, you can reverse the order with the Pointer setup menu, so that the button numbered 3 is the SELECT button (see Section 2.5.4). The button that was formerly number 1 becomes number 3. Buttons 2 and 4 remain unchanged.

Figure 1-5 Puck, Showing Buttons



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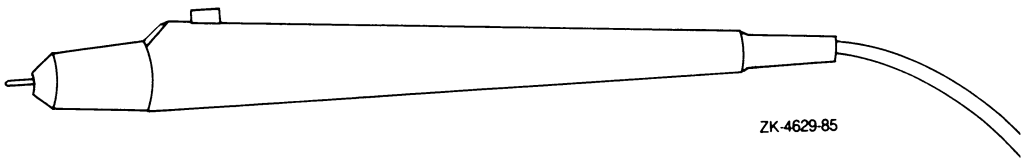
Note that any references to the “mouse SELECT button” in this guide also apply to the SELECT button on the puck.

1.4.3.2 Using the Stylus

The stylus has two buttons: one on the outside of the barrel and one at the tip of the barrel. You hold the stylus as you would hold a pen, and you can activate the tip button by pressing down.

By default, the button on the outside of the barrel is the SELECT button (corresponding to the leftmost button on the mouse), while the tip button is reserved for applications. However, you can reverse the order of the buttons with the Pointer setup menu (see Section 2.5.4).

Figure 1-6 Stylus, Showing Buttons



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Note that any references to the “mouse SELECT button” in this guide also apply to the SELECT button on the stylus.

1.5 VAXstation Function Keys

The F1, F2, F3, and F5 function keys on the upper left of the keyboard have the following functions:

- **F1—Hold Screen**

Pressing the F1 key keeps the entire screen display from changing and stops all process activity until the F1 key is pressed again. Note that the Hold Screen key may not suspend activity in the Workstation Options menu or in the HELP, PRINT, or SETUP functions that can be initiated from the menu.

- **F2—Operator Window**

Pressing this key displays at the top of the screen any messages sent to the operator window (OPA0). For example, if you try to print on a remote device that is not accessible, the software sends a message to OPA0.

To erase the operator display, press the F2 key again.

NOTE: You should also read Section 1.6 of this guide, which provides detailed information about using the operator window.

- **F3—Switch Windowing System**

On monochrome workstations, if you have a custom application that uses the QIO device driver interface as an alternative to the workstation software windowing system, pressing the F3 key switches between windowing systems. (For details, see the *MicroVMS Workstation Video Device Driver Manual*.)

- **F4—Reserved for future use.**

- **F5—Change Active Window**

Press this key to *cycle* through windows to which the keyboard can be attached, or *connected*. (Only windows that can be connected to the keyboard can become active.) Each time you press the key, another window pops to the foreground of the display to become the active window.

An inactive terminal-emulator window (that is, one that no longer has the keyboard connected) “remembers” its cursor position. When a window is disconnected from the keyboard, the cursor position is marked by a nonblinking cursor outline.

You can also use the F5 key to reset color-map entries for the screen background. If the use of the hardware color map by an application should cause some windows to become “invisible,” you can restore the color-map entries for the

screen background, the window foreground and background, and the pointer as follows:

- a. Press the F5 key.
- b. Move the pointer to the banner or border of a window and click the SELECT button.

1.6 The Operator Window

The operator window on the VAXstation, OPA0, serves as a viewport to both the console and the operator terminal device. When the MicroVMS system is halted, you can use the operator window to enter commands at the console prompt (>>>). When MicroVMS is running (but the workstation software is not), you can use the window to log in to OPA0. The operator window is dependent only on the MicroVMS base system and is different from the workstation software terminal emulator windows. It is not a full-function terminal.

The operator window appears in the top portion of the VAXstation screen, regardless of whether the workstation software is running. If you were to install MicroVMS without the workstation software, the entire screen would be dark and OPA0 would be your only means of logging in to the system.

1.6.1 Using the Operator Window

There are two instances in which you will see the operator window appear on your VAXstation screen:

- When you press the F2 function key.

Pressing this key displays at the top of the screen any messages sent to the operator device (OPA0). For example, if you try to print on a remote device that is not accessible, the software sends a message to OPA0.

To erase the operator display, press the F2 key again.

- When a message is sent to OPA0.

When a message is sent to OPA0 (for example, a device-offline error message), the operator window automatically appears; however, the keyboard does not automatically connect to it. The keyboard will connect to the operator window only if the display manager process has not yet been started.

Once you log in to OPA0, keyboard input will continue to be directed to it until you log out of that process.

1-12 Getting Started

You must always press the F2 key to erase the operator window display.

NOTE: It is possible to connect to the operator window even when it is not visible. If you need to halt the system and enter commands at the console prompt (`>>>`), you should be sure to press the F2 key *before* you press the Halt button. If you press the Halt button first, the F2 key is useless and the operator window may not appear. Since there is no screen activity, the system appears to be dead. However, any commands you issue still go to the console. To return the system to its normal screen activity, type C (for CONTINUE) and press RETURN.

1.6.2 Operator Window Functions on Color and Intensity Systems

The operation of the operator window is not the same on color and intensity systems as it is on the monochrome system. The following characteristics are peculiar to color and intensity systems:

- Writing or drawing to the screen does not continue while the operator window is present.
- When the system boots or crashes, the entire screen is used as the operator window. The windowing system will not come up until the startup procedure has completed.

Note that because the operator window covers the entire monitor screen, the system may appear to be hung at startup or shutdown time. If a message is written to the operator window, the window remains on the screen until you press the F2 operator-window function key. Therefore, you may need to press the F2 key to change the screen display after the installation is completed (the installation is complete when the "job terminated" message appears).

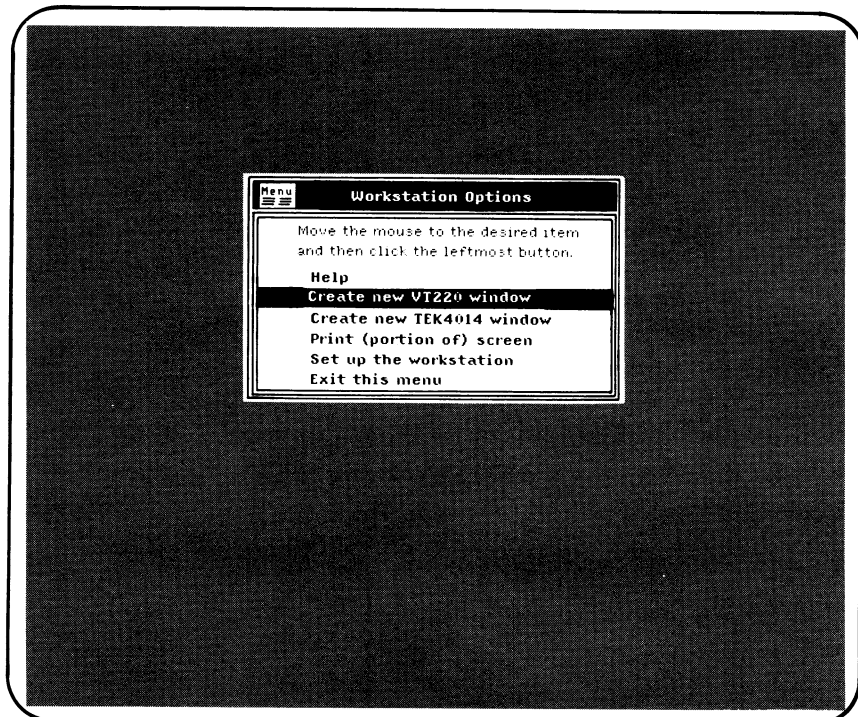
- The screen color changes when the operator window appears. To return the screen to its original colors, remove the operator window from the screen using the F2 operator-window) function key.
- The data in the operator window is lost when the operator window is removed from the screen.

Chapter 2

The Workstation Options Menu

The Workstation Options menu is the *main menu* on the workstation. You use the main menu to get started with the MicroVMS Workstation software. This menu provides options such as "Help" and "Create new VT220 window." (Figure 2-1 shows the Workstation Options menu.)

Figure 2-1 Workstation Options Menu



2-2 The Workstation Options Menu

This chapter describes the options that you can select from the Workstation Options menu.

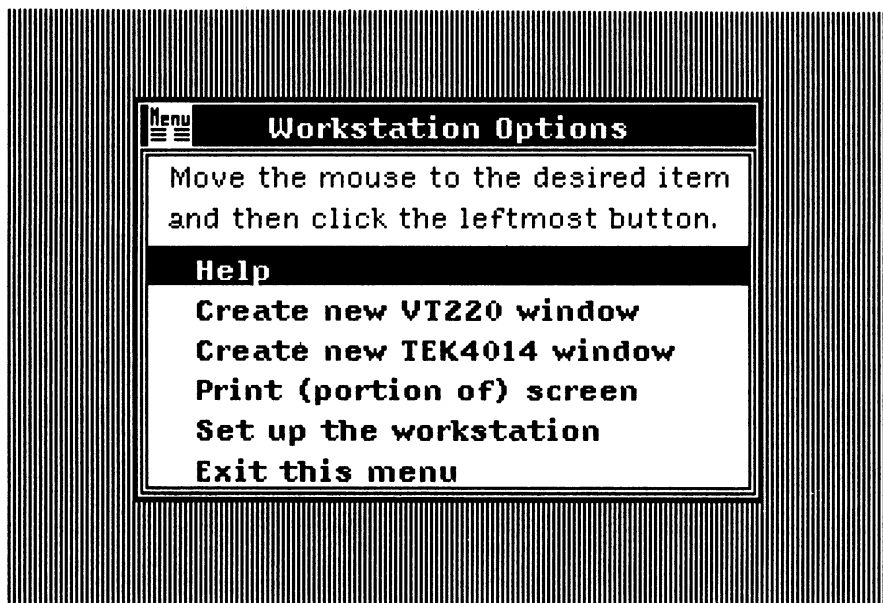
You can also modify the Workstation Options menu to suit your own needs. Section 2.6 describes the menu format and provides instructions for modification.

To invoke the Workstation Options menu, place the pointer in a blank area of the monitor screen (that is, not imposed over a menu or other window) and click the SELECT button on the mouse.

NOTE: If the Workstation Options menu does not appear, the display manager process (UIS\$DISPLAYMGR) is not running. The display manager process is necessary for the creation and management of all windows, including menus. In order to restart UIS\$DISPLAYMGR, you must reboot the system. For instructions on rebooting your system, see the installation guide for your base system.

To select an option, move the pointer until the contrasting bar is over the desired option. For example, Figure 2-2 shows the Workstation Options menu with the "Help" option selected.

Figure 2-2 Workstation Options Menu with Help Option Selected



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Then click the SELECT button to invoke the Help window.

2.1 Obtaining Help

When you select "Help" from the Workstation Options menu, a window containing a list of workstation topics appears. The keyboard is automatically connected to the window. To read about a topic, type its name and press RETURN. You can abbreviate to the first few characters that uniquely identify the topic.

To redisplay the list of topics while Help is running, type a question mark (?) and press RETURN.

To exit from HELP and delete the HELP window, type EXIT and press RETURN, or simply press CTRL/Z.

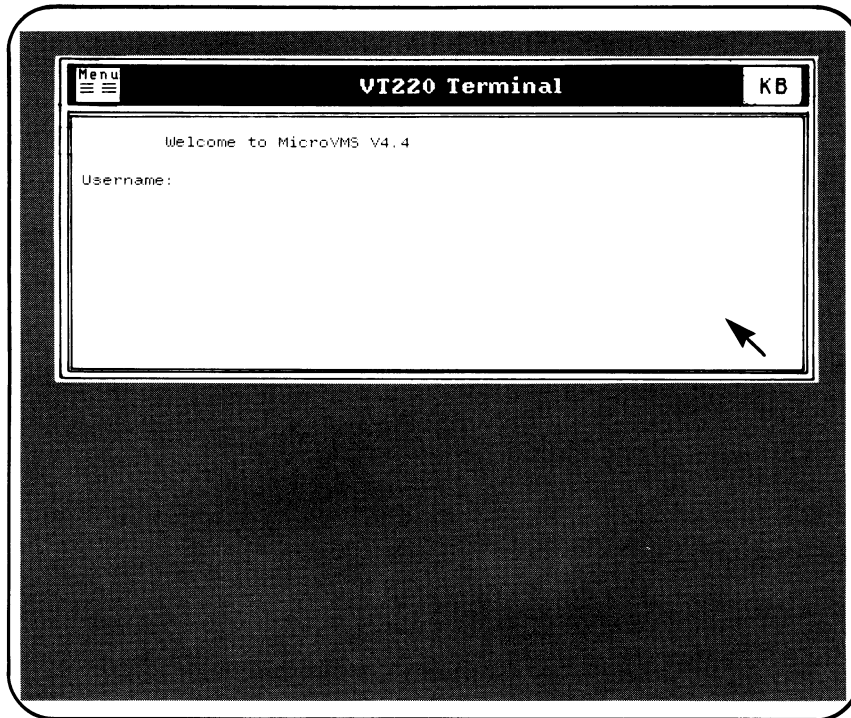
When you select any of the options listed in the Workstation Options menu, the menu automatically disappears from the workstation screen. If you decide not to select an option from the menu and you simply want to remove the menu from the screen, use the option "Exit this menu."

2.2 VT220 Terminal Emulation

To use VT220 emulation, select "Create new VT220 window" from the Workstation Options menu. Figure 2-3 shows a new VT220 terminal-emulator window.

2-4 The Workstation Options Menu

Figure 2-3 VT220 Terminal Emulation Window



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In VT220 terminal emulation, your keyboard interacts with the system as it does with a VT220 terminal. This guide describes only the differences between the physical VT220 terminal and the terminal emulator. Following are the major differences:

- You cannot use the F2 through F5 function keys with the VT220 emulator. However, you can use some of the function keys at the top of the LK201 keyboard for certain line-editing functions if line editing is enabled for DCL (DIGITAL Command Language). See Table 2-1 for details on the line-editing functions.

Table 2-1 LK201 Command Line-Editing Function Keys for Emulated VT220 Terminals

Key	Function
F6	Cancel
F10	Exit
F12	Beginning of Line
F13	Delete (previous) Word
F14	Insert/Overstrike

The function keys F7, F8, F9, and F11 are reserved for future use.

- The emulator does not support dynamically redefinable character sets (DRCS). However, the emulator does have the DIGITAL standard technical character set (TCS) and will use a parameter to report its presence.
- The BREAK and DATA/TALK functions are not relevant to the emulator and therefore are not included.
- The SETUP and PRINT functions are implemented by MicroVMS Workstation software menu routines.
- In certain modes of operation, some keys (or combinations of keys) are not supposed to click; these keys may click with the emulator.
- The emulator does not support the following escape sequences:
 - Keyboard access mode
 - Screen mode
- When the SHIFT key is pressed in SHIFT-LOCK mode using the emulator, the shift state is not unlocked.

Once you have created a VT220 emulation window, you have 30 seconds to log in before the window disappears. See Section 3.1 for information on logging in to the system.

For more information on the VT220, consult the *VT220 Owner's Manual*.

See Appendix B of this guide for information about using VT220 terminal-emulator logical names and escape sequences.

2.3 Tektronix 4010/4014 Terminal Emulation

To use Tektronix 4010/4014 terminal emulation, select "Create new TEK4014 window" from the Workstation Options menu. (See Section 3.1 for information on logging in to the system.)

Tektronix 4010/4014 terminal emulation simulates the Tektronix 4010/4014 terminal with the enhanced graphics module. Table 2-2 indicates the features supported by the VAXstation.

Table 2-2 Tektronix 4010/4014 Emulated Terminal Features

Emulated	Not Emulated
Alpha mode text sizes	Alternate character set
Bypass mode	Incremental plotting
Defocused mode	Special point plotting
Graphics input	Write-through
Margin processing	Enhanced graphics resolution
Point plotting	

All alphanumeric keys and function keys on the Tektronix 4010/4014 keyboard have corresponding keys on the VAXstation LK201 keyboard. However, other Tektronix 4010/4014 user controls do not have corresponding keys on the LK201 keyboard.

To erase the contents of the Tektronix 4010/4014 window display, press any of the following:

- The E6/NEXT SCREEN keypad key on the LK201 keyboard.
- The center button on the mouse.
- The number 2 button on the puck.

For more information on using the puck and stylus, see the description of the tablet subsystem in Section 1.4.3.

In graphics input (GIN) mode, the pointer controls the cross hair. To terminate GIN mode, press the RETURN key or the mouse SELECT button.

Appendix A contains additional information about Tektronix 4010/4014 terminal emulation. For further information, consult Tektronix 4010/4014 documentation.

2.4 Printing a Portion of the Screen Display

If you have a printer accessible to your workstation, you can print any rectangular portion of the screen display by using the following procedure.

1. Make sure that your printer is turned on and that the paper is properly loaded.
2. Select "Print (portion of) screen" from the Workstation Options menu, using the pointer. The pointer changes shape to resemble an arrowhead, pointing toward the upper left-hand corner of the screen.
3. Move the pointer to the upper left-hand corner of the rectangular area you want to print.
4. Press *and hold down* the SELECT button. The arrowhead now points toward the lower right-hand corner of the screen.

As you move the pointer, a "stretchy box" follows.

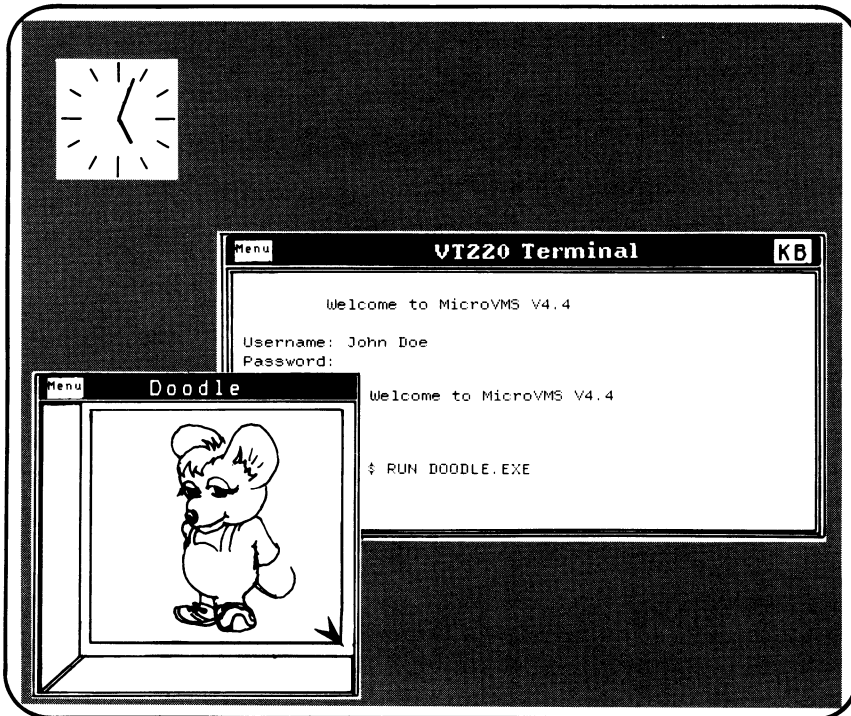
5. Move the pointer until the stretchy box surrounds the area that you want to print.
6. When the box surrounds the area that you want printed, release the SELECT button.

The printer will begin printing and the pointer will change shape once again, so that it resembles an hourglass. The pointer retains its hourglass shape until printing has completed, then returns to its original (arrow) shape.

If you want to cancel the operation (before actually printing), position the pointer at the starting point and release the SELECT button.

In Figure 2-4, the user has drawn a cartoon figure within an application and selected the portion of the screen that contains the figure for printing.

Figure 2-4 Printing a Portion of the Screen



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2.4.1 Changing the Print Destination

As an alternative to CSA0, you can send portions of the screen to a file or to a print queue. The object can be a remote file or device (making it possible to use a shared hardcopy device on another node in the network), providing the device accepts *sixel-format* output. The term "sixel" refers to the format by which the output characters are interpreted. This format allows for the display of special graphics characters.

In addition to printing selected portions of the screen, you can perform conventional file printing operations (using print queues) from a terminal emulator window.

To redefine the screen output destination, select the "Enter new print destination" option from the Printer Setup menu as described in Section 2.5.6. The file specification must include a device name.

For example, you can specify any of the following as the destination for output.

- A file named SYS\$MANAGER:SCREEN.LIS (the translation of SYS\$MANAGER includes the device name for the system disk).
- The local device TTA3 (by specifying TTA3:).
- The remote device ALPHA::TTC5 (by specifying the node name and the device).

Note that the colon is required in a device specification.

- The print queue SYS\$PRINT (assuming the print queue is already created and set up).

If you specify a print queue, do not include the colon. (For information on setting up print queues, see the *MicroVMS User's Manual*.)

In all cases, the final output device (such as any workstation printer described in the owner's manual for your VAXstation) must be able to accept sixel-format output.

See Section 2.5.6 for a description of the printer setup features.

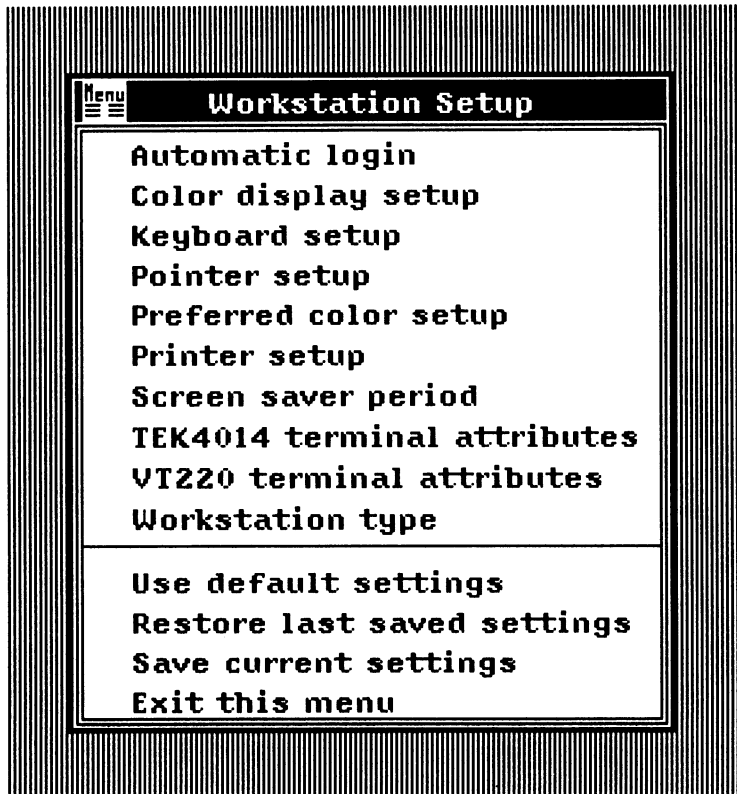
For more information on printing graphics from the VAXstation, see the *MicroVMS Workstation Guide to Printing Graphics*.

2.5 Workstation Setup Menu

Certain keyboard and terminal features on the VAXstation have default settings, or *attributes*. You can use the Workstation Setup menu to change one or more of these attributes.

To change setup attributes, select "Set up the workstation" from the Workstation Options menu. The Workstation Setup menu will appear, as shown in Figure 2-5.

Figure 2-5 The Workstation Setup Menu



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When you select an option from this menu, another menu window, or *submenu*, appears. There are two kinds of submenus. One shows a range of values with an arrow indicating the current one; the other shows choices with a check mark next to the current one.

If you just want to look at a current setting, press the SELECT button after noting the setting.

To change an attribute, move the pointer to the subwindow and select a new setting by pressing the SELECT button.

When you change setup attributes, the new attributes take effect at different times, depending on the option. For example, if you change the setup attribute for the Keyboard setup option "Keyclick volume," the new attribute will take effect upon creation of a new window. On the other hand, some attributes take effect immediately.

The setup options are described in the following sections.

2.5.1 Automatic Login

Selecting this option allows you to enable or disable automatic login. If automatic login is enabled (the default), you only need to log in to the system once; after that, you can create new VT220 or Tektronix 4010/4014 windows under the same account without reentering your user name and password.

If you want to log in to the system under a different account, you need to disable automatic login before you invoke a new terminal emulator window. (As an alternative, you can modify the functions of the Workstation Options menu; see Section 2.6.)

Note that because autologin bypasses some standard VAX/VMS login mechanisms, you may see some unusual side effects. The following sections provide further information.

2.5.1.1 Side Effects of Automatic Login

There are two potentially undesirable effects of enabling automatic login: delayed window creation and incorrect setting of terminal attributes. The following sections explain how you can minimize these side effects.

Excessive Waiting for Windows

To minimize the time you spend waiting for windows to be created, you should modify the system command file SYS\$MANAGER:SYLOGIN.COM to include a line at the beginning of the file that will write a short message to SYS\$OUTPUT. For example:

```
$ WRITE SYS$OUTPUT "Good morning"
```

A terminal-emulator window is not actually created until output to it occurs. Therefore, writing a short message at the beginning of the system login procedure will make window creation seem faster.

Incorrect Fonts Used in Windows

To avoid unpredictable terminal attributes caused by including the DCL command SET TERMINAL in your login command file, modify your login command file to include a line at the beginning of the file that will write a short message to SYS\$OUTPUT *before* invoking the SET TERMINAL command.

2.5.2 Color Display Setup

This option refers to the workstation *standard* colors, which are a set of colors used for the background and foreground colors of the window display.

Selecting this option invokes a menu that offers the following choices:

Pointer foreground

Refers to the filled portion of the pointer.

Pointer background

Refers to the outline portion of the pointer.

Display background

Refers to the background of the workstation monitor screen.

Window foreground

Refers to the output sent to a window.

Window background

Refers to the background color of the window.

Update color map

Initiates the new settings.

To make a selection, move the pointer to the option you want and click the SELECT button. Then select "Update color map" to ensure that the new settings take effect. If you neglect to update the color map, any changes will be lost.

The "Window foreground" and "Window background" options pertain to terminal-emulator windows and any other windows that can be connected to the keyboard.

NOTE: Do not set window background and foreground colors to be the same color. If you do, the text within the window will be invisible.

The enabled color-display options vary according to workstation type.

2.5.2.1 Standard Color Setup on Monochrome Systems

For monochrome systems, only the following choices are enabled:

- Display background
- Window foreground
- Window background

An additional choice is "Update color map," which you must always select after changing any color settings in order for the new settings to take effect. If you do not select "Update color map," any changes will be lost.

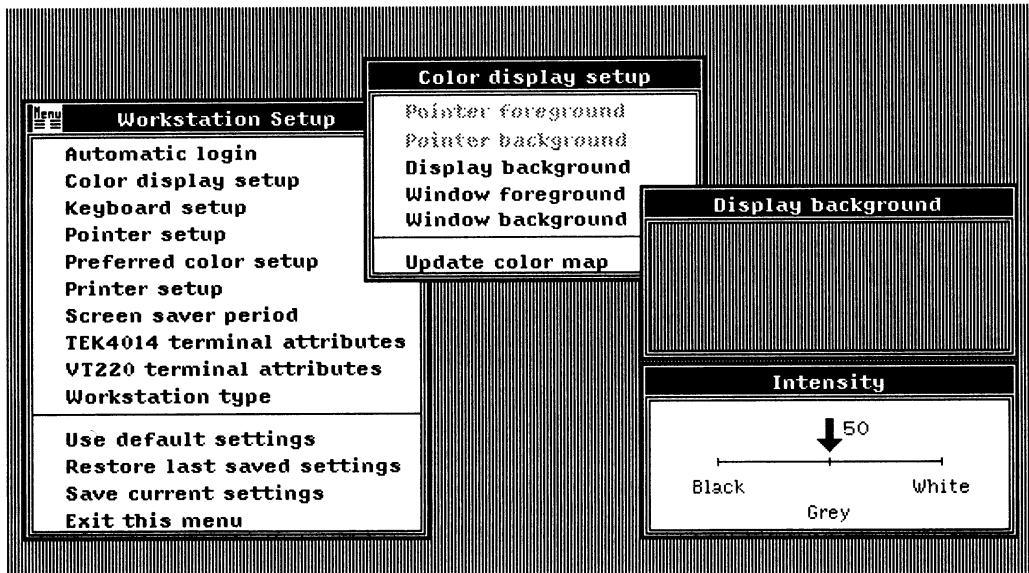
Selecting any of these options except "Update color map" will cause two boxes to appear, one underneath the other. The box on top is labeled according to the selection (for example, "Display background") and displays the currently selected color. The second box is labeled "Intensity" and displays a bar that shows the possible settings.

For the display background, the intensity settings include Black (at the far left), Grey (in the center), and White (at the far right). (Figure 2-6 shows the monochrome Display-background setup menu.)

For the window foreground and the window background, the intensity settings include Black (at the far left) and White (at the far right).

Move the pointer and click the SELECT button to select the desired setting. If you change the window foreground or background color, the new color setting takes effect upon creation of the next window.

Figure 2-6 Display-Background Setup for Monochrome System



ZK 5482 86

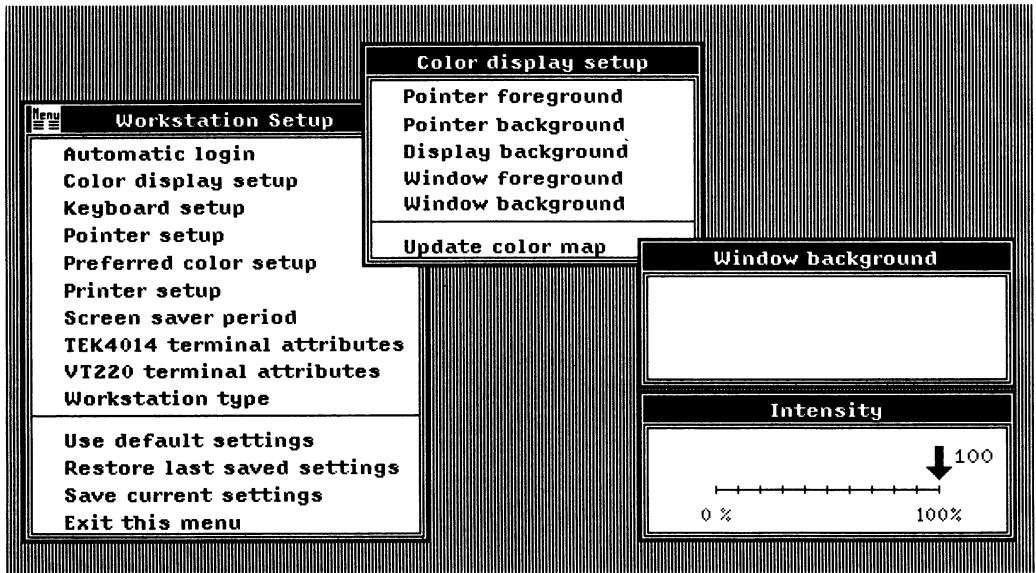
If you change the display background color and select "Update color map," the new setting takes effect after all windows have been deleted or after the system has been rebooted.

2.5.2.2 Standard Color Setup on Intensity Systems

For the intensity systems, all color-display options are enabled; however, the color tones are simulated in shades of grey. The shades vary according to the intensity selected.

Selecting any option except "Update color map" will cause two boxes to appear, one underneath the other. The box on top is labeled according to the selection (for example, "Pointer foreground") and displays the currently selected shade. The second box is labeled "Intensity" and displays a bar with a full range of settings from 0% (at the far left) to 100% (at the far right). (Figure 2-7 shows the intensity Window-background setup menu.)

Figure 2-7 Window-Background Setup for Intensity System



ZK 5481 86

Move the pointer and click the SELECT button to select the desired setting. To find a precise setting, you may find it easier to simply *click and hold down* the SELECT button while you move the pointer along the intensity bar. The arrow-shaped indicator over the bar will move with your pointer, and the intensity level (displayed as *n%* next to the indicator) will change simultaneously. In addition, the color shade in the top box, which is filled in the currently selected shade, will change as you move the pointer. When you find the desired setting, release the SELECT button.

If you change any of the intensity settings, the new setting takes effect as soon as you select "Update color map."

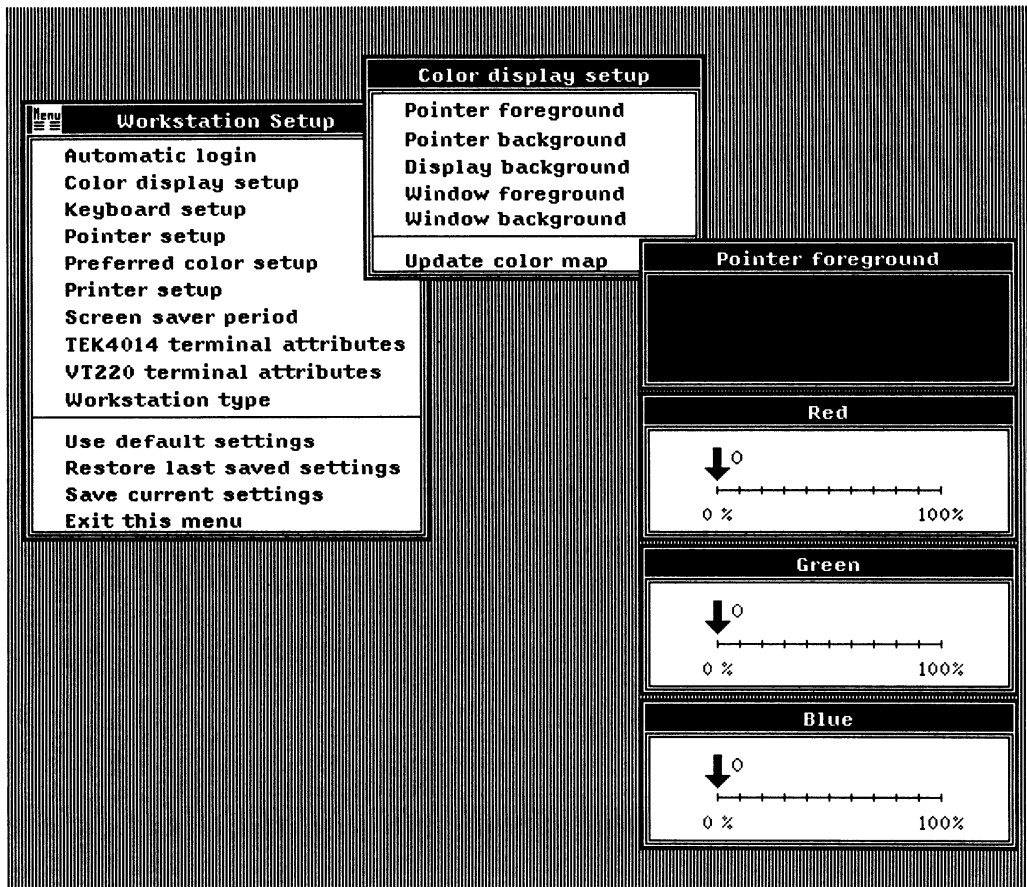
2-16 The Workstation Options Menu

2.5.2.3 Standard Color Setup on Color Systems

For the color-system type, all color-display options are enabled and any option can be set to the desired hue.

Selecting any option except "Update color map" causes four boxes to appear, stacked in a column. The box on top is labeled according to the selected option (for example, "Pointer foreground") and displays the currently selected color setting for that option. The remaining three boxes are labeled "Red," "Green," and "Blue"—each of which displays a range of intensity from 0% to 100%. By increasing or decreasing the values of these ranges, you can select the desired hue for each color option. (Figure 2-8 shows the color Pointer-foreground setup menu.)

Figure 2-8 Pointer-Foreground Setup for Color System



As you move the pointer, the color in the top box (which is filled in the currently selected hue) will change as you move the pointer.

If you change any of the color settings, the new setting takes effect as soon as you select "Update color map."

2.5.3 Keyboard Setup

This option invokes the Keyboard setup menu, which includes the following choices:

Autorepeat

Selecting this option displays a menu from which you can either enable or disable autorepeat. If enabled, a key that is held down repeats (for example, jjjjj). If disabled, the key does not repeat.

If you change the keyboard autorepeat attribute, the new attribute takes effect upon creation of a new window. The current selection is indicated with a check mark.

Bell volume

Selecting this option displays a range of volumes from softest (off) to loudest. The "bell" is the beep sound made by the keyboard (for example, when some errors occur or messages arrive).

If you change the bell volume setup attribute, the new attribute takes effect immediately. The current selection is indicated by an arrow.

Keyboard function

Selecting this option invokes a menu that offers the following keyboard-character choices:

- Typewriter keys
- Data processing keys

If your keyboard is North American, you should select "Typewriter keys," which is the default.

For all other keyboards, select either "Typewriter keys" or "Data processing keys." "Typewriter keys" selects the characters on the left half of the keycaps; "Data processing keys" selects the characters on the right half of the keycaps.

For example, the French Canadian keyboard includes a key that has a C cedilla (Ç) on the left side and brackets ([]) on the right. Selecting "Typewriter keys" on the French Canadian keyboard causes this key to respond as uppercase and lowercase C cedilla. Selecting "Data processing keys" causes this key to respond as "[" and "]".

2-18 The Workstation Options Menu

The current selection is indicated with a check mark.

Keyclick volume

Selecting this option displays a range of volumes from softest (off) to loudest. A keyclick is the sound made when a keyboard key is pressed.

If you change the keyclick volume attribute, the new setting takes effect upon creation of a new window. The current selection is indicated by an arrow.

Lock state

Selecting this option invokes a menu that offers the following LOCK key choices:

- Caps lock
- Shift lock

If you select "Caps lock," the LOCK key will cause all alphabetic characters on the keyboard to be upshifted; all other keys are unaltered.

If you select "Shift lock," the LOCK key will cause all keys to be upshifted. The current selection is indicated with a check mark.

The default is "Caps lock."

Language

Selecting this option produces a listing of the languages that can be associated with the keyboard.

From this listing, you can select the keyboard configuration you wish to use. If you change the keyboard language, your keyboard will use the character set associated with that language. For example, if you select FRENCH, your keyboard will emulate a French keyboard. (Appendix D of this guide illustrates the various keyboards.)

The current selection is indicated with a check mark. Following are the options:

- BRITISH
- CANADIAN_FRENCH
- DANISH
- DUTCH
- FINNISH
- FLEMISH_BELGIAN
- FRENCH
- GERMAN

- ITALIAN
- NORTH_AMERICAN
- NORWEGIAN
- PORTUGUESE
- SPANISH
- SWEDISH
- SWISS_FRENCH
- SWISS_GERMAN

The current selection is indicated with a check mark.

If you change the language selection, the new setting will take effect the next time you create a window.

2.5.4 Pointer Setup

This option invokes the Pointer setup menu, which displays the following pointing-device options:

Button order

Selecting this option invokes the Button order menu, which displays the following mouse- and puck-button options:

Right-handed
Left-handed

The buttons on the mouse and puck are set to “Right-handed” by default, as described in Sections 1.4.2 and 1.4.3.1 respectively. On the mouse, the leftmost button is the SELECT button, and the middle and rightmost buttons are reserved for applications. On the puck, the button numbered 1 is the SELECT button, and the remaining three buttons are reserved for applications.

You can reverse the order of the buttons by selecting “Left-handed” from the Button order menu. The rightmost button on the mouse becomes the SELECT button, and the middle and leftmost buttons are reserved for applications.

If you are using a puck, the button numbered 3 becomes the SELECT button, and the button that was formerly numbered 1 becomes number 3. The buttons numbered 2 and 4 remain unchanged.

2-20 The Workstation Options Menu

Stylus SELECT button

Selecting this option invokes the Stylus SELECT button menu, which displays the following stylus-button options:

- Barrel button
- Tip of stylus

By default, the button on the outside of the barrel is the SELECT button, corresponding to the leftmost button on the mouse, while the tip button is reserved for applications.

If you select the "Tip of stylus" option, the tip button becomes the SELECT button.

2.5.5 Preferred Color Setup

The term *preferred colors* refers to the set of colors representing the user's preference for the eight combinations of the RGB (red, green, and blue) primary colors. These colors are specified for use in applications and their settings have no bearing on the *standard* workstation colors described in Section 2.5.2.

If you are working with a color application, for example, you may wish to define a specific shade of red, rather than a full-intensity red. On an intensity system, you may use the preferred-color setup to define a white base level from which shades of grey are derived.

On a monochrome system, preferred colors are translated to either black or white, whichever is closer to the specified color intensity.

For more information on standard colors and preferred colors, see the *MicroVMS Workstation Graphics Programming Guide*.

Selecting the "Preferred color setup" option invokes a menu that allows you to change these settings. Following are the preferred-color choices:

- Black
- White
- Red
- Green
- Blue
- Cyan
- Yellow
- Magenta

An additional menu item is "Update color map," which you must always select after changing any color settings in order for the new settings to take effect. If you do not select "Update color map," any changes will be lost.

To make a selection, move the pointer to the option you want and click the SELECT button.

If you change any of the color settings, the new setting takes effect as soon as you select "Update color map." The color functions vary according to workstation type (as described in the following sections).

2.5.5.1 Preferred Color Setup on Monochrome Systems

If you define preferred colors on a monochrome system, those colors can only be interpreted as black or white.

Selecting any preferred-color option except "Update color map" will cause two boxes to appear, one underneath the other. The box on top is labeled according to the selection (for example, "Red") and displays the currently selected color setting. The second box is labeled "Intensity" and displays a bar that shows the possible settings, which are Black (at the far left) and White (at the far right). Move the pointer and click the SELECT button to select the desired setting. An arrow indicates the current setting.

See Figure 2-6 for an illustration of the monochrome setup menu.

2.5.5.2 Preferred Color Setup on Intensity Systems

For the intensity system type, the preferred-color tones are simulated in shades of grey. The shades vary according to the intensity selected.

Selecting any option except "Update color map" will cause two boxes to appear, one underneath the other. The box on top is labeled according to the selection (for example, "Red") and displays the currently selected shade. The second box is labeled "Intensity" and displays a bar with a full range of settings from 0% (at the far left) to 100% (at the far right). See Figure 2-7 for an example of the Intensity box.

Move the pointer and click the SELECT button to select the desired setting. To find a precise setting, you may find it easier to simply *click and hold down* the SELECT button while you move the pointer along the intensity bar. The arrow-shaped indicator over the bar will move with your pointer, and the intensity level (displayed as *n%* next to the indicator) will change simultaneously. In addition, the color shade in the top box, which is filled in the currently selected shade, will change as you move the pointer. When you find the desired setting, release the SELECT button.

2.5.5.3 Preferred Color Setup on Color Systems

For the color system type, any preferred-color option can be set to the desired hue.

Selecting any option except "Update color map" causes four boxes to appear, stacked in a column. The box on top is labeled according to the selected option (for example, "red") and displays the currently selected color setting for that option. The remaining three boxes are labeled "Red," "Green," and "Blue"—each of which displays a range of intensity from 0% to 100%. See Figure 2-8 for an example of the color boxes. By increasing or decreasing the values of these ranges, you can select the desired hue for each color option. As you move the pointer, the color in the top box (which is filled in the currently selected hue) will change as you move the pointer.

2.5.6 Printer Setup

Selecting this option invokes the Printer setup menu, which displays the following printer options:

Aspect ratio

- 2 to 1
- 1 to 1

When you select a portion of the screen for printing as described in Section 2.4, the size of the printed output may not be the same as that of the selected screen image, depending on the type of device you use for printing.

The relationship between the original image size and the printed size is referred to as *aspect ratio*. If the aspect ratio is 2 to 1 (2::1), the printed output will be twice the size of the original image. If the aspect ratio is 1 to 1 (1::1), the printed output will be the same size as the original image.

The workstation default for the aspect ratio is 2::1. You can change this default by selecting "1 to 1" from the Aspect ratio menu. You may find this option useful if you want to send the selected output to a VT220 terminal-emulator window, as the normal-sized image will be sharper than the enlarged image.

Note that some devices support only 1::1 printing; the workstation default of 2::1 will have no effect on such devices. You can determine the aspect ratio for your printer by either comparing the output with the original or by consulting the owner's manual for your printer.

Color conversion method

Black and white
Grey shades

If you have an intensity or color system, this option allows you to control the contrast between colors when they must be converted to black and white. The default is "Black and white," which provides the sharper image. However, if you want the converted image to distinguish among a larger number of color tones, you should select "grey shades."

Print destination

Console device (CSA0:)
Enter new print destination

A check mark indicates whether or not the console device (CSA0:) is selected as the current print destination output device. By default, the console device is enabled.

If you select "Enter new print destination," a window appears containing the default print destination and an active cursor. You can enter a new destination or simply press RETURN to leave it unchanged.

If you change the print destination, the new attribute takes effect upon the next print request.

You can change the destination to point to any local or remote device that supports the sixel format (for example, LA50, LA100, or LN03 printer; or VT220 terminal).

There are three formats for entering a new device name:

1. The logical device name in the form [nodename::]devicename:
2. A file name in the form [nodename::]devicename:filename
3. The name of a print queue

See Section 2.4 for more information on printing from a VAXstation. See the *MicroVMS User's Manual* for more information on device-name and queue-name formats.

Print queue management

Execute requests immediately
Accumulate requests

Selecting this option displays the method by which the print queue handles print requests. By default, print requests are executed immediately. If you change this default, print requests will accumulate until you submit them for printing (see the *MicroVMS User's Manual* for more information).

2-24 The Workstation Options Menu

To use either of these queue-handling methods, you must have a print queue set up as described in the *MicroVMS User's Manual*.

If you change the print queue management, the change takes effect upon the next print request. Note, however, that "Print queue management" selections only take effect if the print destination is a queue.

Ribbon or toner saver

Positive image

Negative image

If a large portion (such as the background color) of the image is black, you can reduce wear and tear on your printer by selecting "Negative image," which causes the color of the output to be reversed.

The default is "Positive image."

2.5.7 Screen Saver Period

The screen saver period is the amount of time that your screen is not in use before the screen display will switch off. To prevent screen wear, the screen display switches off after 15 minutes of nonuse. Moving the mouse or pressing any key (for example, Shift) will renew the display.

Although the default is 15 minutes, you can modify the period of nonuse with the "Screen saver period" option. Selecting this option displays a range of periods from 0 to 60 minutes.

If you set the screen saver period to 0, the screen display will not go off unless the power to the monitor or the system unit is switched off.

If you change the screen saver period, the new value takes effect immediately.

2.5.8 Tektronix 4010/4014 Terminal Attributes

Selecting this option displays a menu of Tektronix 4010/4014 terminal emulation attributes (strap options). A check mark before an attribute means it is enabled. To enable or disable an attribute, move the pointer to the item you wish to change (the selected attribute will be highlighted in reverse video), and then click the SELECT button.

Following are the options:

Ignore DELETE character in graphics mode.

Send the RETURN character on GIN termination.

Send the RETURN and EOT characters on GIN termination.

See your Tektronix 4010/4014 documentation for more information about these attributes.

If you change a Tektronix 4010/4014 terminal attribute, the new attribute takes effect upon creation of a new window or execution of the DCL command SET TERMINAL within a particular Tektronix 4010/4014 window.

2.5.9 VT220 Terminal Attributes

Selecting this option displays a menu of VT220 terminal-emulation attributes. If you change a VT220 terminal attribute, the new attribute takes effect upon creation of a new window or execution of the DCL command SET TERMINAL within a particular VT220 window.

NOTE: Resizing an existing window has the same effect as creating a new window.

Following are the VT220 terminal-emulator attributes you can define using the Workstation Setup menu:

Character set

Selecting this option invokes a menu with the following choices:

- ASCII
- NRC

A check mark indicates the current selection.

If "NRC" (National Replacement Character set) is chosen, the ASCII codes are replaced by characters specific to the keyboard language chosen.

The default is "ASCII;" the standard North American characters are used.

Clear screen on resize

Selecting this option invokes a menu with the following choices:

- Enable
- Disable

If "Enable" is checked, the VT220 emulator window will be cleared (made blank) when resized. The default is "Disable;" the screen will retain its original contents after it is resized.

2-26 The Workstation Options Menu

Conforming sizes only

Selecting this option invokes a menu with the following choices:

- Enable
- Disable

If "Enable" is checked, the VT220 window width can be set only to 80 or 132 columns. The default is "Disable;" the window width can be set to any desired number of columns (up to 160).

Cursor type

Selecting this option invokes a menu with the following choices:

- Underline cursor
- Block cursor

The cursor marks the area on the VT220 window where the next typed character will appear, if appropriate. The cursor can be set to be either an underscore or a rectangle (block). The default is "Block cursor."

Margin bell

Selecting this option invokes a menu with the following choices:

- Enable
- Disable

The "bell" is the beep sound made by the keyboard. If the margin bell is enabled, the bell sounds when the cursor is positioned at 8 columns from the right margin. The default is "Disable;" the bell does not sound.

Numeric keypad mode

Selecting this option invokes a menu with the following choices:

- Numeric keypad
- Application keypad

The numeric keypad is the set of numbered keys at the right of the keyboard. When set to "Application keypad," the keypad keys send out escape sequences and can be defined for application-specific functions.

The default is "Numeric;" the keypad keys can be used to type numbers. Note that an application can override your setup menu setting.

Page length

Selecting this option produces a box containing a bar, which you can set to the number of lines to be displayed in a newly created VT220 terminal emulator window.

The default is 24 lines.

Page width

Selecting this option produces a box containing a bar, which you can set to the number of columns to be displayed in a newly created VT220 terminal emulator window.

The default is 80 columns.

SIXEL scrolling

Selecting this option invokes a menu with the following choices:

- Enable
- Disable

If you print or type a sixel-format graphics image or file within a VT220 terminal-emulator window, the graphics will stop printing at the bottom of the page. That is, the graphics will not *scroll*.

If you want to view the entire contents of a graphics image that is too large for the window, you can do so by selecting the SIXEL scrolling option "Enable." When the graphics image reaches the bottom of the page, it will scroll upward until the entire image has been written to the screen.

The default is "Disable;" sixel graphics will not scroll.

Text cursor

Selecting this option invokes a menu with the following choices:

- Enable
- Disable

This option specifies whether the text cursor is displayed. The default is "Enable;" the text cursor is displayed.

Transmission mode

Selecting this option invokes a menu with the following choices:

- 8 bit controls
- 7 bit controls

2-28 The Workstation Options Menu

The default is "8 bit controls," which indicates that the VT220 terminal window uses eight-bit ASCII character codes to interpret characters.

VT terminal type

Selecting this option produces a menu with the following choices:

- VT52
- VT100
- VT220

The default is VT220. If you change the default, the new setting takes effect upon creation of the next terminal emulator window. For example, if you select "VT52," the next terminal emulator window that you invoke will emulate the escape-sequence features of a VT52 terminal. Note, however, that the label in the window banner will still be "VT220."

Warning bell

Selecting this option invokes a menu with the following choices:

- Enable
- Disable

The "bell" is the beep sound made by the keyboard; for example, when some errors occur or messages arrive. This option allows you to disable the sound.

The default is "Enable;" the warning bell will sound.

2.5.10 Workstation Type

Selecting this option displays the following three choices:

- Monochrome system—black and white output only
- Intensity system—simulates color hues in shades of grey
- Color system—supports a full spectrum of color

A check mark indicates the current setting. The workstation type must be set correctly in order for the color setup and applications to work correctly.

2.5.11 Use Default Settings

Selecting this option restores the setup features to their original defaults (as packaged by DIGITAL). You will not lose site-specific settings that you have saved with the "Save current settings" option unless you select "Save current settings" again after selecting "Use default settings."

2.5.12 Restore Last Saved Settings

Select this option if you change your mind about settings you made but have not yet saved the settings. Selecting this option resets settings to their state at startup or when "Save the current settings" was last selected.

2.5.13 Save the Current Settings

Selecting this option stores the changes you made so that they will remain in effect for the next startup or reboot.

2.5.14 Exit this Menu

Selecting this option erases the Workstation Setup menu.

See Appendix B for information on additional VT220 attributes that are not included in the Workstation Setup menu.

2.6 Modifying the Workstation Options Menu

The Workstation Options menu can be modified to include user-defined options. For example, you can add a menu option that invokes an application.

NOTE: The facility described in this section may not remain in the same form from release to release of the MicroVMS Workstation software. It is described only for your convenience and is not supported by DIGITAL.

You add menu options (or change existing ones) by editing the file `SYS$MANAGER:UISBG.DAT` and then restarting the display manager process (`UIS$DISPLAYMGR`). When `UIS$DISPLAYMGR` starts up, it reads the commands in `UISBG.DAT` to determine the content of the Workstation Options menu.

If you type or edit `UISBG.DAT`, you will see that the file includes a template (commented out by exclamation marks) in which you can substitute an application of your own.

In addition, the file includes a ready-to-go option for invoking a VT220 terminal-emulator window without autologin. This extra option allows you to choose between autologin and interactive login without altering the Workstation Setup menu. All you need to do is edit the file and remove the exclamation marks.

You need to reboot the system in order to initialize the new menu.

Following are the commands you can use in `UISBG.DAT`.

- **TITLE**—specifies a character string to appear as the title in the menu banner. The string must be enclosed in double quotes. The default title is "Workstation Options."

2-30 The Workstation Options Menu

Two qualifiers are used with the **TITLE** command to specify the character fonts used in the menu:

- **/INSTRUCTION_FONT**—specifies the font to be used for text written by the **INSTRUCTION** command (such as the instructions for selecting an option).
- **/CHOICE_FONT**—specifies the font to be used for text written by the **CHOICE** command (the menu options).
- **SPACE**—specifies a blank line to be inserted in the menu.
- **INSTRUCTION**—writes a line of text, such as the instructions for selecting a menu option. The text string must be enclosed in double quotes.
- **CHOICE**—specifies a selectable option to be included in the menu. The option name must be enclosed in double quotes.

The following qualifiers to the **CHOICE** command define the function to be performed by the option:

- **/ROUTINE=routine**—can be any of the following:

UISBG\$CREATE_TERMINAL	Creates a terminal-emulator window, ignoring the setting of the autologin setup attribute.
UISBG\$AUTOLOGIN_TERMINAL	Creates a terminal-emulator window. If autologin is enabled in the Workstation Setup menu, the user is logged in to the terminal-emulator window automatically (without user input).
UISBG\$PRINT_SCREEN	Invokes the print-screen function (as in the “Print (portion of) screen” menu option).
UISBG\$SETUP	Invokes the Workstation Setup menu.
UISBG\$CREATE_PROCESS	Creates a process to run a specified application.
UISBG\$EXIT	Invokes the exit function (deletes the menu).

- **/IMAGE=image**—specifies the image to run in the created process, such as **SYS\$SYSTEM:UISHELP.EXE**. Note that **SYS\$SYSTEM:LOGINOUT.EXE** must be used in conjunction with the routine **UISBG\$AUTOLOGIN_TERMINAL**.
- **/TITLE=string**—specifies the title to be displayed in the terminal-emulator window.

- **/TERMINAL=tt**—specifies the terminal type for a terminal-emulator window invoked by the routines `UISBG$AUTOLOGIN_TERMINAL` and `UISBG$CREATE_TERMINAL`. The terminal options are the following:
TK For Tektronix 4010/4014 terminal emulator.
WT For VT220 terminal emulator.
- **/INPUT=input-spec**—specifies the command input for a process created by the routine `UISBG$CREATE_PROCESS`. You can specify `NLA0:` to designate a null device.
- **/OUTPUT=output-spec**—specifies the output for a process created by the routine `UISBG$CREATE_PROCESS`. You can specify `NLA0:` to designate a null device.
- **/ERROR=error-spec**—specifies the output for errors generated by the routine `UISBG$CREATE_PROCESS`. You can specify `NLA0:` to designate a null device.
- **/DEFAULT**—determines the position of the menu on the VAXstation screen. If **/DEFAULT** is included, the menu appears with the specified option at the location of the pointer. If **/DEFAULT** is omitted, the menu appears in the lower left-hand corner of the screen.



Chapter 3

Using Windows

This chapter provides information about using windows on the VAXstation. The following topics are discussed:

- Logging in to a terminal-emulator window
- Window Options menu
- Pushing and popping windows
- Resizing a window
- Cycling the keyboard
- Moving a window

For information on managing window memory (and performing other VAXstation tuning operations), see the *VWS Installation Guide*.

3.1 Logging in to a Terminal-Emulator Window

The Workstation Options menu offers two types of terminal emulators:

- VT220
- Tektronix 4010/4014

Section 2.2 describes the VT220 terminal characteristics that are emulated by the MicroVMS Workstation software. Section 2.3 describes Tektronix 4010/4014 terminal emulation.

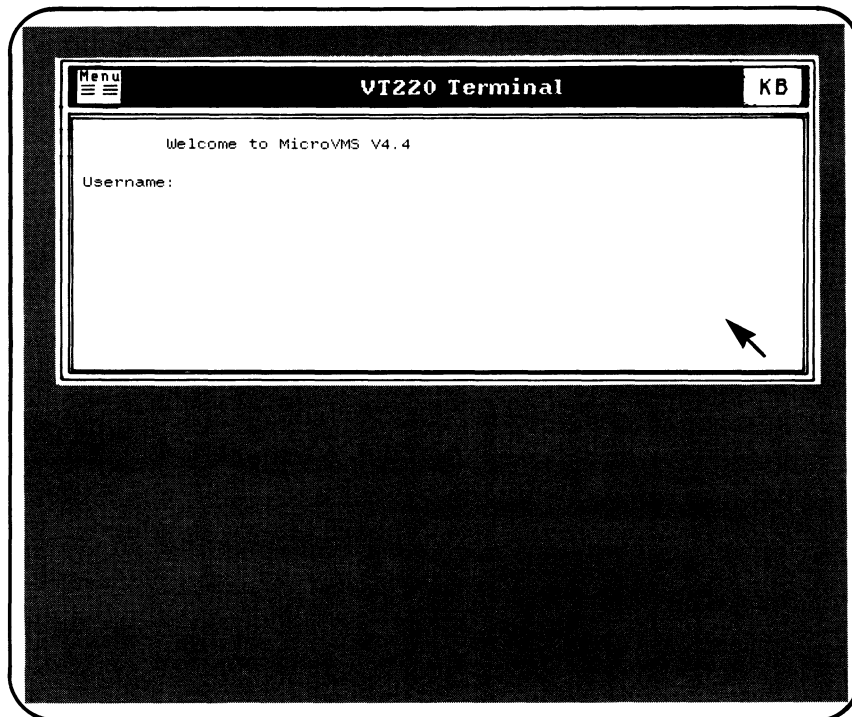
After you invoke a terminal-emulator option, the window that appears will have the keyboard connected to it automatically. The new window displays the user name prompt for you to log in.

To use VT220 terminal emulation, select "Create new VT220 window" from the Workstation Options menu.

Figure 3-1 shows a new VT220 terminal-emulator window.

3-2 Using Windows

Figure 3-1 VT220 Emulator Window with User Name Prompt



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Type `USER` and press `RETURN` to log in at the user name prompt, assuming that your system manager has not changed the default `USER` account. Otherwise, log in under the user name and password assigned you by your system manager. By default, you have 30 seconds to log in before the window disappears.

Note that if automatic login is enabled, you are only prompted for login information the first time you invoke a terminal-emulator window. See Section 2.5.1 for more information on automatic login.

You can position windows on the screen as you create them. The newly created window will always appear at the location of the Workstation Options menu.

You can create as many windows on the screen as your system resources allow. For example, you can select "Create new VT220 window" several times, each time logging in on the same or on different accounts. Windows can overlap each other and you can run different applications in different windows, all at the same

time. However, the keyboard can only be connected to one window at a time; an application will continue to run whether or not the keyboard remains attached.

NOTE: If your system crashes frequently, or if your processes are being deleted when you have a large number of windows on your screen, the problem may be that there is insufficient memory allocated for use by windows.

You can change the amount of memory allocated to windows, or *window memory size*, to support more or fewer windows, as described in the *VWS Installation Guide*.

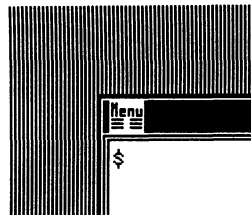
Notice that the terminal-emulator window has a *banner*—the wide portion of the border at the top of the window, containing the title. By default, the banner is black. On color and intensity systems, however, you can alter the color of the banner just as you would any other color on your screen (see Section 2.5.2). For simplicity, any discussion of the banner in this section will be in terms of black and white.

The banner contains a symbol called an *icon* at each end:

- The Menu icon, at the left end of the banner
- The KB (keyboard) icon, at the right end of the banner

The menu icon enables you to select the Window Options menu. By placing the pointer over the menu icon and clicking the SELECT button, you can invoke a menu that allows you to perform various window functions, such as changing the size of the window. Figure 3-2 shows the Window Options menu icon.

Figure 3-2 Menu Icon on Window Banner



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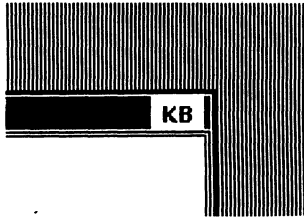
See Section 3.2 for a complete description of the Window Options menu.

If the keyboard is *connected* to a window, that means you can use it to enter characters into that window. The KB icon indicates whether or not the keyboard is connected to the window. If the keyboard is connected to a window, the KB icon consists of black letters against a white background. When you connect to another window, the KB icon in the disconnected window reverses to white letters against a black background. Figure 3-3 shows the KB icon as it appears when the keyboard

3-4 Using Windows

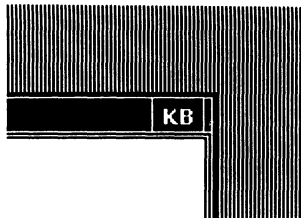
is attached. Figure 3-4 shows the KB icon as it appears when the keyboard is not attached.

Figure 3-3 KB Icon when Keyboard Is Attached



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Figure 3-4 KB Icon when Keyboard Is Not Attached

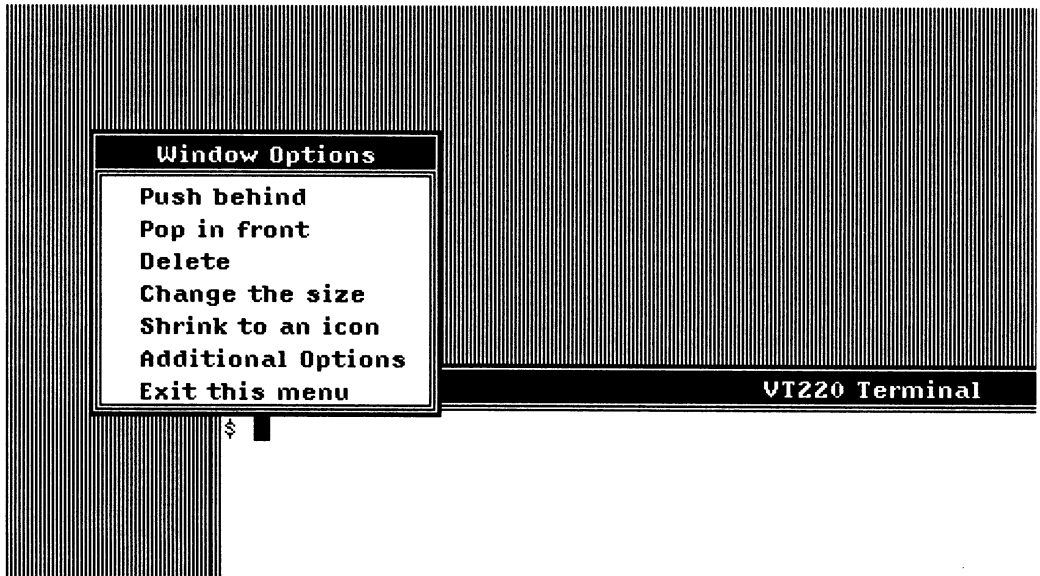


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3.2 Window Options Menu

You can use the Window Options menu to manipulate windows on the screen. To select the Window Options menu, move the pointer to the Menu icon in the banner of the window you want to change. Press the SELECT button; a menu appears, as shown in Figure 3-5.

Figure 3-5 Window Options Menu



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Again, use the pointer to select the appropriate option for the task you want to perform. The options are as follows:

3.2.1 Push Behind

Selecting this option causes the selected window to move to the background of the display; in other words, under any windows it was covering.

3.2.2 Pop in Front

Selecting this option causes the selected window to move to the foreground of the display.

3.2.3 Delete

Selecting this option erases the window from the screen and stops the associated image; for emulated terminals, it stops the associated process.

Note that the function of the Delete option may be altered by an application; see the *MicroVMS Workstation Graphics Programming Guide* for more information.

3.2.4 Change the Size

Selecting this option allows you to resize the window. An outline with blinking "lights" appears, superimposed over the original window border, and the shape of the pointer changes to that of an arrowhead.

Move the pointer to any position along the outline and hold down the SELECT button; the blinking lights disappear and the outline becomes a *stretchy box* (still superimposed over the original window). Move the pointer until the stretchy box conforms to the desired size; then release the SELECT button. The stretchy box and the original window disappear, and then are replaced by a new window containing the contents of the original.

If you have already selected the resize option and decide you do not want to continue, you can cancel the operation by placing the pointer at any position on the outline and clicking the SELECT button.

Note that the function of the resize option may be altered by an application.

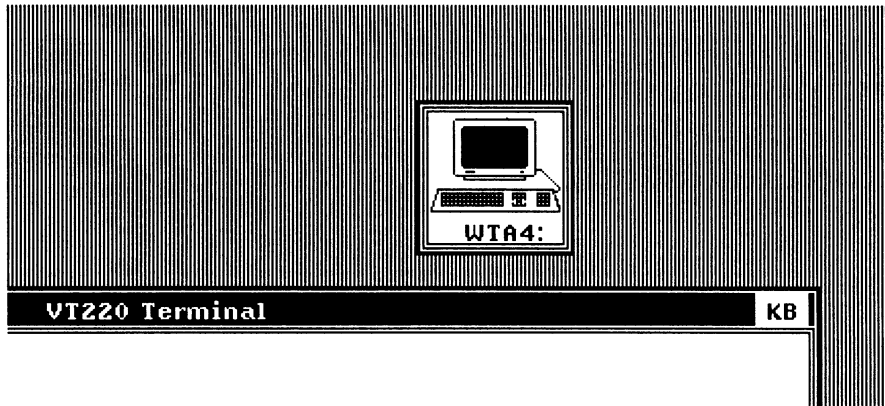
For information on an alternate way to resize windows, see Section 3.5.

3.2.5 Shrink to an Icon

Selecting this option causes the associated window to be replaced by an icon on the VAXstation screen. Icons provide a convenient way to make room on the monitor screen without deleting windows. The icon includes a border and the title from the window banner. For terminal-emulator windows, the icon also includes a picture of a monitor and keyboard, and the process name associated with the window.

Figure 3-6 shows a VT220 terminal-emulator icon adjacent to the banner of another VT220 terminal-emulator window.

Figure 3-6 Terminal-Emulator Window Reduced to an Icon



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You can use the pointing device to move or pop the icon just as you would any other bordered window on the screen.

To restore and connect the keyboard to the associated window, move the pointing device to any point on or within the border of the icon; then click the SELECT button. The window reappears at its most recent location on the monitor screen, regardless of icon placement. The same is true of the icon. Although the default placement of the icon is at the lower left-hand corner of the monitor screen, it will "remember" its most recent placement. However, if a window or icon is partially offscreen when you shrink or restore it, the window or icon cannot be restored with any part offscreen. Instead, it will reappear on the screen in its entirety at the position closest to its previous placement.

Note that the function of the "Shrink to an icon" option may be altered by an application.

3.2.6 Additional Options

This option is reserved for application use.

3.2.7 Exit this Menu

Selecting this option erases the Window Options menu.

If a menu option is turned off (for example, by an application), it is displayed in grey characters and cannot be highlighted or selected.

3-8 Using Windows

3.3 Cycling the Keyboard

When you *cycle* the keyboard, you switch its connection from one window to another.

You can cycle the keyboard between as many windows as you like, in either of the following ways:

- With the pointing device
- With the CYCLE (F5) function key

Connect to a different window with the pointer as follows:

1. **Without** pressing any mouse button, move the pointer to any point within the border (including the banner) of the window containing the process you want.
2. Click the SELECT button.
3. The KB icon on the banner displays black letters against a white background, showing that the keyboard is connected to that window. If that window was underneath other windows, it pops to the top.

An inactive terminal-emulator window “remembers” its cursor position. When a window is disconnected from the keyboard, the cursor position is marked by a nonblinking cursor outline.

In addition to using the pointer, you can switch the keyboard between windows by pressing the F5 (cycle) function key. Each time you press the key, another window pops to the foreground of the display to become the active window. See Section 1.5 for more information on the keyboard function keys.

3.4 Moving a Window

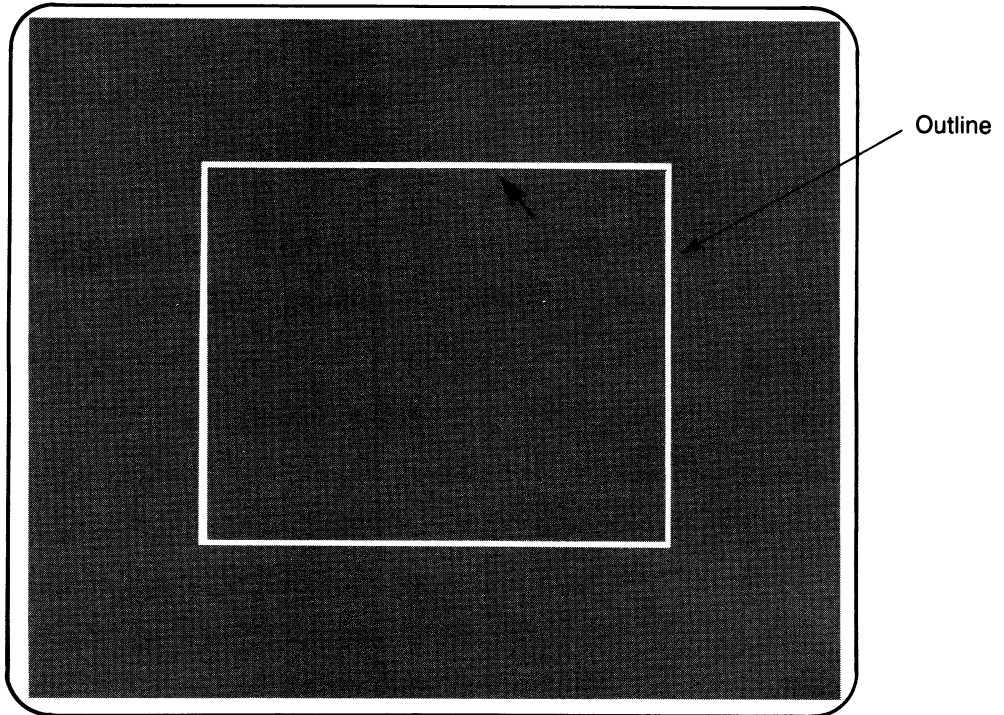
You may want to reposition windows on the screen to place them in more convenient locations, for example, to avoid blocking one or more of them.

Using the mouse, you can move a window to a different part of the screen as follows:

1. Move the pointer to any point on the border of the window.
2. Press the SELECT button and hold it down. The window will disappear, leaving an outline of the window.
3. Holding the SELECT button down, move the pointer steadily until the outline is where you want the window to be.

4. Release the SELECT button. The window reappears in the new place with its previous contents intact.

Figure 3-7 Moving a Window



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You can move a window so that only a small part of it appears on the screen. Note, however, that moving a window partially off the screen may affect the scrolling rate and the drawing rate within that window.

3.5 Changing Window Size with DCL

As an alternative to resizing a window with the Window Options menu, you can change the size of VT220 terminal windows with the DCL command SET TERMINAL/WIDTH=*n*/PAGE=*n*. By using this command, you can specify the exact columns and lines that you want in your terminal window.

The default size for a VT220 window is 80 columns wide and 24 lines long (that is, WIDTH=80, PAGE=24). If you just want to change the page size to 45 lines, for example, use the following command:

```
$ SET TERMINAL/PAGE=45
```

Appendix A

VAXstation Support for Tektronix 4010/4014 Terminals

This appendix describes the features of industry-standard Tektronix 4010/4014-based software that are emulated by the VAXstation. The information in this appendix assumes that the reader has a working knowledge of Tektronix 4010/4014 functions.

Tektronix 4010/4014 terminal emulation supports those features of Tektronix 4010/4014 terminals that can be transferred from direct-view storage tube technology to the raster-scan technology used by the VAXstation.

Tektronix 4010/4014 terminal emulation supports industry-standard Tektronix 4010/4014 software packages. This appendix describes known differences between Tektronix 4010/4014 and VAXstation support of Tektronix 4010/4014.

A.1 Implementation

Tektronix 4010/4014 terminal emulation supports the following modes and functions:

- Alpha mode
Processes text characters.
- Graph mode
Processes vectors from endpoints defined by absolute coordinate values.
- Point plot mode
Similar to graph mode except that only the points specified by the absolute coordinate values are plotted; no vector is drawn between the points.
- Graphics input mode
Uses local cross-hair cursor for selecting items.

A-2 VAXstation Support for Tektronix 4010/4014 Terminals Implementation

- Strap options
Supports strap options as Workstation Setup options. Select these options as described for Tektronix 4010/4014 terminal attributes in Section 2.5.
- Control characters
Uses ASCII control characters to define actions to be taken by the terminal.
- Escape sequences
Supports escape sequences that control and/or define Tektronix 4010/4014 functions.
- Bypass condition
Inhibits terminal from responding to data echoed by the host.

A.2 Implementation Restrictions

Because of the differences between direct-view and raster-scan display technologies, some functions are not implemented in the VAXstation or are implemented in a limited fashion. Following is a description of these limitations.

1. A fallout of storage tube technology is write-through mode, in which images are drawn on the tube, but not retained. These images need to be refreshed to be visible, with their intensity dependent on the refresh rate. In Tektronix 4010/4014 series terminals, write-through can be used for alpha mode characters as well as for graphic images. Write-through cannot be implemented using the raster-scan technology of the VAXstation.
2. The Tektronix 4010/4014 Enhanced Graphics Module (EGM) is an option that provides a number of special features. The VAXstation implements a number of the features available through the EGM option. However, special point plot and incremental plot are not implemented in the VAXstation.

A.3 Screen Addressing

The Tektronix 4010/4014 series terminals use Tekpoints as units of screen addressing. By default, there is a 1024 X 820 addressable Tekpoint matrix. The default matrix is used in graphics input (GIN) mode.

A.4 Setup Support

The Tektronix 4010/4014 terminals have four strap options that you can select by repositioning jumper wires on the terminal circuit cards. The VAXstation supports the Ignore Del and Ignore Gin terminators.

A.5 ASCII Character Codes

Table A-1 shows the 7-bit ASCII codes.

A-4 VAXstation Support for Tektronix 4010/4014 Terminals

ASCII Character Codes

Table A-1 7-Bit ASCII Codes

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

KEY

CHARACTER	ESC	33	OCTAL
		27	DECIMAL
		1B	HEX

Table A-2 summarizes the ASCII character code functions supported in the four operational modes of the Tektronix 4010/4014 emulation.

VAXstation Support for Tektronix 4010/4014 Terminals

ASCII Character Codes

A-5

Table A-2: ASCII Character Code Function Summary

ASCII Char.	Alpha	Graph	Operational Mode Value Bypass/GIN	LCE Flag (note 1)
NUL				SET LCE
SOH				
STX				
ETX				
EOT				
ENQ				RETURN TERMINAL STATUS
ACK				
BEL	RING BELL	RING BELL	RING BELL	RING BELL
BS	MOVE ONE SPACE LEFT			MOVE ONE SPACE LEFT
HT	MOVE ONE SPACE RIGHT			MOVE ONE SPACE RIGHT
LF	MOVE ONE LINE DOWN	MOVE DOWN	MOVE ONE LINE DOWN	SET LCE (note 2)
VT	MOVE ONE LINE UP			MOVE ONE LINE UP
FF				ERASE AND HOME (PAGE)
CR	MOVE TO LEFT MARGIN	SET ALPHA AND LEFT	SET ALPHA AND LEFT	SET LCE (note 2)
S0				
S1				
DLE				
DC1				
DC2				
DC3				

(Continued on next page)
ZK-4670/1-85

**A-6 VAXstation Support for Tektronix 4010/4014 Terminals
ASCII Character Codes**

Table A-2: ASCII Character Code Function Summary (Cont.)

ASCII Char.	Alpha	Graph	Operational Mode Value	Bypass/GIN	LCE Flag (note 1)
DC4					
NAK					
SYN					
ETB					
CAN					SET BYPASS
EM					
SUB					SET GIN AND BYPASS
ESC	SET LCE	SET LCE	SET LCE		SET LCESET LCE
FS	SET POINT PLOT	SET POINT PLOT	SET POINT PLOT		
GS	SET GRAPH & DARK VECTOR	DO A DARK VECTOR	SET GRAPH & DARK VECTOR		SET GRAPH & DARK VECTOR
RS					
US			SET ALPHA MODE		SET ALPHA MODE
SPACE	MOVE ONE SPACE RIGHT	HIGH X OR HIGH Y			
'	PRINT CHARACTER	HIGH X OR HIGH Y			
"	PRINT CHARACTER	HIGH X OR HIGH Y			
#	PRINT CHARACTER	HIGH X OR HIGH Y			
\$	PRINT CHARACTER	HIGH X OR HIGH Y			
%	PRINT CHARACTER	HIGH X OR HIGH Y			
&	PRINT CHARACTER	HIGH X OR HIGH Y			
(PRINT CHARACTER	HIGH X OR HIGH Y			
)	PRINT CHARACTER	HIGH X OR HIGH Y			
*	PRINT CHARACTER	HIGH X OR HIGH Y			
+	PRINT CHARACTER	HIGH X OR HIGH Y			

VAXstation Support for Tektronix 4010/4014 Terminals

ASCII Character Codes

A-7

.	PRINT CHARACTER	HIGH X OR HIGH Y	
-	PRINT CHARACTER	HIGH X OR HIGH Y	
.	PRINT CHARACTER	HIGH X OR HIGH Y	
/	PRINT CHARACTER	HIGH X OR HIGH Y	
0	PRINT CHARACTER	HIGH X OR HIGH Y	
1	PRINT CHARACTER	HIGH X OR HIGH Y	
2	PRINT CHARACTER	HIGH X OR HIGH Y	
3	PRINT CHARACTER	HIGH X OR HIGH Y	
4	PRINT CHARACTER	HIGH X OR HIGH Y	
5	PRINT CHARACTER	HIGH X OR HIGH Y	
6	PRINT CHARACTER	HIGH X OR HIGH Y	
7	PRINT CHARACTER	HIGH X OR HIGH Y	
8	PRINT CHARACTER	HIGH X OR HIGH Y	NOT CURRENTLY IMPLEMENTED
9	PRINT CHARACTER	HIGH X OR HIGH Y	NOT CURRENTLY IMPLEMENTED
:	PRINT CHARACTER	HIGH X OR HIGH Y	NOT CURRENTLY IMPLEMENTED
;	PRINT CHARACTER	HIGH X OR HIGH Y	NOT CURRENTLY IMPLEMENTED
<	PRINT CHARACTER	HIGH X OR HIGH Y	
=	PRINT CHARACTER	HIGH X OR HIGH Y	
?	PRINT CHARACTER	HIGH X OR HIGH Y	LOW Y FOR GRAPH (note 3)

(Continued on next page)

ZK-4670/3-85

A-8 VAXstation Support for Tektronix 4010/4014 Terminals
 ASCII Character Codes

Table A-2: ASCII Character Code Function Summary (Cont.)

ASCII Char.	Alpha	Graph	Operational Mode Value	Bypass/GIN	LCE Flag (note 1)
@	PRINT CHARACTER	LOW X			
A	PRINT CHARACTER	LOW X			
B	PRINT CHARACTER	LOW X			
C	PRINT CHARACTER	LOW X			
D	PRINT CHARACTER	LOW X			
E	PRINT CHARACTER	LOW X			
F	PRINT CHARACTER	LOW X			
G	PRINT CHARACTER	LOW X			
H	PRINT CHARACTER	LOW X			
I	PRINT CHARACTER	LOW X			
J	PRINT CHARACTER	LOW X			
K	PRINT CHARACTER	LOW X			
L	PRINT CHARACTER	LOW X			
M	PRINT CHARACTER	LOW X			
N	PRINT CHARACTER	LOW X			
O	PRINT CHARACTER	LOW X			
P	PRINT CHARACTER	LOW X			
Q	PRINT CHARACTER	LOW X			
R	PRINT CHARACTER	LOW X			
S	PRINT CHARACTER	LOW X			
T	PRINT CHARACTER	LOW X			
U	PRINT CHARACTER	LOW X			
V	PRINT CHARACTER	LOW X			
W	PRINT CHARACTER	LOW X			

**A-10 VAXstation Support for Tektronix 4010/4014 Terminals
ASCII Character Codes**

Table A-2: ASCII Character Code Function Summary (Cont.)

ASCII Char.	Alpha	Graph	Operational Mode Value	Bypass/GIN	LCE Flag (note 1)
m	PRINT CHARACTER	LOW Y			Reserved for future use
n	PRINT CHARACTER	LOW Y			
o	PRINT CHARACTER	LOW Y			
p	PRINT CHARACTER	LOW Y			
q	PRINT CHARACTER	LOW Y			
r	PRINT CHARACTER	LOW Y			
s	PRINT CHARACTER	LOW Y			
t	PRINT CHARACTER	LOW Y			
u	PRINT CHARACTER	LOW Y			
v	PRINT CHARACTER	LOW Y			
w	PRINT CHARACTER	LOW Y			
x	PRINT CHARACTER	LOW Y			
y	PRINT CHARACTER	LOW Y			
z	PRINT CHARACTER	LOW Y			
{	PRINT CHARACTER	LOW Y			
	PRINT CHARACTER	LOW Y			
}	PRINT CHARACTER	LOW Y			
.	PRINT CHARACTER	LOW Y			
DEL		LOW Y or NO-OP (note 3)			SET LCE

NOTES:

1. The applicable ASCII character performs the function as listed when used as part of an escape sequence; LCE flag is an escape sequence introducer condition.
2. Filler CRs and filler LFs will not interfere.
3. In graph mode, the effect of DEL as a low Y character can be disabled by the DEL IMPLIES LOW Y option in graphics setup; if DEL cannot be used, the program can substitute ESC?, which will perform the same function as DEL.

A.6 Tektronix 4010/4014 Escape Sequences

The following sections discuss various Tektronix 4010/4014 escape sequences and indicate which sequences are supported by the VAXstation.

A.6.1 Ignored Tektronix 4010/4014 Escape Sequences

The following are the escape sequences for functions *not* implemented in Tektronix 4010/4014 terminal emulation.

ESC SO	Select alternate character set
ESC SI	Select ASCII character set
ESC p	Set solid vector pattern with write-through
ESC q	Set dotted vector pattern with write-through
ESC r	Set dot-dashed vector pattern with write-through
ESC s	Set short-dashed vector pattern with write-through
ESC t	Set long-dashed vector pattern with write-through
ESC u	Set solid vector pattern with write-through
ESC v	Set solid vector pattern with write-through
ESC w	Set solid vector pattern with write-through
ETB	Make copy
ESC FS	Special point plot
RS	Set incremental plot
ESC RS	Set incremental plot

A.6.2 Request Terminal Status

Terminal status is requested by invoking the following escape sequence:

```
1/11    0/5  
ESC    ENQ
```

This escape sequence will also set the bypass condition. If alpha mode is in effect, the VAXstation sends terminal status and the address of the lower left corner of the alpha cursor. If graph mode is in effect, the terminal sends terminal status and the address of the current active position.

A-12 VAXstation Support for Tektronix 4010/4014 Terminals

Tektronix 4010/4014 Escape Sequences

A.6.3 Select Bypass Condition

Bypass condition is set using the following escape sequence:

1/11	1/8
ESC	CAN

Bypass condition inhibits the VAXstation from responding to any data echoed by the host.

A.6.4 Set Alpha Mode

Alpha mode can be selected using the following escape sequence:

1/11	0/12
ESC	FF

In addition to selecting alpha mode, the screen is erased, the current position is moved to top left corner, margin 1 is activated, and bypass condition is cleared.

A.6.5 Set GIN Mode

GIN mode is selected by using the following escape sequence:

1/11	1/10
ESC	SUB

A.6.6 Select Point Plot Mode

Point plot mode can be selected by using the following escape sequence:

1/11	1/12
ESC	FS

In a Tektronix 4010/4014-series terminal, this escape sequence sets the terminal to special point plot mode, a mode identical to point plot mode except that the electron beam intensity is programmable. Special point plot mode is not implemented in the VAXstation. As a fallback, ESC FS sets the terminal to point plot mode.

A.6.7 Select Character Size

Only one character size is currently supported. Any escape sequence that selects a different character size is ignored. The character size currently supported is the following:

Sequence	Character Size
1/11 3/11 ESC ;	Selects 64 lines of 133 characters each.

A.6.8 Select Vector Patterns

The type of pattern used for vector drawing can be selected by the escape sequences in the following table:

Sequence	Pattern	Intensity
1/11 6/0 ESC `	Solid	Normal
1/11 6/1 ESC a	Dotted	Normal
1/11 6/2 ESC b	Dot-Dashed	Normal
1/11 6/3 ESC c	Short-Dashed	Normal
1/11 6/4 ESC d	Long-Dashed	Normal
1/11 6/8 ESC e	Solid	Thick
1/11 6/9 ESC i	Dotted	Thick
1/11 6/10 ESC j	Dot-Dashed	Thick
1/11 6/11 ESC k	Short-Dashed	Thick
1/11 6/12 ESC l	Long-Dashed	Thick

A.6.9 Set LCE Flag

The LCE flag, an escape sequence introducer condition, is set by any of the following escape sequences:

1/11	7/15
ESC	DEL
1/11	0/0
ESC	NUL
1/11	0/13
ESC	CR
1/11	0/10
ESC	LF
1/11	1/11
ESC	ESC

A-14 VAXstation Support for Tektronix 4010/4014 Terminals

Tektronix 4010/4014 Escape Sequences

A.6.10 Delete Character

Tektronix 4010/4014 terminals have a "DEL implies LOW Y" strap option, which is supported in graphic setup mode in the VAXstation. This option allows the ASCII code associated with the DEL control character to be a possible low Y value in Tektronix 4010/4014 series coordinate specifications. Through this option, DEL can be enabled as low Y for graphics mode or disabled as low Y during graphics mode. Since this usage may conflict with some operating systems' usage of DEL for synchronization, Tektronix 4010/4014 terminal emulation accepts the following escape sequence as a functional substitute for the low Y coordinate value of DEL.

1/11	3/15
ESC	?

A.6.11 Miscellaneous Escape Sequences

The following escape sequences have the same function as when only the control character is invoked:

ESC BEL	Same as BEL
ESC BS	Same as BS
ESC HT	Same as HT
ESC VT	Same as VT
ESC GS	Same as GS
ESC RS	Same as RS
ESC US	Same as US

In addition, ESC FS will perform the same function as FS, because of a fallback condition in the VAXstation's Tektronix 4010/4014 terminal emulation.

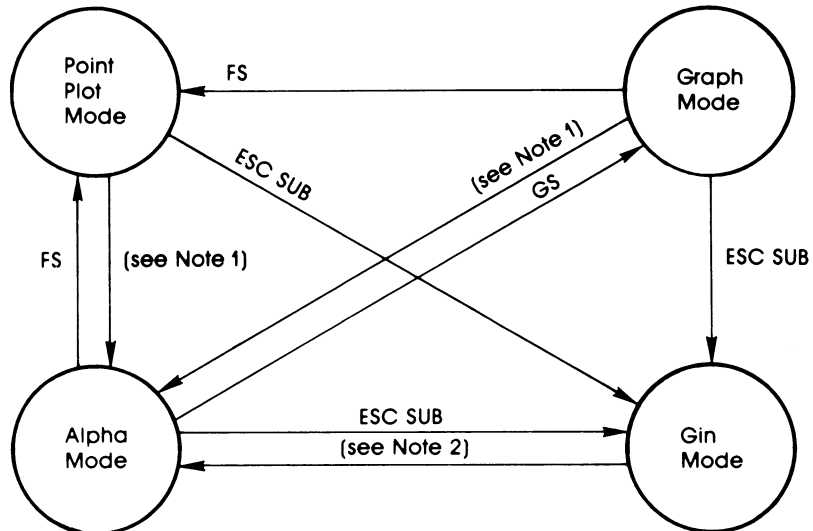
A.7 Changing Operational Modes

Once Tektronix 4010/4014 terminal emulation has been entered, control characters are used to make transitions between the various operational modes. In some instances, escape sequences are used to change between modes.

Control characters or escape sequences used to change the operational mode of the VAXstation can be generated by the host.

Figure A-1 shows the four operating modes available in Tektronix 4010/4014 terminal emulation. Transitions between modes are represented by arrows. Shown with each arrow is the identification of the ASCII control characters (or escape sequences), which can be used to cause the mode transition.

Figure A-1 Tektronix 4010/4014 Terminal Emulation Transition Diagram



NOTES
1. US, ESC US, ESC FF, or NEXT SCREEN key;
2. CR, ESC, FF. See GRAPHIC INPUT (GIN) MODE section.

ZK-4212-85

A.8 Clearing the Screen

The Tektronix 4010/4014 series terminals have a "clear screen" key. The VAXstation uses the middle mouse button or the keyboard key labeled E6.

A.9 Bypass Condition

When bypass condition is in effect, the VAXstation will ignore any characters received from the host until bypass is disabled. This allows the terminal to ignore its own transmissions if they are erroneously echoed by the host.

Bypass can be enabled either by keyboard input or from the host, using any of the following escape sequences:

- ESC CAN
Enables bypass condition, but performs no other function
- ESC ENQ
Enables bypass condition and requests status information
- ESC SUB
Enables bypass condition and places VAXstation in GIN mode

Bypass will be disabled upon receipt of any of the following escape sequences:

- BEL
Control character generating bell tone, if bell is enabled
- LF
Control character causing new line operation
- CR
Control character moving cursor to left margin and resetting VAXstation to alpha mode
- US
Control character resetting VAXstation from graph mode to alpha mode
- ESC FF
Escape sequence selecting alpha mode and clearing screen
- Mouse SELECT button click
Selecting alpha mode and clearing screen

A.10 Alpha Mode

In alpha mode, all characters received that are not ASCII control characters or escape sequence characters are displayed on the screen in the currently selected character size.

Control characters or escape sequences that are not valid Tektronix 4010/4014 commands or that are for functions not implemented are ignored.

Alpha mode is the default operational mode in Tektronix 4010/4014 terminal emulation.

A.10.1 Margin Processing

Margin processing refers to two-column character writing in alpha mode. In two-column writing, there are two margins: margin 1, which is located at the leftmost edge of the display area; margin 2, which is located at the center of each row in the display area. When rows of characters are being written from the left edge to the center of the display area, margin 1 is active. When rows of characters are being written from the center to the right edge, margin 2 is active.

Margin switching occurs automatically when the last row of characters has been filled for the currently active margin, or when a line feed occurs at the last row of the display. Upon either of these conditions, further character processing moves to the top row at the new margin: margin 2 if margin 1 was active, margin 1 if margin 2 was active.

Since Tektronix 4010/4014 series terminals are storage tube terminals, they cannot scroll. When printable characters are received in alpha mode without intervening control characters, the characters are written in the following manner:

1. Initial character processing begins at the top left corner of the screen and moves across the top row to the center of the screen.
2. When the end of a row is reached, character wrap occurs; the next character is written at the left edge of the next row down.
3. Rows of characters continue until column 1 is filled.
4. Once the bottom row of column has been filled, the next character is written at the top center of the screen, and following characters are now written from the center to the right edge of the screen, overstriking any existing characters.
5. As each row is filled, wrapping occurs to the middle of the next row, until column 2 is filled.
6. When the last row of column 2 is filled, wrapping begins again at the top row of column 1 (the left edge of the screen).

A-18 VAXstation Support for Tektronix 4010/4014 Terminals Alpha Mode

Margin processing allows text writing in either one column or two columns. If one-column writing is desired, then the screen must be cleared before wrapping to margin 2 occurs. If two-column writing is desired, then CR and LF (or CR alone if selected in setup support for CR and LF) should be inserted in each row before writing reaches margin 2, so that wrapping will not overstrike any characters.

A.10.2 Character Size

Only one character size is currently supported. Any escape sequence that selects a different character size is ignored. The character size currently supported is the following:

Sequence	Character Size
1/11 3/11 ESC ;	Selects 64 lines of 133 characters each.

A.11 Graph Mode

In graph mode, vectors are drawn between specified absolute coordinate values. The absolute coordinate values are Tekpoint values mapped to the nearest corresponding VAXstation pixel. The vectors are drawn in the currently selected line pattern.

The Tektronix 4010/4014 with Oct EGM has a 1024 X 1024 square matrix with the high 25% of the four addresses above the top of the display area. Coordinates can be specified within this area, and despite being off screen, they will be tracked accurately. As much of the requested vector will be drawn as appears within the display area. The remainder of the vector will be clipped.

Any valid Tektronix 4010/4014 terminal escape sequences or control characters will be acted on in graph mode. Escape sequences and control characters that are not valid for Tektronix 4010/4014 functions, or that are for functions not implemented in the VAXstation, are ignored.

A.11.1 Line Patterns

Five basic line patterns can be used, with each pattern available as either normal or thick intensity. Following is a list of the patterns that can be selected, along with identification of the escape sequences required for each selection.

Solid (normal)	ESC `
Solid (thick)	ESC h
Dotted (normal)	ESC a
Dotted (thick)	ESC i
Dot-Dashed (normal)	ESC b
Dot-Dashed (thick)	ESC j
Short-Dashed (normal)	ESC c
Short-Dashed (thick)	ESC k
Long-Dashed (normal)	ESC d
Long-Dashed (thick)	ESC l (lowercase L)

A.11.2 Drawing Command

The control character GS is used to enter graph mode from alpha mode. In graph mode, GS defines the start of a vector draw.

In graph mode, vectors are not drawn from the active location when GS is invoked. The vector is drawn from the first coordinate value specified, to the next value specified. If more than two coordinates are specified following a GS control character, each new vector is drawn from the last coordinate drawn to, to the next coordinate specified. For example:

GS A B C D

Vectors will be drawn from point A to point B, from point B to point C, and from point C to point D. However, in the following command, two separate vectors are drawn, one from A to B, and another from C to D:

GS A B GS C D

A-20 VAXstation Support for Tektronix 4010/4014 Terminals Graph Mode

A.11.3 Encoding of Coordinates

Tektronix 4010/4014 terminal emulation supports 10-bit addressing. The Tekpoint matrix of the screen is defined as being 1024 X 820, with Tekpoints mapped to the nearest corresponding pixel.

Coordinates are encoded into four bytes. Table A-3 shows the transmission order of these bytes, and identifies their formats.

Tektronix 4010/4014 terminal emulation supports shortened address transmission. That is, when only parts of an address change, only certain bytes need be sent. The transmission rules for this shortened address capability are shown in Table A-4.

Table A-3 Coordinate Encoding Byte Values

Byte Name	Tag		Bits				Address Bits				
	7	6	5	4	3	2	1				
HI Y	0	1	5 MSB OF Y ADDRESS								
LO Y	1	1	5 INTERMEDIATE BITS OF Y ADDRESS								
HI X	0	1	5 MSB OF X ADDRESS								
LO X	1	0	5 INTERMEDIATE BITS OF X ADDRESS								

Table A-4 Shortened Address Capability Transmission Rules

Bytes Changed	HI Y	LO Y	HI X	LO X
HI Y	YES	NO	NO	YES
LO Y	NO	YES	NO	YES
HI X	NO	YES	YES	YES
LO X	NO	NO	NO	YES

A.12 Point Plot Mode

In point plot mode, no vectors are drawn. Instead, single pixels are turned on. The pixel turned on is the physical pixel most closely corresponding to the Tekpoint specified by absolute coordinate values.

Point plot mode values identical to the coordinate values are transmitted for graph mode.

As with graph mode coordinates, a coordinate may be specified that is not within the actual display area, but points so addressed would not be visible.

Point plot mode is entered from alpha or graph mode by using the FS control character. No other control characters or escape sequences are used for point plot mode functions. In the point plot mode, most valid Tektronix 4010/4014 escape sequences and control characters are acted on when received. Escape sequences or control characters that are not valid for Tektronix 4010/4014 functions or that are for functions not implemented in the VAXstation are ignored.

ESC FS will also cause the VAXstation to enter point plot mode from alpha or graph mode. However, this is a fallback function. In Tektronix 4010/4014-series terminals, ESC FS normally selects a special point plot mode, identical to point plot mode, except that the beam intensity is programmable. Tektronix 4010/4014 terminal emulation does not implement special point plot mode.

Once in point plot mode, all coordinate values are transmitted without specifying FS (or ESC FS) again.

A.13 Graphics Input Mode

You invoke graphics input (GIN) mode by entering ESC SUB. The terminal enters a local mode in which the following occurs:

- The VAXstation cross-hair cursor appears, with the hairs intersecting at the current active position.
- Bypass condition is enabled.

Once in GIN mode, the active position can be changed by using the mouse to reposition the cross-hair cursor over the position desired.

If ESC ENQ is received while the cross-hair cursor is being displayed, the address of the intersect point will automatically be sent to the processor. This will be followed by CR or CR and EOT, if selected by setup option. If the SELECT button (the leftmost mouse button) is pressed, GIN mode is terminated with a space as the terminator character.

GIN mode can be terminated while the cross-hair cursor is being displayed, without transmitting to the computer. Command CR or ESC FF will terminate GIN mode, switching the terminal to alpha mode. However, CR may leave the terminal in either margin 1 or margin 2 status, and ESC FF will erase the display. It may be better to terminate by sending ESC ENQ and ignore the transmission at the computer.

A-22 VAXstation Support for Tektronix 4010/4014 Terminals Graphics Input Mode

You can also exit from GIN mode using the keyboard: once the active position has been properly selected (or if already correct on entering GIN mode), pressing any active key on the keyboard will result in the following:

- The ASCII code of the key pressed is sent to the host.
- The coordinates of the cross-hair cursor at the time the key was pressed are sent to the host in 10-bit addressing format.
- The graphics cursor disappears from the screen.
- The VAXstation leaves GIN mode and enters alpha mode.

At this point, however, the VAXstation is still in bypass mode. Further keyboard input is necessary to get the VAXstation out of bypass. See the description of bypass condition in Section A.9 for identification of control characters and escape sequences you can use to terminate bypass.

Appendix B

Additional Features of the VT220 Terminal Emulator

This appendix describes:

- The following additional ways to modify VT220 terminal-emulator attributes (ways other than using the the Workstation Setup menu option—Section 2.5):
 1. Redefining systemwide logical names
 2. Defining escape sequences
- The format of VT220 terminal-emulator mailbox messages, which can be used by an application to track terminal emulator events.

B.1 Optional Ways to Modify VT220 Terminal Emulator Features

The following are ways of modifying VT220 terminal-emulator attributes other than using the Workstation Setup menu option.

B.1.1 Redefining VT220-Emulator Logical Names

VWS defines a number of systemwide logical names that determine the behavior of the VT220 terminal emulator. You can redefine these logical names to suit your needs. For example, the following command redefines the logical name `UIS$VT_AUTO_WRAP_MODE` to wrap text within a VT220 terminal-emulator window when the right margin is reached.

```
$ DEFINE/SYSTEM UIS$VT_AUTO_WRAP_MODE TRUE
```

In this case, for the logical name to take effect you must define it *before* you create a window or execute a `SET TERMINAL` command.

B-2 Additional Features of the VT220 Terminal Emulator

Optional Ways to Modify VT220 Terminal Emulator Features

You can modify the procedure `SYS$MANAGER:SYSTARTUP.COM` to define the logicals you wish to use as defaults. Note that these logical names must be defined systemwide (using the DCL command `DEFINE/SYSTEM`).

Table B-1 lists and describes the logical names you can define for the VT220 emulator.

Table B-1 VT220 Logical Names

LOGICAL NAME	TYPE/DESCRIPTION
<code>UIS\$VT_ANSWERBACK</code>	String, 0 to 40 characters Defines the text to be transmitted when an ENQ is received and Auto Answerback is enabled. By default, no string is defined.
<code>UIS\$VT_AUTO_ANSWERBACK</code>	Logical T/F If TRUE, the terminal will transmit an answerback string in response to a ENQ (<code>^x05</code>) character. If FALSE or undefined, no answerback can be generated. The default is FALSE.
<code>UIS\$VT_AUTO_WRAP_MODE</code>	Logical T/F If TRUE, the terminal will wrap text when the right margin is reached. If FALSE or undefined, the text will not wrap automatically. The default is FALSE.
<code>UIS\$VT_CURSOR_KEY_MODE</code>	Logical T/F If TRUE, the arrow keys will transmit the application-mode CSI sequences. If FALSE or undefined, the arrow keys will transmit the SS3 arrow sequences. The default is TRUE.
<code>UIS\$VT_ENABLE_MBX_EVENTS</code>	Logical T/F If TRUE, terminal emulator events will cause messages to be written to associated terminal mailboxes. See Section B.2. If FALSE or undefined, the messages will not be delivered. The default is FALSE.

Additional Features of the VT220 Terminal Emulator B-3

Optional Ways to Modify VT220 Terminal Emulator Features

Table B-1 (Cont.) VT220 Logical Names

LOGICAL NAME	TYPE/DESCRIPTION
UIS\$VT_ENABLE_OSC_STRINGS	<p>Logical T/F</p> <p>If TRUE, you may define escape sequences that modify VT200 emulator features. See Section B.1.2. If FALSE or undefined, any escape sequences defined to modify VT220 emulator features will not work.</p> <p>The default is FALSE.</p>
UIS\$VT_LOCK_USER_FEATURES	<p>Logical T/F</p> <p>If true, the following user-preference features cannot be altered by SET/RESET MODE Escape Sequences.</p> <p style="padding-left: 40px;">AUTOREPEAT TAB STOPS</p> <p>The default is FALSE.</p>
UIS\$VT_NEW_LINE_MODE	<p>Logical T/F</p> <p>If TRUE, the emulator causes all CR, LF, and VT characters to set the current position to the left margin and the next line. If FALSE or undefined, new-line mode is disabled.</p> <p>The default is FALSE.</p>
UIS\$VT_TAB_STOPS	<p>String, 0 to 168 characters</p> <p>Defines a TAB-stop ruler. The string should be formatted as follows: Where no tab stop is desired, a blank character (space) should be used; where a tab stop is desired, any other character can be used.</p> <p>If this name is not defined, tabs will be set by default for every 8 positions starting in column 9.</p>
UIS\$VT_UDK_LOCK	<p>Logical T/F</p> <p>If TRUE, the emulator will not allow the current value of the user-definable keys (UDK) to be altered.</p> <p>If FALSE or undefined, the UDKs can be altered by the host software.</p> <p>The default is UNDEFINED.</p>

B-4 Additional Features of the VT220 Terminal Emulator

Optional Ways to Modify VT220 Terminal Emulator Features

Table B-1 (Cont.) VT220 Logical Names

LOGICAL NAME	TYPE/DESCRIPTION
UIS\$VT_FONT_DEFAULT	80/132 <p>If 132 is specified (132-column font), the values 7 and 12 are used for the spacing- and point-size defaults respectively. By default, 9 and 14 are used (80-column font size).</p> <p>However, if the FAMILY; SPACING and POINT logical names are also specified, they will override UIS\$VT_FONT_DEFAULT. Table B-2 shows the FAMILY, SPACING and POINT defaults.</p>

Table B-2 VT220 Default Font Specifications

Default Font File and Size		
Logical name	Acceptable Value	Default
UIS\$VT_FAMILY_DEF	7 characters	DTABER0
UIS\$VT_SPACING_DEF	1-n	9
UIS\$VT_POINT_DEF	1-n	14
80-Column Font File and Size		
UIS\$VT_FAMILY_080	7 characters	DTABER0
UIS\$VT_SPACING_080	1-n	9
UIS\$VT_POINT_080	1-n	14
132-Column Font File and Size		
UIS\$VT_FAMILY_132	7 characters	DTABER0
UIS\$VT_SPACING_132	1-n	7
UIS\$VT_POINT_132	1-n	12

B.1.2 Defining VT220-Emulator Escape Sequences

Another way of modifying Terminal Emulator features is to define escape sequences. Escape sequences are special character sequences that when invoked perform specific actions. In the 7-bit environment, each of these sequences begins with the *escape character* located in row 11, column 1 of the DEC Multinational Character Set (MCS)

Additional Features of the VT220 Terminal Emulator B-5

Optional Ways to Modify VT220 Terminal Emulator Features

table. In the 8-bit environment, these sequences may begin with other special characters.

Three types of special character strings affect the terminal emulator:

1. Operating system command (OSC) strings
2. Control sequence introducer strings (CSI)
3. Device control strings (DCS)

Each is described individually in the following sections.

B.1.2.1 Operating System Command (OSC) Sequences

A number of terminal emulation features can be modified using Operating System Command (OSC) strings.

NOTE: For OSC strings to work, you must first enable them by defining the logical name `UIS$VT_ENABLE_OSC_STRINGS` to be `TRUE`.

The following is the format for the DIGITAL private-syntax Operating System Command (OSC) string that affects the VT220 emulator.

```
OSC      2      function code ; [parameters] ST
9/13    3/2                                9/12 ! column/row (MCS)
```

where:

OSC	Special initiating character located at Column 9, Row 13 of the DEC Multinational Character Set
2	Value (decimal) indicating that the sequence is directed to a workstation (Column 3, Row 2 of the MCS table)

B-6 Additional Features of the VT220 Terminal Emulator

Optional Ways to Modify VT220 Terminal Emulator Features

function code

Value (hexadecimal) indicating which terminal emulator feature to modify. Following are the function codes (hexadecimal values) and their meanings:

Value	Meaning
1	Set terminal banner
2	Shrink to icon
3	Expand from icon
4	Move terminal window
5	Move terminal icon
6	Disconnect keyboard
7	Disable keyboard
8	Enable keyboard
9	Push terminal window
A	Pop terminal window

Each of these functions and their respective parameters (if any) are described in following sections.

Additional Features of the VT220 Terminal Emulator B-7

Optional Ways to Modify VT220 Terminal Emulator Features

parameters

Any parameters applicable to the specified function code. The following sections describe which function codes take which parameters. Below is a list of all possible parameters:

new_banner—Text for a window banner. Specify a character string in the range of 0 to 64 bytes

icon_text—Text for an icon image. Specify a character string in the range of 0 to 64 bytes

position—Position for a window or icon. Specify positive, real, X, and Y values that represent the absolute position, in centimeters, from the lower lefthand corner of the display to the lower lefthand corner of the window/icon, using the following format:

[xx.xxx,yy.yyy]

The leading and trailing square brackets are required, as is the comma, for separation. The decimal point is NOT required for whole numbers, nor are leading or trailing zeros.

Window (or icon) positions that would cause all or part of the window to be off-screen will cause the window to be displayed as close as possible to the location, but entirely on-screen.

Note that all parameters must be separated by a semicolon. (The function code is considered a parameter of the OSC string.) You must use a semicolon as a placeholder if a parameter is omitted.

ST

Special termination character located at Column 9, Row 12 of the DEC Multinational Character Set

If you are using the VT220 emulator as a 7-bit environment, the special characters may be represented using two 7-bit characters. OSC is equivalent to ESC] (escape, right-square-bracket) and ST is equivalent to ESC \ (escape, backslash). See the MCS table for numerical representations.

VTESTB—Set Terminal Banner

Changes the text banner of a terminal.

Parameters:

FUNCTION CODE 1

NEW_BANNER If blank, uses the system default banner.

Text is centered. A null string is ignored. A maximum of 64 characters may be specified; all characters after the maximum are ignored.

B-8 Additional Features of the VT220 Terminal Emulator

Optional Ways to Modify VT220 Terminal Emulator Features

Example:

```
<OSC>21;VT220 Terminal<ST>
```

VTESTI—Shrink to Icon

Shrinks a terminal window to an terminal icon.

Parameters:

FUNCTION CODE	2
POSITION	If blank, best fit to BOTTOM-LEFT (if it is the first shrink_ to_icon; otherwise, previous icon position.
ICON_TEXT	If blank, uses VMS PROCESS NAME.

If the terminal is already an icon, the icon will be moved to the position (if specified).

This sequence will generate a SHRINK terminal mailbox message if terminal mailbox messages are enabled and the SHRINK was done.

Examples:

```
<OSC>22; [1.5,2];VT220 Terminal Icon<ST>  
<OSC>22;;VT220 Terminal Icon<ST>  
<OSC>22; [1.5,2]<ST>  
<OSC>22<ST>
```

VTEEFI—Expand from Icon

Expand a terminal icon to a terminal window.

Parameters:

FUNCTION CODE	3
POSITION	If blank, restores to previous position.
NEW_BANNER	If blank, does not change banner.

If the terminal is already expanded, the window will be moved to the position (if specified) and the banner updated. Text is handled the same as in set_terminal_banner.

This sequence will generate an EXPAND terminal mailbox message if terminal mailbox messages are enabled and the SHRINK was done.

Examples:

```
<OSC>23; [5,7];VT220 Terminal Banner Text<ST>  
<OSC>23;;VT220 Terminal Banner Text<ST>  
<OSC>23; [5,7]<ST>  
<OSC>23<ST>
```


Additional Features of the VT220 Terminal Emulator

Optional Ways to Modify VT220 Terminal Emulator Features

B-9

VTEMTW—Move Terminal Window

Move a terminal window.

Parameters:

FUNCTION CODE 4
POSITION Parameter required, otherwise sequence ignored

If the terminal is in an icon state, the position will be used when next expanded to a terminal window.

This sequence will generate a `MOVED_WINDOW` terminal mailbox message if terminal mailbox messages are enabled and the terminal was moved.

Example:

```
<OSC>24; [3.25,6.0] <ST>
```

VTEMTI—Move Terminal Icon

Move a terminal icon.

Parameters:

FUNCTION CODE 5
POSITION Parameter required, otherwise sequence ignored.

If terminal is not in an icon state, the position will be used for the next shrink to icon.

Example:

```
<OSC>25; [5,4] <ST>
```

VTEDCONK—Disconnect Keyboard

Disconnect the physical keyboard.

Parameters:

FUNCTION CODE 6

The physical keyboard is disconnected from the terminal window. If the terminal is an icon, this sequence is ignored. The keyboard may be reconnected to the terminal by cycling using the F5 key.

This sequence will generate a `LOST_KB` terminal mailbox message if terminal mailbox messages are enabled and the terminal is not an icon.

A `UIS$DISABLE_KB` is executed.

Example:

```
<OSC>26<ST>
```

B-10 Additional Features of the VT220 Terminal Emulator

Optional Ways to Modify VT220 Terminal Emulator Features

VTEDK—Disable Keyboard

Disable the virtual keyboard.

Parameters:

FUNCTION CODE 7

The virtual keyboard is disabled. The keyboard may be reconnected to the terminal only by the enable_keyboard sequence.

This sequence will generate a LOST_KB terminal mailbox message if terminal mailbox messages are enabled and the terminal is not an icon.

A UIS\$DISABLE_VIEWPORT_KB is executed.

Example:

```
<OSC>27<ST>
```

VTEEK—Enable Keyboard

Connect the keyboard to the terminal.

Parameters:

FUNCTION CODE 8

The keyboard is connected to the terminal window.

This sequence will generate a GAIN_KB terminal mailbox message if terminal mailbox messages are enabled and the terminal is not an icon.

If the window is an icon, a UIS\$ENABLE_VIEWPORT_KB is done otherwise a UIS\$ENABLE_KB is done.

Example:

```
<OSC>28<ST>
```

VTEPUSH—Push Terminal

Push the terminal window.

Parameters:

FUNCTION CODE 9

The window (terminal or icon) is "pushed" to the background.

Example:

```
<OSC>29<ST>
```

Additional Features of the VT220 Terminal Emulator B-11

Optional Ways to Modify VT220 Terminal Emulator Features

VTEPOP—Pop Terminal

Pop the terminal window.

Parameters:

FUNCTION CODE A

The window (terminal or icon) is "popped" to the foreground.

Example:

```
<OSC>2A<ST>
```

B.1.2.2 Control Sequence Introducer (CSI) Strings

You can set the number of lines and columns on a terminal using Control Sequence Introducer (CSI) strings.

CSI strings are similar to OSC strings except that they begin with the special character CSI (column 9, row 11 of the MCS table). If you are using the VT220 emulator as a 7-bit environment, the special characters may be represented using two 7-bit characters. CSI is equivalent to ESC [(escape, left bracket) See the MCS table for numerical representations.

DECSLPP—Set Lines Per Page (DEC Private)

This sequence sets the number of display lines per page according to the numeric parameter. It has the format:

```
CSI Pn t  
9/11 7/4 ! column/row (MCS)
```

where:

- CSI Special initiating character located at column 9, row 11 of the DEC Multinational Character Set.
- Pn Number of display lines per page. If this parameter is omitted or zero, the page length is defaulted to 24. A maximum of 64 may be set in the current version of the emulator.
- t Terminating character located at column 7, row 4 of the DEC Multinational Character Set.

DECSLPP does not cause Page Memory to be cleared, the scrolling regions to be reset, or the Active Position to move. The scrolling margins may be reset to the extremes of the new Page Configuration if the current scrolling margin exceeds the physical limits of the new Page height. Information may be lost if the new height of the pages selected by the DECSLPP is too small to hold the previous information.

B-12 Additional Features of the VT220 Terminal Emulator

Optional Ways to Modify VT220 Terminal Emulator Features

Examples:

```
<CSI>50t    ! Sets the terminal to 50 lines.  
<ESC>[20t   ! Sets the terminal to 20 lines.  
<CSI>t      ! Sets the terminal to the default (24 lines).
```

DECSCPP—Set Columns Per Page (DEC Private)

This sequence sets the number of columns on the display page. It has the format:

```
CSI Pn $ |  
9/11 2/4 7/12 ! column/row (MCS)
```

where:

CSI Special initiating character located at column 9, row 11 of the DEC multinational character set.

Pn Number of columns on the display page. If this parameter is omitted or zero, the page width is defaulted to 80.

\$ Terminating character located at column 2, row 4 of the DEC multinational character set.

| Terminating character located at column 7, row 12 of the DEC multinational character set.

DECSCPP does not cause display memory to be cleared, the scrolling regions to be reset, or the Active Position to move. The scrolling margins may be reset to the width of the new Page Configuration if the current scrolling margin exceeds the width of the new Page Information may be lost if the new width of the pages selected by the DECSCPP is too small to hold the previous information.

NOTE: The number of columns per page can also be changed through Column Mode (DECCOLM). This should be considered the "old method" of changing the width of the page.

Examples:

```
<CSI>95$|    ! Sets the width to 95 columns  
<CSI>$|      ! Sets the width to the default (80 columns).  
<ESC>[160$|  ! Sets the width to 168 columns.
```

Additional Features of the VT220 Terminal Emulator B-13

Optional Ways to Modify VT220 Terminal Emulator Features

B.1.2.3 Device Control Sequences (DCS)

You can inquire the terminal emulation features page width and page length using two Device Control Sequence (DCS) strings in combination with each other. You inquire the state of the length or width using DECRQSS, and the emulator responds using DECRPSS.

DCS strings are similar to OSC strings except that they begin with the special character DCS (column 9, row 11 of the MCS table). If you are using the VT220 emulator as a 7-bit environment, the special characters may be represented using two 7-bit characters. DCS is equivalent to ESC P and ST is equivalent to ESC \ (escape, backslash). See the MCS table for numerical representations.

DECRQSS—Request Selection or Setting (DEC Private)

Request Selection or Setting is sent to Terminal to determine the setting of page width or page length. It has the format:

```
DCS $ q D...D ST
9/0 2/4 7/1          9/12 ! column/row (MCS)
```

where:

- DCS Special initiating character located at column 9, row 0 of the DEC multinational character set.
- \$ Required intermediate character located at column 2, row 4 of the DEC multinational character set.
- q Required intermediate character located at column 7, row 1 of the DEC multinational character set. Number of display lines per page.
- D...D Terminating characters of the control string which set the feature. Must be one of the following:
 - \$ l—Set Columns Per Page (DECSCPP)
 - t—Set Lines Per Page (DECSLPP)
- ST Terminating character located at column 9, row 2 of the DEC multinational character set.

NOTE: Only one setting at a time may be queried through the use of the DECRQSS device control string.

Examples:

```
<DCS>$q$ | <ST> ! Requests the number of columns per page.
```

```
<DCS>$qt<ST> ! Requests the number of lines per page.
```

B-14 Additional Features of the VT220 Terminal Emulator

Optional Ways to Modify VT220 Terminal Emulator Features

DECRPSS—Report Selection or Setting (DEC Private—Terminal to Host)

The Report Selection or Setting device control string is issued from the terminal emulator in response to a Request Selection or Setting command; when possible it returns the setting of the page width or page length. It has the format:

```
DCS Ps $ r D...D ST
9/0 2/4 7/2 9/12 ! column/row (MCS)
```

where:

DCS	Special initiating character located at column 9, row 0 of the DEC multinational character set.
Ps	Indicates whether the request was successful: 0—Request successful, data contains selection information. 1—UNKNOWN selection or setting, request unsuccessful.
\$	Required intermediate character located at column 2, row 4 of the DEC multinational character set.
r	Required intermediate character located at column 7, row 2 of the DEC multinational character set. Number of display lines per page.
D...D	Data returned by the DECRPSS control string. This is the entire control string that would be sent to the emulator to set the page length or width to arrive at the current setting. Note though that the leading Control Sequence Introducer character (CSI, or ESC [in 7 bits) is omitted. The returned control will contain no omitted parameters, even if the inquired value is the default value.
ST	Terminating character located at column 9, row 2 of the DEC multinational character set.

NOTE: Note that the coding of the DECRPSS control string that indicates UNKNOWN, is always coded as follows:

```
DCS 1 $ r ST
```

Examples:

In response to a <DCS> \$qt <ST> command with the current number of lines at 50 the response would be:

```
<DCS>0$r50t<ST>
```

In response to a <DCS> \$q\$| <ST> command with the current number of columns at 132 the response would be:

```
<DCS>0$r132$ | <ST>
```

B.1.2.4 How to Create and Invoke Escape Sequences

The simplest way to create and invoke escape sequences is through DCL. Creating an escape sequence in DCL differs depending on whether you are using a 7-bit environment or 8-bit environment. The following examples use the OSC strings to demonstrate both methods.

For the 7-bit Environment:

- Create an escape character by loading the correct ASCII value into the first seven bits of a symbol, as follows:

```
$ escape[0,7]==27
```
- Invoke the OSC string by using the escape in conjunction with other characters to construct the OSC and ST special characters. The following example defines a symbol to "push" the terminal window.

```
$ push := write sys$output ""''escape']29''esc'\''''
```

Note that you may wish to go one step further and define a key to perform the function, as follows:

```
$ define/key PF2 "push" /nolog/noecho/term
```

For the 8-bit Environment

- Create the necessary special characters by loading the correct ASCII value into the first eight bits of a symbol for each, as follows:

```
$ osc[0,8]==157  
$ st[0,8]==156
```
- Invoke the OSC string using DCL. The following example defines a symbol to redefine the terminal window banner.

```
$ banner := write sys$output ""''osc'21'';'New Window Banner''st''''
```

Using TPU to Create Escape Sequences

You may also use the TPU command *copy_text* to insert special characters into a command file when creating escape sequences. Executing the command file executes the included escape sequences. The following example inserts an escape character into a file:

```
copy_text(ascii(27))
```

B-16 Additional Features of the VT220 Terminal Emulator

VWS Terminal Mailbox Messages

B.2 VWS Terminal Mailbox Messages

Terminal mailbox messages are important to applications that wish to keep track of events on particular terminal windows. For messages to be delivered, the following must be true:

- A terminal must have an associated mailbox.
- The logical name `UIS$VT_ENABLE_MBX_EVENTS` must be defined to be `TRUE`. The default value is `FALSE`.

The following lists the events that cause a message to be written, along with the message name and message value:

Name	Value	Event
<code>MSG\$TRMLOSE_KB</code>	(105)	Keyboard disabled
<code>MSG\$TRMGAIN_KB</code>	(106)	Keyboard enabled
<code>MSG\$TRMSHRINK</code>	(107)	Window shrunk to icon
<code>MSG\$TRMEXPAND</code>	(108)	Icon expanded to window
<code>MSG\$TRMRESIZE</code>	(109)	Window resized
<code>MSG\$TRMMOVE</code>	(110)	Window moved

Figure B-1 illustrates the standard Terminal Mailbox Message format.

Figure B-1 Standard Mailbox Message Format

```
+-----+
| Unit          | Message Type | 0
+-----+
| Controller name | Count | 4
+-----+
=
+-----+
|
+-----+
```

Of the five events that may occur only two, `RESIZE` and `MOVE`, return any data. Each is described below.

RESIZE message format

A resize event returns:

- New origin as F_FLOATING data, in centimeters (as returned by UIS\$GET_VIEWPORT_POSITION)
- New size as INTEGER data, in columns and rows

Figure B-2 illustrates the resize message format:

Figure B-2 Format for Resize Message

Unit	Message Type	0
Controller name	Count	4
=		=
New_X (left)		20
New_Y (bottom)		24
New_Width		28
New_Height		32

MOVE message format

A move event returns:

- New origin as F_FLOATING data, in centimeters (as returned by UIS\$GET_VIEWPORT_POSITION)

B-18 Additional Features of the VT220 Terminal Emulator VWS Terminal Mailbox Messages

Figure B-3 illustrates the move message format:

Figure B-3 Format for MOVE message

```
+-----+
| Unit          | Message Type | 0
+-----+
| Controller name | Count | 4
+-----+
=
+-----+
|   New_X (left)   | 20
+-----+
|   New_Y (bottom) | 24
+-----+
```

Appendix C

Compose Sequences

This appendix provides reference material for using compose sequences in VT220 terminal emulation. This material includes the following:

- Instructions for composing special characters
- Table of valid compose sequences in multinational mode
- Table of valid compose sequences in national mode

C.1 Composing Characters

You can use *compose sequences* to create characters that do not exist as standard keys on your keyboard. To use a compose sequence, you press a series of keys. There are two types of compose sequences:

- three-stroke sequences
- two-stroke sequences

The compose sequences you can use depend on the character set mode selected (multinational or national). Table C-1 lists the valid compose sequences for multinational mode. Table C-2 lists the valid compose sequences for each keyboard in national mode. In national mode, the compose sequences you can use depend on the keyboard selected.

You can use three-stroke sequences on all VT220 keyboards. First you press the Compose Character (or Symbol) key, then you press two standard keys whose characters form a valid compose sequence.

You can use two-stroke sequences on all keyboards except the North American keyboard. Two-stroke sequences are faster than three-stroke sequences, but are limited to sequences starting with the following nonspacing diacritical marks:

- accent grave
- acute accent

C-2 Compose Sequences

Composing Characters

circumflex accent
tilde mark
diaeresis mark (umlaut)
ring mark

Two-stroke sequences do not use the Compose Character key. Instead, you enter a nonspacing diacritical mark first. You then enter a standard character that forms a valid compose sequence with the diacritical mark. (Some keyboards have keys that contain both a standard character and a diacritical mark. When you do compose sequences with these keys, the Shift and Lock keys work as usual).

Diacritical marks vary depending on the LK201 variation. Rather than diacritical marks, the North American keyboard has equivalent characters.

Diacritical Mark	Equivalent Character
Diaeresis (umlaut) mark	Double quote "
Acute accent	Apostrophe '
Grave accent	Single quote `
Circumflex accent	Circumflex character ^
Tilde mark	Tilde character ~
Ring mark	Asterisk * or degree °

Tables C-1 and C-2 list all valid compose sequences for multinational and national modes respectively. Depending on the keyboard, you can create characters in column 1 in one or more ways.

- With a standard key (if available on that keyboard)
- With a three-stroke compose sequence
- With a two-stroke compose sequence (if the diacritical mark is available on the keyboard)

C.1.1 Using a Three-Stroke Compose Sequence

Create a three-stroke compose sequence as follows:

1. Find the character you want to create in column 1 of Table C-1 or C-2.
2. Press the Compose Character key. (The Compose indicator comes on, indicating the terminal is in compose mode.)
3. Type the two characters in column 2 for the character you want to create.

For example, to create *e* with an acute accent, press Compose Character, and then type *e* and an apostrophe; or press Compose Character, and then type an apostrophe and *e*.

When you complete a valid sequence, the screen displays the composite character and the Compose indicator turns off. If you use an invalid sequence, the sequence is aborted and the bell sounds (if the warning bell is enabled in the setup menu).

NOTE: Function keys abort a compose sequence without sounding the bell.

C.1.2 Using a Two-Stroke Sequence

NOTE: You can use two-stroke compose sequences on all keyboards except the North American keyboard.

Create a two-stroke compose sequence as follows:

1. Find the character you want to create in column 1 of Table C-1 or C-2. Verify in column 3 that the character can be created.
2. Press the key with the diacritical mark shown in column 3. (The Compose indicator comes on, indicating the terminal is in compose mode.)
3. Type the second character shown in column 3.

For example, to create *e* with an accent grave on a Danish keyboard, press the key that has the grave accent and then type *e*.

When you complete a valid sequence, the screen displays the composite character and the Compose indicator turns off. If you use a invalid sequence, the sequence is aborted and the bell sounds (if the warning bell is enabled in the setup menu).

NOTE: Function keys abort a compose sequence without sounding the bell.

C.1.3 Aborting or Restarting a Compose Sequence

If you accidentally enter compose mode (by pressing the Compose Character key or a diacritical mark key), press the DELETE key (**<X>**) key to immediately terminate the compose sequence and exit compose mode. The terminal does not display a composite character.

If you press Compose Character during a compose sequence, a new three-stroke sequence starts from that point. The previous sequence cannot be displayed.

Table C-1 lists the two-stroke and three-stroke compose sequences for multinational mode.

Table C-2 lists the two-stroke and three-stroke compose sequences for national mode.

In three-stroke sequences, you can enter required characters in any order unless the table states "order sensitive." You must enter all two-stroke sequences in the order shown.

C-4 Compose Sequences Composing Characters

Note that when you see (sp), you need to press the space bar.

Table C-1 Valid Compose Sequences: Multinational Mode

Composite Character	Meaning	Three-Stroke Sequence	Two-Stroke Sequence
"	quotation mark	" (sp)	" (sp)
#	number sign	++	
'	apostrophe	' (sp)	' (sp)
@	commercial at	a a or A A	
[opening bracket	((
\	backslash	// or / <	
]	closing bracket)	
^	circumflex accent	(sp)	(sp)
'	single quote	' (sp)	' (sp)
{	opening brace	(-	
	vertical line	/^	
}	closing brace)-	
~	tilde	(sp)	(sp)
¡	inverted !	!!	
¢	cent sign	c/ or C/ or c! or C!	
£	pound sign	l- or L- or l= or L=	
¥	yen sign	y- or Y- or y= or Y=	
§	section sign	so or SO or S! or s! or s0 or S0	
Ø	currency sign	xo or XO or x0 or X0	
©	copyright sign	co or CO or c0 or C0	
ª	feminine ordinal indicator	a- or A-	
«	angle quotation mark left	< <	
°	degree sign	0^ or (sp)#	° (sp)
±	plus/minus sign	+-	

Compose Sequences C-5
Composing Characters

Table C-1 (Cont.) Valid Compose Sequences: Multinational Mode

Composite Character	Meaning	Three-Stroke Sequence	Two-Stroke Sequence
²	superscript 2	2^	
³	superscript 3	3^	
μ	micro sign	/~ or /U (order sensitive)	
¶	paragraph sign	p! or P!	
•	middle dot	.^	
¹	superscript 1	1^	
º	masculine ordinal indicator	o_ or O_	
»	angle quotation mark right	> >	
¼	fraction one-quarter	1 4 (order sensitive)	
½	fraction one-half	1 2 (order sensitive)	
¿	inverted ?	??	
À	A grave	A`	`A
Á	A acute	A'	'A
Â	A circumflex	A^	^A
Ã	A tilde	A~	~A
Ä	A umlaut	A" or A "	"A
Å	A ring	A* or A° (degree sign)	`A
Æ	A E ligature	AE (order sensitive)	
Ç	C cedilla	C,	
È	E grave	E`	`E
É	E acute	E'	'E
Ê	E circumflex	E^	^E
Ë	E umlaut	"E or E "	"E
Ì	I grave	I`	`I
Í	I acute	I'	'I
Î	I circumflex	I^	^I
Ï	I umlaut	I" or I "	"I
Ñ	N tilde	N~	~N

C-6 Compose Sequences Composing Characters

Table C-1 (Cont.) Valid Compose Sequences: Multinational Mode

Composite Character	Meaning	Three-Stroke Sequence	Two-Stroke Sequence
Ò	O grave	O`	`O
Ó	O acute	O´	´O
Ô	O circumflex	Oˆ	ˆO
Õ	O tilde	O~	~O
Ö	O umlaut	O" or O¨	¨O
Œ	O E ligature	O E (order sensitive)	
Ø	O slash	O/	
Ù	U grave	U`	`U
Ú	U acute	U´	´U
Û	U circumflex	Uˆ	ˆU
Ü	U umlaut	U" or U¨	¨U
ÿ	Y umlaut	Y" or Y¨	¨Y
ß	German small sharp s	ss	
à	a grave	a`	`a
á	a acute	a´	´a
â	a circumflex	aˆ	ˆa
ã	a tilde	a~	~a
ä	a umlaut	a" or a¨	¨a
ä	a ring	a* or a° (degree sign)	oa
æ	a e ligature	a e (order sensitive)	
ç	c cedilla	c , (comma)	
è	e grave	e`	`e
é	e acute	e´	´e
ê	e circumflex	eˆ	ˆe
ë	e umlaut	e" or e¨	¨e
ì	i grave	i`	`i
í	i acute	i´	´i
î	i circumflex	iˆ	ˆi
ï	i umlaut	i" or i¨	¨i
ñ	n tilde	n~	~n

Table C-1 (Cont.) Valid Compose Sequences: Multinational Mode

Composite Character	Meaning	Three-Stroke Sequence	Two-Stroke Sequence
ò	o grave	o`	`o
ó	o acute	o'	'o
ô	o circumflex	o^	^o
õ	o tilde	o~	~o
ö	o umlaut	o" or o "	"o
œ	o e ligature	o e (order sensitive)	
ø	o slash	o/	
ù	u grave	u`	`u
ú	u acute	u'	'u
û	u circumflex	u^	^u
ü	u umlaut	u" or u "	"u
ÿ	y umlaut	y" or y "	"y

Table C-2 Valid Compose Sequences: National Mode

Composite Character	Meaning	Three-Stroke Sequence	Two-Stroke Sequence
British Keyboard			
£	pound sign	l- or L- or l= or L=	
\	backslash	/ <	
Flemish Keyboard			
£	pound sign	-L or -l or =L or =l	
§	section	!s or !S or sO or oS	
'	apostrophe	` (sp)	
ù	u grave	`u	
è	e grave	`e	

C-8 Compose Sequences Composing Characters

Table C-2 (Cont.) Valid Compose Sequences: National Mode

Composite Character	Meaning	Three-Stroke Sequence	Two-Stroke Sequence
French Canadian Keyboard			
à	a grave	`a	`a
â	a circumflex	^a	^a
ç	c cedilla	,c	
é	e acute	'e	'e
ê	e circumflex	^e	^e
è	e grave	`e	`e
î	i circumflex	^i	^i
ô	o circumflex	^o	^o
ù	u grave	`u	`u
û	u circumflex	^u	^u
Danish Keyboard			
#	number sign	++	
'	apostrophe	' (sp)	
@	commercial at	a a or A A	
'	single quote	'(sp)	
æ	a e ligature	a e (order sensitive)	
Ä	A umlaut	``A	``A
Å	A ring	*A	
Ø	O slash	O/	
ä	a umlaut	..a	..a
å	a ring	*a	
ø	o slash	o /	
ü	u umlaut	``u	``u

Table C-2 (Cont.) Valid Compose Sequences: National Mode

Composite Character	Meaning	Three-Stroke Sequence	Two-Stroke Sequence
Finnish Keyboard			
#	number sign	++	
@	commercial at	a a or A A or aA	
`	apostrophe	`(sp)	
"	quotations	"(sp)	
Ä	A umlaut	"A	
Ö	O umlaut	"O	
Å	A ring	*A	
Ü	U umlaut	"U	
é	e acute	'e	
ä	a ring	*a	
ä	a umlaut	a"/	
ö	o umlaut	o"	
ü	u umlaut	"u	
German Keyboard			
#	pound sign	++	
`	apostrophe	`(sp)	
"	quotations	"(sp)	
Ä	A umlaut	"A	
Ö	O umlaut	"O	
§	section sign	sO or !S or s!	
Ä	A umlaut	"A	
Ö	O umlaut	"O	
Ü	U umlaut	"U	
ä	a umlaut	"a/	
ö	o umlaut	"o	
ü	u umlaut	"u	
^	circumflex character	^(sp)	
'	opening single quote	'(sp)	
ß	German sharp s	ss	

C-10 Compose Sequences Composing Characters

Table C-2 (Cont.) Valid Compose Sequences: National Mode

Composite Character	Meaning	Three-Stroke Sequence	Two-Stroke Sequence
Dutch Keyboard			
£	pound sign	-l or -L or =l or =L	
`	apostrophe	`(sp)	
"	quotations	"(sp)	
¼	fraction one-quarter	1 4 (order sensitive)	
¾	three quarters	3 4 (order sensitive)	
ij	i j sign	i j (order sensitive)	
½	fraction one-half	1 2 (order sensitive)	
Florin		f- (order sensitive)	
`	opening single quote	`(sp)	
Italian Keyboard			
£	pound sign	-l or -L or =l or =L	
`	apostrophe	`(sp)	
"	quotations	"(sp)	
°	degree sign	^o	
§	section sign	os or OS or !S or !s or 0s or 0S	
ˆ	circumflex accent	^(sp)	
à	a grave	`a	`a
é	e acute	'e	
è	e grave	`e	
ì	i grave	`i	
ò	o grave	`o	
ù	u grave	`u	

Table C-2 (Cont.) Valid Compose Sequences: National Mode

Composite Character	Meaning	Three-Stroke Sequence	Two-Stroke Sequence
Swiss (French) Keyboard			
`	apostrophe	`(sp)	
"	quotations	"(sp)	
à	a grave	`a	
ä	a umlaut	``a	
ç	c cedilla	,c	
é	e acute	´e	
è	e grave	`e	
ê	e circumflex	ˆe	ˆe
î	i circumflex	ˆi	ˆi
ô	o circumflex	ˆo	ˆo
ö	o umlaut	``o	
û	u circumflex	ˆu	ˆu
ù	u grave	`u	`u
ü	u umlaut	``u	
Swiss (German) Keyboard			
`	apostrophe	`(sp)	
"	quotations	"(sp)	
à	a grave	`a	`a
ä	a umlaut	``a	
ç	c cedilla	,c	
é	e acute	´e	
è	e grave	`e	
ê	e circumflex	ˆe	ˆe
î	i circumflex	ˆi	ˆi
ô	o circumflex	ˆo	ˆo
ö	o umlaut	``o	
û	u circumflex	ˆu	ˆu
ù	u grave	`u	`u
ü	u umlaut	``u	

C-12 Compose Sequences Composing Characters

Table C-2 (Cont.) Valid Compose Sequences: National Mode

Composite Character	Meaning	Three-Stroke Sequence	Two-Stroke Sequence
Swedish Keyboard			
`	apostrophe	`(sp)	
"	quotations	"(sp)	
#	number sign	++	
Å	A ring	*A	
Ä	A umlaut	"A	
É	E acute	'E	
Ö	O umlaut	"O	
Ü	U umlaut	"U	
å	a ring	*a	
ä	a umlaut	"a	
é	e acute	'e	
ö	o umlaut	"o	
ü	u umlaut	"u	
Norwegian Keyboard			
`	apostrophe	`(sp)	
"	quotations	"(sp)	
#	number sign	++	
Å	A ring	*A	
Ä	A umlaut	"A	
@	commercial at	a a or A A	
Æ	A E ligature	AE (order sensitive)	
Ø	O slash	O/	
å	a ring	a*	
æ	a e ligature	a e (order sensitive)	
ø	o slash	o/	
ˆ	circumflex accent	ˆ (sp)	
`	opening single quote	`(sp)	
˜	tilde	˜ (sp)	

Table C-2 (Cont.) Valid Compose Sequences: National Mode

Composite Character	Meaning	Three-Stroke Sequence	Two-Stroke Sequence
French/Belgian Keyboard			
'	apostrophe	`(sp)	
"	quotations	“(sp)	
£	pound sign	-l or -L or =l or =L	
§	section sign	oS or os or !S or !s or Os or OS or OS or Os	
°	degree sign	O^	
à	a grave	`a	
ç	c cedilla	c,	
é	e acute	'e	
è	e grave	`e	
ù	u grave	'u	
'	opening single quote	'(sp)	
^	circumflex accent	^(sp)	
Spanish Keyboard			
'	apostrophe	`(sp)	
"	quotations	“(sp)	
£	pound sign	-l or -L or =l or =L	
§	section sign	oS or os or !S or !s or Os or OS or OS or Os	
¡	inverted !	!!	
¿	inverted ?	??	
°	degree sign	^O	
Ñ	N tilde	~N	
^	circumflex character	^(sp)	
'	opening single quote	'(sp)	
ñ	n tilde	~n	
~	tilde	~(sp)	
ç	c cedilla	c,	

C-14 Compose Sequences
Composing Characters

Table C-2 (Cont.) Valid Compose Sequences: National Mode

Composite Character	Meaning	Three-Stroke Sequence	Two-Stroke Sequence
Portuguese Keyboard			
`	apostrophe	`(sp)	
"	quotations	(sp)"	
@	commercial at	a a or A A	
Ã	A tilde	~A	
Ç	C cedilla	C,	
Õ	O tilde	~O	
ã	a tilde	~a	
õ	o tilde	~o	
`	opening single quote	'(sp)	
^	circumflex character	^(sp)	

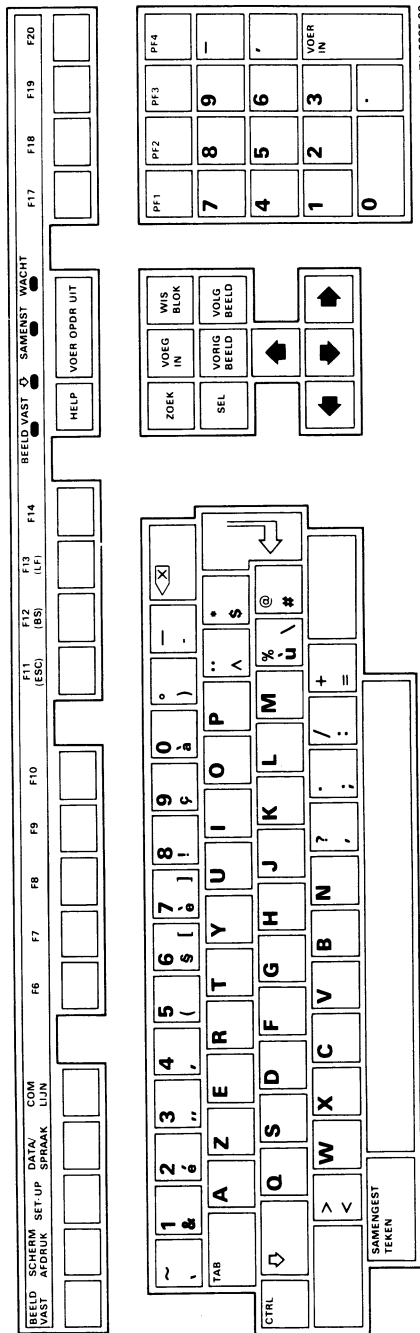
Appendix D

National Keyboards for VT220 Emulation

This appendix provides illustrations of all national keyboards for VT220 terminal emulation, in the following order:

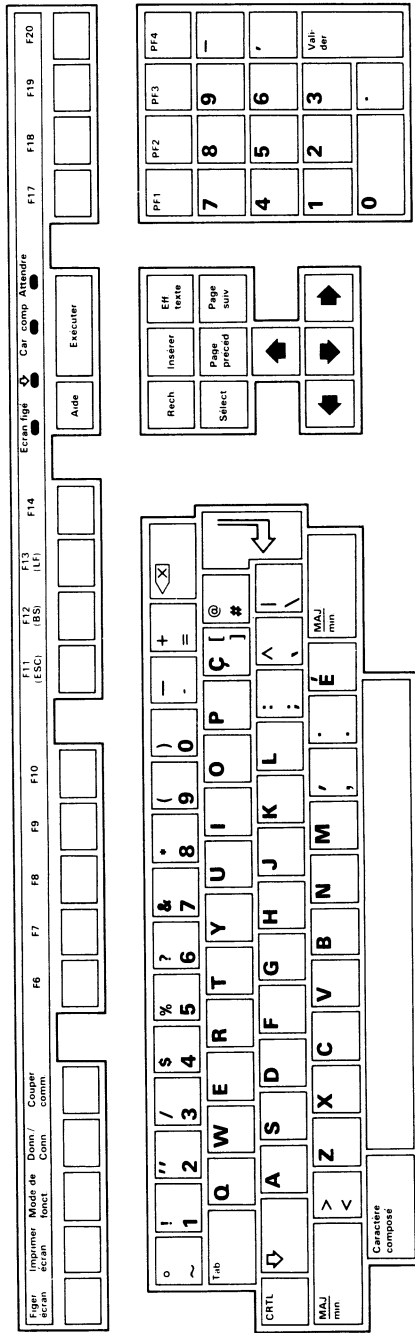
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- British
- Flemish-Belgian
- Canadian-French
- Danish
- Finnish
- French
- German
- Dutch
- Italian
- Norwegian
- Spanish
- Swedish
- Swiss-French
- Swiss-German

Figure D-3 Flemish-Belgian



ZK-5335-86

Figure D-4 Canadian-French



ZK-5334-86

D-4 National Keyboards for VT220 Emulation

Figure D-5 Danish

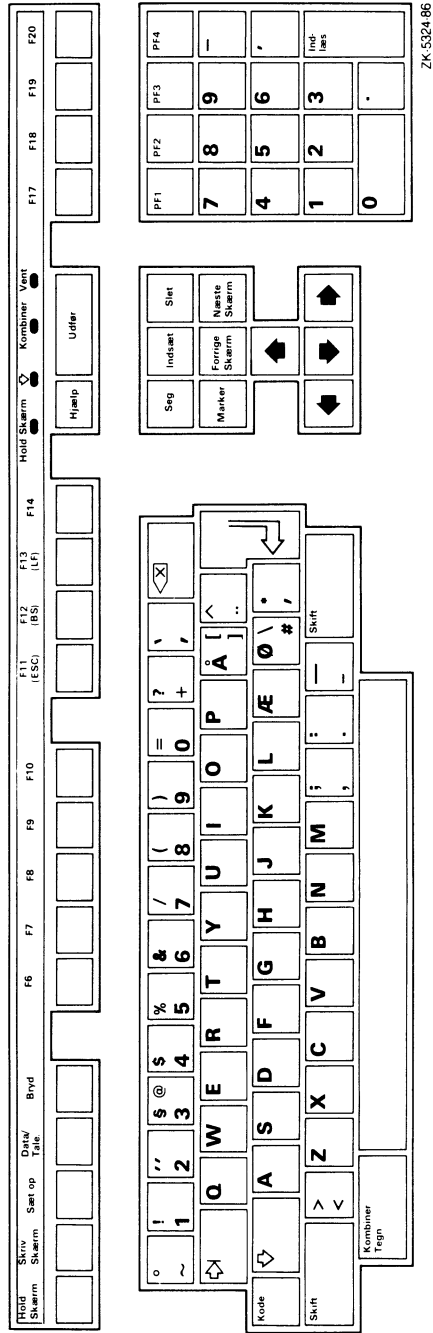
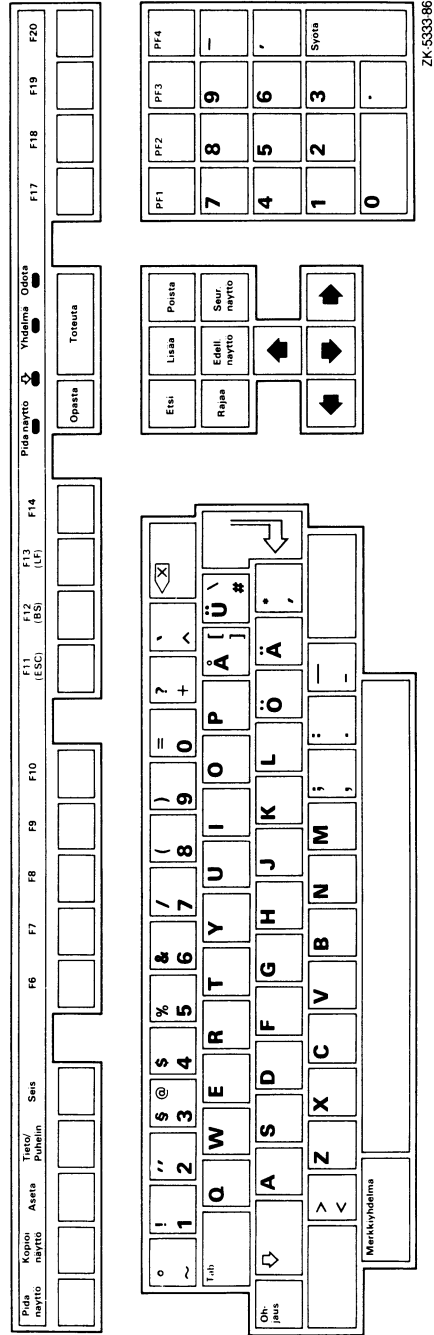


Figure D-6 Finnish



D-6 National Keyboards for VT220 Emulation

Figure D-9 Dutch

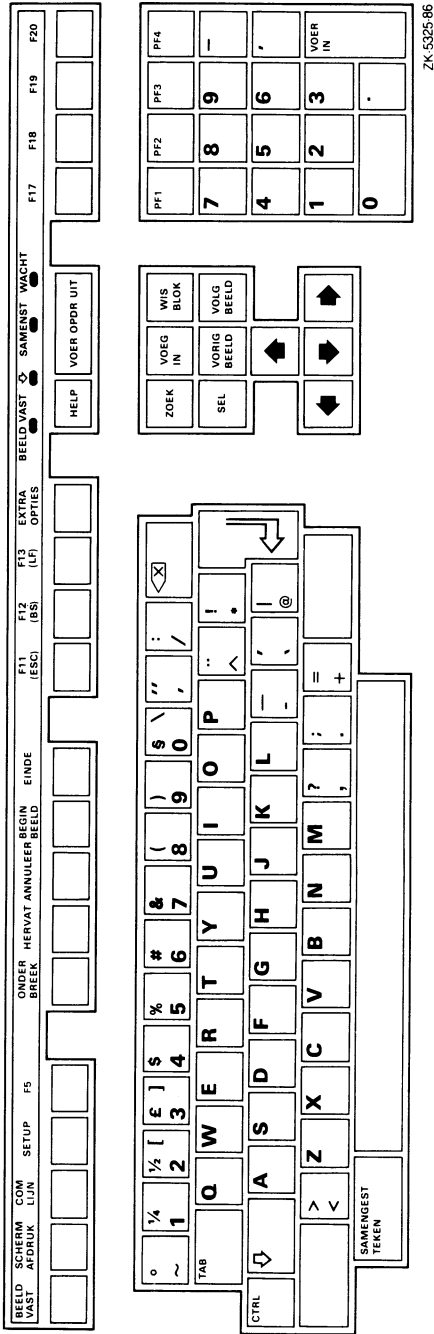
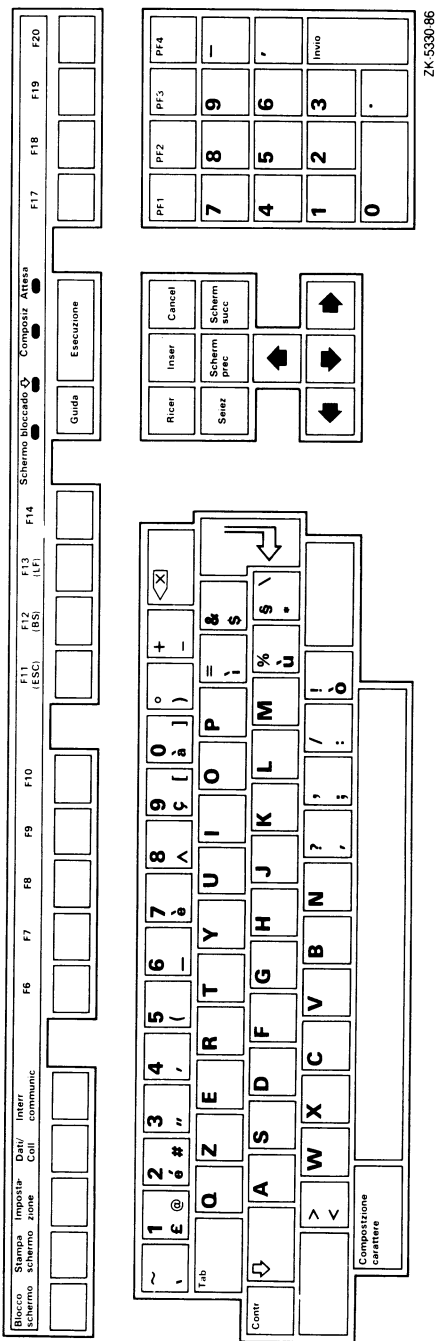


Figure D-10 Italian



D-8 National Keyboards for VT220 Emulation

Figure D-13 Swedish

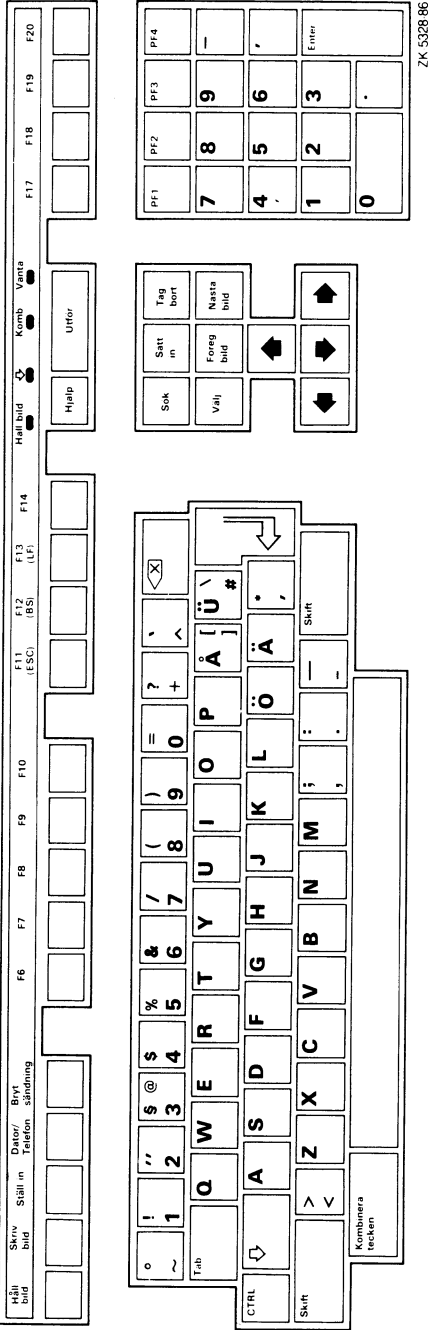


Figure D-14 Swiss-French

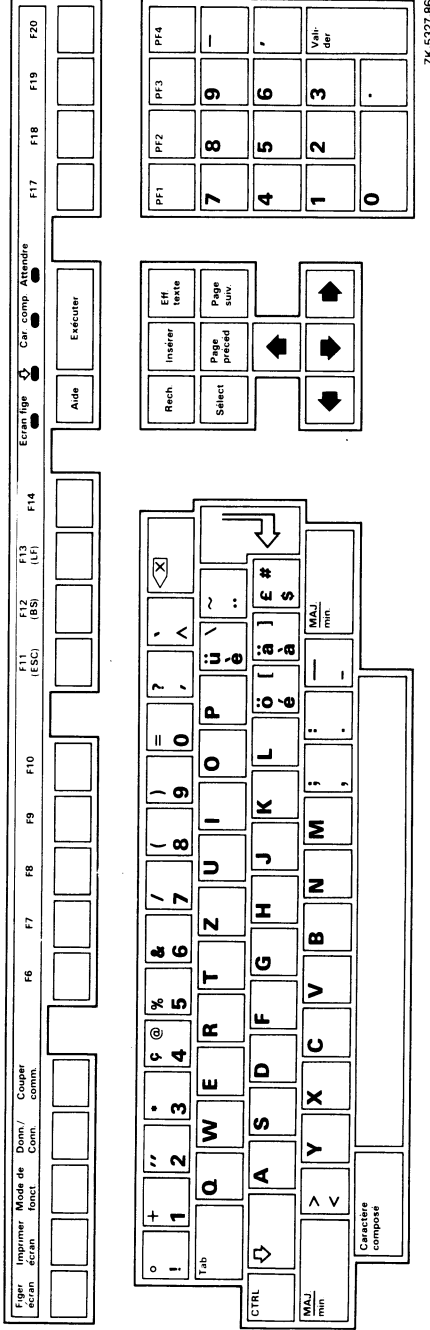
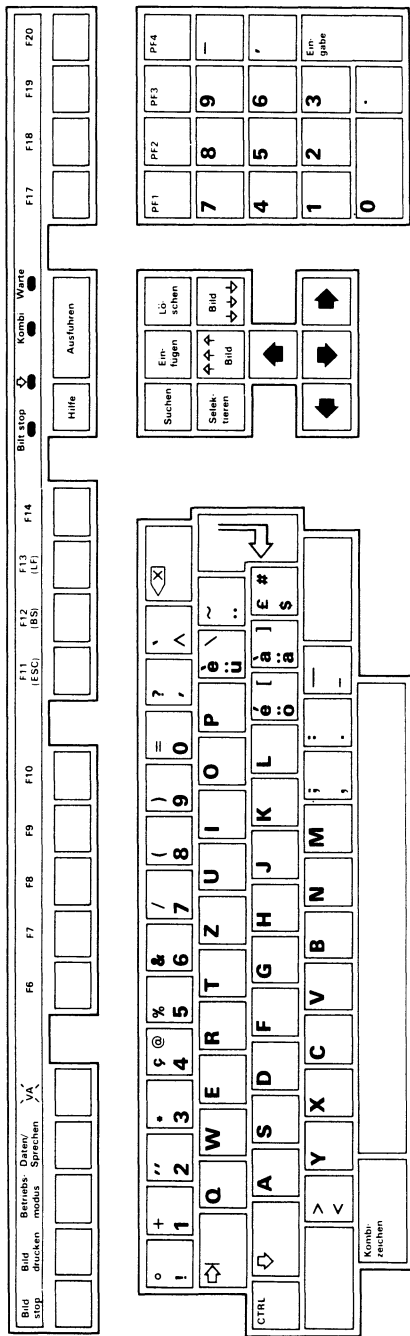


Figure D-15 Swiss-German



ZK-5326-86



Index

A

- Automatic login, 2-11
 - using simultaneously with interactive login, 2-29
- Autorepeat keyboard function
 - setup, 2-17

B

- Background color
 - display, 2-12
 - window, 2-12
- Banner, 3-3
 - icon, 3-3
 - KB (keyboard), 3-3
 - window options, 3-3
- Bell volume
 - setup, 2-17

C

- Change Active Window function key, 1-10
- Color setup
 - preferred, 2-20
 - on color system, 2-22
 - on intensity system, 2-21
 - on monochrome system, 2-21
 - standard, 2-12
 - on color system, 2-16
 - on intensity system, 2-14
 - on monochrome system, 2-13
- Color system
 - standard color setup, 2-16
- Compose sequences, C-1

Control keys

- See Function keys
- Cycling the keyboard, 3-8

D

- Device name
 - format, 2-23
- Display manager process
 - restarting, 2-2

F

- Foreground color
 - pointer, 2-12
 - window, 2-12
- Function keys, 1-10 to 1-11
 - Change Active Window, 1-10
 - F5 (CYCLE), 3-8
 - Hold Screen, 1-10
 - Operator Window, 1-10
 - Switch Windowing System, 1-10
 - Tektronix 4010/4014 terminal emulation, 2-6
 - VT220 terminal emulation, 2-4

H

- Help
 - VAXstation, 2-3
- Help key, 1-3
- Hold Screen function key, 1-10

Index-2

I

Icon

definition of, 1-3

Intensity system

standard color setup, 2-14

K

Keyboard

autorepeat, 2-17

character choice setup, 2-17

connecting to a window, 3-1

cycling, 3-8

function keys

See Function keys

interaction with VT220 emulation, 3-1

language

setup, 2-18

lock state

setup, 2-18

setup, 2-17

Keyclick volume, 2-18

L

Language

keyboard setup, 2-18

Logical device name

format, 2-23

Login, 3-1

automatic, 2-11, 2-29

used with interactive, 2-29

M

Menu

definition of, 1-3

exiting from, 1-4

icon, 3-3

Messages

status, 1-2

MicroVMS Workstation software

MicroVMS Workstation software (cont'd.)

getting started, 2-1

help, 2-3

Monochrome system

standard color setup, 2-13

Mouse

how to use, 1-5 to 1-6

moving windows using, 3-8

printing portion of screen using, 2-7

SELECT button, 1-5

selecting a menu option, 2-1

Mouse fallback keys, 1-6

O

Operator window

connecting to, 1-10, 1-11

functions on color and intensity systems,
1-12

how to use, 1-11 to 1-12

Operator Window function key, 1-10

P

Pen

See Stylus

Pointer

background color

selecting, 2-12

definition of, 1-4

foreground color

selecting, 2-12

moving windows using, 3-8

moving with mouse, 1-5

moving with puck, 1-8

moving with stylus, 1-9

printing portion of screen using, 2-7

SELECT button, 1-4

setup, 2-19

Pointing device

how to use, 1-4

mouse, 1-5

puck, 1-8

stylus, 1-9

types, 1-4

- Print destination
 - selecting from Workstation Setup menu, 2-23
- Printer setup, 2-22
- Print operation
 - canceling, 2-7
 - changing print destination, 2-8, 2-23
 - sending to remote device, 2-8
 - using pointer, 2-7
- Print queue, 2-23
- Print status
 - selecting from Workstation Setup menu, 2-23
- Puck, 1-7
 - how to use, 1-8
 - using with Tektronix 4010/4014 terminal emulation, 2-6

S

- Saving current settings, 2-29
- Screen
 - background color
 - selecting, 2-12
 - printing portion of, 2-7, 2-8
- Screen display
 - printing, 2-7
 - writing to file, 2-8
- Screen saver
 - disabling, 2-24
- Setting
 - restoring, 2-29
- Software
 - MicroVMS Workstation
 - See MicroVMS Workstation software
- Stylus, 1-7
 - how to use, 1-9
 - SELECT button
 - setup, 2-20
 - using with Tektronix 4010/4014 terminal emulation, 2-6
- Switch Windowing System
 - function key, 1-10

T

- Tablet
 - how to use, 1-7 to 1-9
- Tektronix 4010/4014 terminal emulation
 - alpha mode, A-17
 - character size, A-18
 - margin processing, A-17
 - ASCII character codes, A-3
 - attributes, 2-24
 - bypass condition, A-16
 - changing operational modes, A-14
 - clearing the screen, A-15
 - DELETE character, 2-24
 - description of VAXstation support, A-1 to A-22
 - EOT character, 2-24
 - escape sequences, A-11 to A-14
 - delete character, A-14
 - ignored, A-11
 - miscellaneous, A-14
 - request terminal status, A-11
 - select bypass condition, A-12
 - select character size, A-12
 - select point plot mode, A-12
 - select vector patterns, A-13
 - set alpha mode, A-12
 - set GIN mode, A-12
 - set LCE flag, A-13
 - features, 2-6
 - function keys, 2-6
 - graphic input (GIN) mode, 2-6, A-21
 - graph mode, A-18
 - drawing command, A-19
 - encoding of coordinates, A-20
 - implementation restrictions, A-2
 - modes and functions, A-1
 - point plot mode, A-20
 - RETURN character, 2-24
 - screen addressing, A-2
 - setup support, A-3
- Terminal emulation
 - See Tektronix 4010/4014 terminal emulation
 - See VT220 terminal emulation

Index-4

V

- VT220 terminal emulation, 2-3 to 2-5
 - attributes, 2-25
 - character set, 2-25, 2-26
 - keypad mode, 2-26
 - margin bell, 2-26
 - page length, 2-27
 - SIXEL scrolling, 2-27
 - text cursor, 2-27
 - transmission mode, 2-27
 - VT terminal type, 2-28
 - warning bell, 2-28
- compose sequences, C-1
- connecting to keyboard, 3-1
- function keys, 2-4

W

Window

- background color
 - selecting, 2-12
- banner, 3-3
 - icon, 3-3
 - KB (keyboard), 3-3
 - window options, 3-3
- changing size of
 - using DCL, 3-10
 - using pointer, 3-6
- connecting to, 3-8
- creating, 2-3, 3-1
- cycling, 1-10
- definition of, 1-1
- deleting, 3-5
- foreground color
 - selecting, 2-12
- getting started, 1-3
- help, 2-3
- managing memory, 3-1
- moving, 3-8
- options
 - change the size, 3-6
 - delete, 3-5
 - pop in front, 3-5
 - push behind, 3-5

Window

- options (cont'd.)
 - shrink to an icon, 3-6
 - status message, 1-2
 - Tektronix 4010/4014 terminal emulation, 2-6
 - terminal-emulator, 1-1
 - VT220 terminal emulation, 2-3, 3-1
- Window size
 - changing, 3-6, 3-10
- Window Options menu, 3-4 to 3-7
- Workstation Options menu, 2-1 to 2-31
 - help, 2-3
 - invoking, 2-2
 - modifying, 2-29
 - printing portion of screen, 2-7
 - selecting an option, 2-1
 - selecting an option, 2-2
 - setting up the workstation, 2-9
 - Tektronix 4010/4014 Terminal Emulation, 2-6
 - VT220 terminal emulation, 2-3, 3-1
- Workstation setup
 - automatic login, 2-11
 - bell volume, 2-17
 - color display
 - standard, 2-12
 - display background color, 2-12
 - exiting, 2-29
 - keyboard, 2-17
 - keyboard autorepeat, 2-17
 - keyboard language, 2-18
 - keyclick volume, 2-18
 - lock state, 2-18
 - menu, 2-9 to 2-29
 - pointer background color, 2-12
 - pointer foreground color, 2-12
 - pointer setup, 2-19
 - button order, 2-19
 - stylus SELECT button, 2-20
 - preferred color, 2-20
 - print destination, 2-23
 - printer, 2-22
 - aspect ratio, 2-22
 - color conversion, 2-23
 - print queue management, 2-23

Workstation setup (cont'd.)

- print status, 2-23
- restoring to last settings, 2-29
- restoring to original default settings,
2-28
- saving current settings, 2-29
- screen saver period, 2-24
- Tektronix 4010/4014 terminal emulation
attributes, 2-24
- VT220 terminal emulation attributes,
2-25
 - character set, 2-25
- window background color, 2-12
- window foreground color, 2-12
- workstation type, 2-28

Workstation software

See MicroVMS Workstation software

Workstation types, 1-1

See also Color system, Intensity system,
Monochrome system



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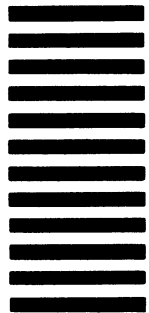
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