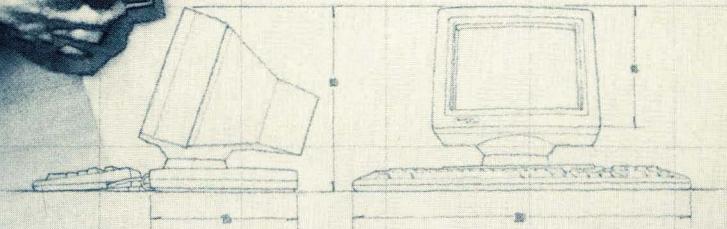


GraphOn 14

User's Guide



*GraphOn X terminals
bring your desktop
into the 1990's*



GraphOn 14 User's Guide



GraphOn

First Edition

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Chapter 1

Introduction

1.1 Terminal Features

The GraphOn 14 offers these features:

- X Window System compatibility in conjunction with host-based X server software
- 800 x 600 resolution (expandable to 800 x 920 through software implementation)
- Sophisticated local mouse/digitizer support
- Raster Operators for font and bitmap manipulations
- VT220 and VT100 emulation
- Up to 30 lines of text in VT emulation
- General purpose communications ports

The GraphOn 14 system provides complete support of the X Window System Version 11 over an RS-232 serial communications line. This system consists of a GraphOn 14 display device and the GraphOn X Server Software running on the host.

This manual provides the information required to connect, configure, and use the GraphOn 14 display device.

The GraphOn 14 allows its user to communicate with a host computer in two different ways. It has VT220 and VT100 emulation for efficiently manipulating and displaying text. And it has the graphics capabilities required to run the X Window System.

The GraphOn 14 may communicate directly with a local printer to generate copies of either the graphics or alphanumeric display. In VT220/VT100 emulation, it may also act as a go-between, allowing the computer to transmit characters to the printer with or without the characters being displayed at the terminal.

1.2 The X Window System

The X Window System, also called X, consists of a display server program and a set of application program interface libraries that allow multiple applications running on multiple hosts to share a single display, each showing output in a different window on the screen.

Much of the importance of X is that it has been ported to a large number of systems. This allows diverse hardware platforms to provide a single, device-independent graphical user interface for application programs. This greatly simplifies the task of porting applications between different systems.

1.3 How the X Window System Works

X manages a screen, a keyboard and a mouse, making these resources available to software applications which are known as X clients, or simply "clients." The "X server" serves these clients by allocating to them screen space, in the form of "windows," and access to the keyboard and the mouse. It further provides these clients with information such as exposure events (when all or part of a previously obscured window is uncovered), keyboard input, mouse position, etc.

Clients access these functions through subroutine calls contained in a library called Xlib. These calls, such as XClearWindow and XDrawString, are converted by Xlib into a byte stream protocol which is then communicated to the X server.

In practice, clients generally use a software “tool kit” to manage their dealings with X. These tool kits provide two main benefits. They simplify the programming task for applications by hiding the low level details of X. And, by providing ready to use “widgets” such as scroll bars and radio buttons, they help to enforce a consistent “look and feel” across many applications.

X is network transparent in that it can as easily handle display requests from co-resident processes as it can from processes executing on other systems networked to the host. Therefore, client processes may exist anywhere on the network, allowing the user to view multiple applications running on any number of hosts.

1.4 The GraphOn Architecture

The X server consists of two major sections — the device independent interface (dix) and the device dependent interface (ddx). The dix handles the high level functions of managing windows, communicating over networks, and parsing the X protocol. It is independent of the display hardware.

The ddx implements the device dependent functions required to support the windowing system. It draws lines and polygons, it performs the “raster operations” which copy text and other rasters between the screen and off-screen memory and from screen to screen, and it manages the keyboard and mouse, reporting mouse position and up and down transitions of both keys and mouse buttons.

Every hardware manufacturer who supports the X Window System creates a ddx which drives its own implementation of screen, keyboard, and mouse. In general, ddx and the dix are executed on the same processor.

GraphOn’s implementation distributes the load between two processors linked by a serial communications line. The GraphOn architecture places the dix on the host system. The ddx is distributed between the host system and the GraphOn 14 terminal.

This architecture yields important benefits in an X terminal. These become apparent when one considers the assumptions which the designers of X made regarding potential X-capable hardware platforms. First, X assumes that it will not run out of memory — so, either a lot of memory must be available, or virtual memory must be supported. Virtual memory is preferred, since the X protocol places no limits on the number of windows which may be opened.

Second, since fonts are managed by and accessible to the server alone and not to the clients, the server benefits from local access to a file system on disk where fonts may be stored.

Thus, it is very useful to have X running on workstations and other hosts which can provide virtual memory and local disk storage, which are not normally found in terminals.

Another benefit of the GraphOn architecture is simply that two processors do the work. Since the actual low level drawing tasks are performed by the processor in the display device, many of these tasks can be executed concurrently with other server functions executing in the host.

1.5 Understanding the Various Communications Protocols Used by the GraphOn 14

Although the GraphOn architecture uses RS-232 for communicating graphics commands to the terminal, this communications line usage should not be confused with the typical use of the local area network with the X Window System.

In a conventional X platform, a workstation runs an X server which drives its own display. Clients use standard operating system facilities which allow them to communicate with each other and with the X server. These facilities are just as comfortable communicating across a network as they are communicating locally. Thus, clients may run on any system on the network and communicate with the server over that network.

Client/server communication is no different in the GraphOn 14. The server runs on the host, and clients may run on that host or on other hosts on the network.

The RS-232 link is used by the X server to communicate its own protocol with the display device — the X byte-stream protocol does not traverse the serial line.

In fact, the GraphOn 14 realizes significant speed improvement by transmitting compressed data to the terminal, rather than the raw X byte-stream.

The GraphOn 14 has full access to the network by utilizing the host system as a gateway onto the network. Full network support is preserved.

A significant benefit of using an optimized protocol on the RS-232 line is that it becomes possible to use X at relatively low baud rates in order to use a modem. Even 2400 baud communication, while perhaps not the ideal environment for running X, is useful and fully functional.

1.6 How to Run X on the GraphOn 14

As described above, the GraphOn architecture divides X into two pieces, with the bulk of the X server residing on the host. In order to run X, the GraphOn X Server Software must be installed on your host system. This software is available from GraphOn — if you don't have it, contact your GraphOn Sales Representative.

All files and documentation necessary to install, run, and learn about the X Window System on the GraphOn 14 are contained in the GraphOn X Server Software package. The manuals which come with the GraphOn X Server Software will step you through:

- loading the software on your host
- performing any system configuration necessary
- starting the X server
- using X applications
- terminating the X session

1.7 VT220/VT100 Emulation

The GraphOn 14 provides full VT220 emulation and VT100 emulation in addition to its X support. It is provided for compatibility with systems which do not yet have X capability, for applications which demand more rigorous VT220/VT100 emulation than is provided by X, and as the medium for logging on and starting up an X session.

To be precise, the alphanumeric mode of the GraphOn 14 is an emulation of either the Digital Equipment Corporation VT220 or the VT100 with Advanced Video Option and serial printer interface. The emulations are so complete that the GraphOn 14 is truly “plug compatible” with these terminals — the computer “thinks” that it is connected to a VT220 or VT100. All functions of these terminals are supported, which allows the user to access the full range of DEC-compatible software.

The VT220 emulation supports such features as a downloadable character set, selective erase, 8-bit control code support, and DEC’s Multinational Character Set.

The VT100 emulation responds to commands from the host computer in the same manner as a real VT100. Of course, the GraphOn 14 supports the VT220’s emulation of the VT100, as well.

Up to 30 lines of text may be displayed and manipulated.

1.8 Miscellaneous Features

General Purpose Serial Communications Ports

The GraphOn 14 provides three generalized RS-232 ports for serial communication with one or more of the following devices:

- computers
- output devices such as printers
- input devices such as mice and digitizing tablets

Since any type of device may be attached to any of the ports at the back of the GraphOn 14, these ports are labeled 'A', 'B', and 'C' rather than 'Main', 'Printer', etc. Setup mode provides the means of establishing which ports are attached to each type of device.

In addition to connecting any type of device to any port, devices of the same type may be connected. For example, it is possible to connect the terminal to two or three computers. All device connections are configured using Setup mode.

Also, since the terminal can redirect I/O through any of the ports, it is a simple matter to redirect a screen dump away from the printer and back to the host computer instead.

Local Mouse/Digitizer Support

The GraphOn 14 supports graphic input devices such as mice and digitizers.

The input device interface is designed to make it possible to achieve a high degree of interactivity with X without swamping the host communications line with data from the input device. High level cursor controls have been implemented in the terminal to achieve this goal.

Raster Operators

The GraphOn 14 supports a generalized set of “raster operators.” A raster is any rectangular array of pixels which has two horizontal sides and two vertical sides. Alphanumeric character cells, all pixels in the bitmap, the piece of a picture which gets covered by a pop-up menu, and the menu itself are all examples of rasters.

Raster operators allow host-based software to manipulate these arrays usefully and efficiently. Sophisticated controls are supported in the terminal to handle fixed space and proportionally spaced fonts.

1.9 What This Manual Contains

This manual is divided into 8 chapters.

Chapter 1 provides an introduction to the GraphOn 14.

Chapter 2 describes the various functions of the keys on the keyboard.

Chapter 3 describes how to use Setup mode to configure the terminal.

Chapter 4 describes how to use a locally attached graphic input device such as a mouse.

Chapter 5 describes how use a locally attached printer.

Chapter 6 describes how you can attach more than one host computer to the terminal.

Chapter 7 describes the information displayed on the status line.

Chapter 8 describes how the terminal communicates with host computers and printers.

Appendix A takes you step-by-step through installation of the terminal.

Appendix B provides troubleshooting information.

Appendix C contains 7- and 8-bit ASCII tables.

Appendix D provides a summary of the control codes and ESC sequences supported by the GraphOn 14.

Chapter 2

Keyboard

2.1 General

The keyboard of the GraphOn 14 is used for communicating text and numeric data to a host computer. It is also used for communicating with the terminal itself. This occurs in Setup mode and may also occur during normal operation through the use of special keys.

The QWERTY section of the keyboard is very similar to the keyboard of a standard typewriter. It is used for transmitting text, numbers, and special characters. In addition, there are two keypads — immediately to the right of the QWERTY section is the extended cursor keypad, and beyond that is the 18 key numeric keypad for rapid entry of numeric data. And there is a full row of keys above the main typing area. This row contains both special purpose and user-programmable function keys.

Despite its general similarity to a typewriter keyboard, there are many keys which will be unfamiliar to first time terminal users. There are also some keys which are unique to the GraphOn 14. These special keys are described in section 2.3.

While the functions of many keys are dependent upon the application software being run, many of these functions remain the same between various DEC-compatible packages and even X clients. For example, the arrow keys generally move some sort of cursor or other indicator up, down, right, or left, in any application. For this reason, the functions of the keys discussed below generally apply equally well to usage inside and outside of X. Where definite differences exist, these are described and clearly marked.

2.2 Using the Keyboard in X

The bottom line on keyboard usage in the X Window System is that X takes complete control. All keys (with the three exceptions listed below) are made available to clients, and therefore the standard VT220 compatible Setup, Break, etc. keys do not have their usual effect.

In order to support a wide variety of hardware platforms, X works with a large assortment of keyboard layouts. This can occur because the X Server informs clients about the quantity and types of keys which are available. So, the theory goes, applications can adapt themselves to the capabilities of the hardware being used.

In the real world, however, applications do make assumptions about the presence of particular keys. So, in order to ensure compatibility with applications which expect to communicate with a VT220-style keyboard, the GraphOn 14 makes available to the X Server every key which exists on the DEC keyboard. The five keys at the upper left of the keyboard, generically known as F1 thru F5 and better known as Hold, Print, Setup, etc., are no exception. Rather than performing their usual special functions, these keys are passed off to the X Server just as are all others.

Several of these missing functions, though, are crucial to the operation of a terminal. So, the GraphOn 14 places these functions on the three top keys of the extended cursor keypad. The X server is not informed when these keys are pressed, but since they do not exist on DEC keyboards, they will not be missed by X applications.

2.3 Key Descriptions

Top Row Keys

In X...

The top row of the keyboard consists of function keys F1 through F20. The function of all of these keys is determined by the X client which is currently receiving input from the keyboard.

As described in Section 2.2, F1 through F5 are no different from the remaining function keys — the special functions supported on these keys in VT220/VT100 emulation are either not applicable in X or are handled by the Hold, Print, and Setup keys on the extended cursor keypad (see below). This makes F1 through F5 available to applications which require the full use of the function keys.

Any user or host-defined functions for F6 through F20 are ignored in X, again to ensure that all keys are recognizable and available to each X client.

In VT220/VT100 Emulation...

The top row of the keyboard holds keys which perform special functions in VT220/VT100 emulation. Some of these keys are processed locally by the terminal for its own purposes. The others are special keys whose functions are either interpreted by the application software or defined by the user or host computer.

<u>KEY</u>	<u>ACTION</u>
Hold	Same as the Hold key in the Extended Cursor Keypad, below.
Print	Same as the Print key in the Extended Cursor Keypad, below.
Setup	Same as the Setup key in the Extended Cursor Keypad, below.

Status

The Status key acts as a toggle which allows you to turn the status line on and off. If the status line is being displayed, press Status to turn it off. If it is off, press Status to turn it on. Also, the Status key may be pressed to erase the warning reported if the power up self-tests detect an error.

The Status key does not transmit any codes.

Break

Press Break to transmit a break signal approximately 250 msec in duration.

If the Shift key is held down when Break is pressed, a long break is sent which is approximately 3.5 seconds in duration. The terminal lowers an outgoing hardware handshaking signal for the duration of the break signal. DTR is lowered if the break signal is sent out Port A. DSR is lowered if the break signal is sent out Port B. No outgoing handshaking is supported at Port C. Shift-Break may be used with many modems to perform a communications line disconnect.

If the Ctrl key is down when Break is pressed, the VT220/VT100 answerback message is sent.

F6-F14**Help****Do****F17-F20**

These keys operate differently depending upon whether or not the Shift key or Ctrl key is held down while they are pressed.

Unshifted, these keys operate in a manner identical to the VT220. The meaning of these keys is dependent upon the application software. They generate codes when VT220 emulation is active. In VT100 or VT52 modes, only three of these keys generate codes. These are:

F11 generates ESC

F12 generates BS

F13 generates LF

If the Shift or Ctrl key is held down, these keys become user- or host-definable function keys. You can define these keys to transmit whatever you like by going into Setup mode and entering the character or string of characters to be transmitted.

Although there are only 15 of these user or host definable function keys on the keyboard, they may transmit up to 45 different functions. Fifteen are available if the Shift key is held down. A second group of fifteen is available if the Ctrl key is held down. Finally, by making a selection in the Function Key Setup screen, even the unshifted function keys may be programmed to transmit user- or host-definable functions instead of their normal VT220 functions. Note that if this selection is made, application programs which expect to receive standard VT220 function key sequences may not work correctly.

Extended Cursor Keypad

The extended cursor keypad holds a variety of different types of keys. Some perform special terminal-oriented commands, some are dedicated to VT220 compatibility, and others move the cursor.

The top three keys, Hold, Print, and Setup, function identically in or out of X. The remaining keys transmit codes whose functions are determined by the DEC compatible application software or X client.

KEY

ACTION

Hold

Press the Hold key to tell the GraphOn 14 to stop processing incoming characters temporarily. The screen will be frozen in its current state until the Hold condition is ended, usually by pressing Hold a second time.

Hold operates only if handshaking (either XON/XOFF or hardware) is enabled at the current main port.

The Hold key performs the same function as the Hold Screen key of the VT220 and the No Scroll key of the VT100.

Print

This key will copy alphanumeric text from a VT220/VT100 emulation to any locally attached serial ASCII printer. It will copy a bit dump of any screen to any of several graphics printers.

Press the Print key, unshifted, to print the contents of the screen to a locally attached printer. If the VT220/VT100 emulation is active, the GraphOn 14 will print text characters. While in X, the GraphOn 14 will send a bit dump of the contents of the display to the printer, but only if that printer is capable of printing graphics.

Press Shift-Print to print a bit dump of the display to a graphics printer, regardless of the contents of the display. This may be used in order to print an exact copy of what is on the screen. This may be particularly useful to get an exact bit dump of the VT220/VT100 emulation — since it is a bit-for-bit copy of the screen, reverse video characters are printed in reverse, double wide characters are printed double wide, etc.

Press Ctrl-Print to put the VT220/VT100 emulation in auto print mode. Auto print causes each line of received text to be printed as it is displayed. For more information, see Chapter 5 Printing.

The GraphOn 14 always prints to the port which is defined as the printer port in the General Setup screen.

The Print key does not transmit any codes to the host.

Setup

Press this key to cause the GraphOn 14 to enter or exit Setup mode. Setup mode is described in Chapter 3.

If the Setup key is pressed during a local print operation (print screen, auto print mode, etc.), the print operation will be cancelled. See Chapter 5 Printing for a complete description of stopping a print operation.

Shift-Setup performs the same function as the Status key. It toggles the status line on and off.

The Setup key does not transmit any codes to the host.

Find
Insert Here
Remove
Select
Prev Screen
Next Screen

These keys transmit special codes to the computer. The action taken by the computer depends upon the software package being used.

No codes are transmitted in VT100 emulation.

Up arrow
Down arrow
Left arrow
Right arrow

The action taken by the computer depends upon the software package being used. Not unreasonably, many DEC compatible applications and X clients use these keys to move the cursor in one of four directions on the display.

Numeric Keypad

The numeric keypad is used for the rapid entry of numeric data and occasionally for application specific functions. It also supports four additional function keys.

PF1 - PF4

In VT220/VT100 emulation, these keys are equivalent to PF1 through PF4 on a VT220 or VT100 keyboard. In X, they are simply additional keys which can be used as the X client sees fit. In both cases, the action taken depends upon the software package being used.

Numeric Keypad

The numeric keypad combines, in one location, number keys and other keys commonly used for the entry of numeric data. Under most circumstances, these keys transmit the same codes as the corresponding keys in the main keyboard.

In X...

X clients are not restricted to using these keys as number keys. They may be used as desired by the X client.

In VT220/VT100 mode...

It is possible for the computer to instruct the GraphOn 14 to use the keys of the numeric keypad for special functions. When this occurs, the keys transmit special codes which are different from those transmitted by the corresponding keys in the QWERTY section. The computer recognizes these special codes and processes them accordingly. So called "Keypad Editors" are examples of programs which use this feature.

Enter

Normally, the Enter key performs the same function as the Return key. However, both DEC compatible applications and X clients may redefine the use of this key.

Special Keys of the QWERTY Section

Esc Transmits the ASCII code ESC.

Back Space  Transmits the ASCII code BS.

Tab Transmits the ASCII code HT.

Delete  Transmits the ASCII code DEL.

Ctrl The Ctrl key does not transmit a key by itself. Instead, it is used to modify the codes sent by other keys. To key in Control-A (ASCII code SOH), for example, hold down the Ctrl key and press the "A" key.

Return This key usually transmits a carriage return (ASCII code CR). In VT220/VT100 emulation with new line mode set, the Return key transmits a carriage return and a line feed (ASCII code LF).

Lock The Lock key is a locking key which does not transmit a code by itself. Rather, it modifies the action of other keys. The exact form of that modification depends upon whether X or VT220/VT100 emulation is running, and upon the setting of the "Lock" field in the Keyboard Setup screen.

In X...

The Lock key, as is true for all other keys, is under the control of the X Server. It generally acts as a Shift Lock key, regardless of the setting of the "Lock" field in Setup.

In VT220/VT100 Emulation...

When the Lock key is set to act as a Caps Lock key in the Keyboard Setup screen, it causes all lower case alphabetic characters to be converted to upper case. All other keys are unaffected.

When the Lock key is set to act as a Shift Lock key, it causes all keys to perform their shifted functions.

The Lock key may also be selected to have no action whatsoever.

Shift This key does not transmit a code by itself. Instead, it is used to transmit the upper case characters or alternate functions of other keys. Hold down either Shift key, then press the key whose shifted function is to be transmitted.

LF

Transmits the ASCII code LF (line feed).

Comp Char

The Compose Character key may be programmed to provide any of three distinct functions in VT220/VT100 emulation. In X, its function is fixed.

In X...


The Compose Character key functions as a Meta key. The Meta key is similar to the Shift and Ctrl keys in that it is used to modify the action of other keys or of the mouse buttons while in X. The use of Meta is so integral to X that its function cannot be altered in Setup mode.

In VT220/VT100 Emulation...

The three functions available to VT220/VT100 emulation are Compose Character, Meta, and Hold Screen. The function performed by this key is selected in the Keyboard Setup screen.

When Compose Character is selected, this key functions identically to the Compose Character feature of the VT220. It allows users in VT220 environments to type national characters and other special symbols which are not part of the US ASCII character set.

To type these special characters, press and release the Compose Character key. The Compose LED will light, indicating that you are in the middle of a Compose Character sequence. Next, type the two characters required to generate the character you desire. A list of the special characters, and which keys to press to generate them, is given in Figure 2.2. For example, to type “ç”, press Compose Character, followed by “c” and “/”.

Press Delete  to abort a Compose Character sequence any time before the last key is typed.

The Compose Character function works only in VT220 emulation.

If the Compose Character key is performing the Meta function, the key works entirely differently, though the end result may be the same. The Meta key is used to generate any ASCII character with its 8th bit set to one.

The Meta key works in a manner identical to the Ctrl key or Shift key — hold down the Meta key and press any standard ASCII key while still holding down the Meta key.

For example, to transmit Meta-A, hold down the Meta key and type "A". Normally, the terminal sends the hexadecimal value \$41 for an "A". Holding down the Meta key will cause the terminal to transmit \$C1.

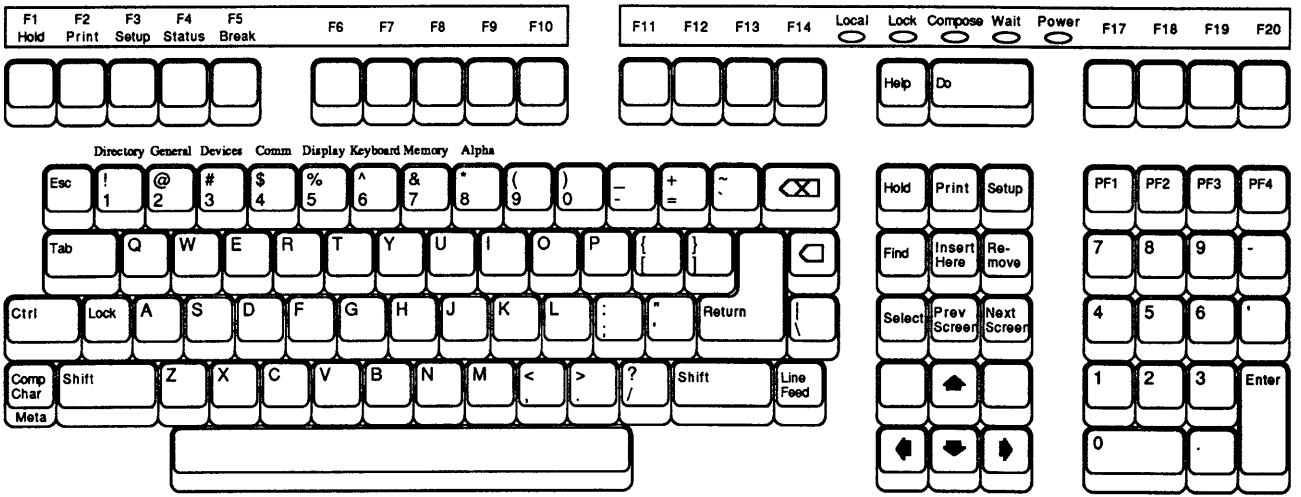
The Meta key is extremely useful when using several UNIX-based text editors.

The third and final possible function of the Compose Character key is Hold. If you are used to using a VT100 keyboard, you may wish to have a Hold key (called No Scroll on the VT100) in the lower left corner of the keyboard, where it is found on the VT100. By selecting the Hold function for the Compose Character key, VT100 users may have the No Scroll function in a familiar place.

2.4 Keyboard Layout

Figure 2.1 shows the keyboard layout of the GraphOn 14. The figure shows the ASCII characters generated by the keyboard under most circumstances.

Figure 2.1 GraphOn 14 Keyboard Layout



2.5 Keyboard LEDs

The keyboard uses five light emitting diodes (LEDs) to report several aspects of the terminal's operation. See the keyboard layout in Figure 2.1.

Local

The Local LED indicates whether the terminal is in local mode or in online mode. If the terminal is online, characters entered at the keyboard are transmitted to the host. Characters received from the host are displayed on the screen. If the terminal is in local mode, characters entered at the keyboard are displayed directly on the screen and are not sent to the host. Characters received from the host are saved and are displayed later once the terminal is put back online.

The Local LED blinks if the terminal is online and the Hold key has been pressed. The LED will cease blinking and turn off when the Hold condition ends.

Lock

The Lock LED indicates the state of the Lock key. If the Lock key has been pressed once, the LED will turn on, indicating that either Caps Lock or Shift Lock is active (see the description of the Lock key, above). If the Lock key is pressed a second time, the LED will turn off.

Compose

In VT220 emulation, the Compose LED indicates that you are in the middle of a Compose Character sequence.

The VT100 did not have Compose Character capability, so this LED is not used in VT100 emulation.

In X, the Compose LED indicates that raster data is being uploaded or downloaded to the terminal.

Wait

The Wait LED indicates whether key strokes are being accepted from the keyboard. Under most circumstances, the keyboard is unlocked and typed characters are processed normally.

If the Wait LED is turned on, the terminal has been unable to process characters as quickly as they have been typed. This may occur for two reasons. First, the terminal may have received a handshaking signal from the host telling it to stop transmitting characters. Second, if the terminal is in the middle of a very time consuming operation, such as printing the screen, it will not process any keystrokes until the print is complete.

If the terminal is unable to process a keystroke immediately, it saves that keystroke so that it can process it later. If so many characters are typed that the terminal runs out of storage space, it will lock the keyboard, turn on the Wait LED, and not accept any more keystrokes.

When the situation causing the delay ends, the GraphOn 14 processes the stored characters and turns off the Wait LED.

Power

The Power LED glows at all times when the terminal is on.

2.6 Compose Character Tables

The GraphOn 14 supports “compose sequences” as a means of generating characters that are not directly supported by the keyboard. In general, compose sequences generate 8-bit displayable characters which belong to the DEC Supplemental Graphics character set.

Compose sequences are supported only in VT220 emulation.

A compose sequence is performed by pressing the Compose Character key (labeled “Comp Char”), then pressing two keys whose characters form a valid compose sequence. No code is transmitted to the host until the full compose sequence has been entered.

Figure 2.2 lists the compose sequences supported by the GraphOn 14.

Table note: To generate the indicated code, press the Compose Character key, followed by the two keys indicated in the table. The order in which the keys is pressed is not significant unless otherwise noted.

Code	Keys to press	Code	Keys to press	Code	Keys to press
"	" space	¤	xo or XO or x0 or X0	À	A`
#	++	©	co or CO or c0 or C0	Á	A'
'	' space	ª	a_ or A_	Â	A^
@	aa or AA	«	<<	Ã	A~
[	((	°	0^ or * space	Ä	A"
\	// or /<	±	+-	Å	A*
]	))	²	2^	Æ	Æ (order sensitive)
^	^ space	³	3^	Ç	C,
`	` space	µ	/u or /U (order sensitive)	È	E`
{	(-	¶	p! or P!	É	E'
|	/^	·	·^	Ê	E^
}	)-	¹	1^	Ë	E"
~	~ space	º	o_ or O_	Ì	l'
¡	!!	»	>>	Í	l'
¢	c/ or C/ or c| or C|	¼	1 4 (order sensitive)	Î	l^
£	l- or L- or l= or L=	½	1 2 (order sensitive)	Ï	l"
¥	y- or Y- or y= or Y=	¿	??	Ñ	N~
§	so or SO or s! or S! or s0 or S0			Ò	O`
				Ó	O'
				Ô	O^
				Õ	O~
				Ö	O"

Figure 2.2 Compose Character Tables

Table note: To generate the indicated code, press the Compose Character key, followed by the two keys indicated in the table. The order in which the keys is pressed is not significant unless otherwise noted.

Code	Keys to press	Code	Keys to press	Code	Keys to press
Œ	OE (order sensitive)	í	i'		
		î	i^		
Ø	O/	ï	i"		
Ù	U`	ñ	n~		
Ú	U'	ò	o`		
Û	U^	ó	o'		
Ü	U"	ô	o^		
ÿ	Y"	õ	o~		
ß	ss	ö	o"		
à	a`	œ	oe (order sensitive)		
á	a'	ø	o/		
â	a^	ù	u`		
ã	a~	ú	u'		
ä	a"	û	u^		
å	a*	ü	u"		
æ	ae (order sensitive)	ÿ	y"		
ç	c,				
è	e`				
é	e'				
ê	e^				
ë	e"				
ì	i`				

Figure 2.2 Compose Character Tables (continued)

Chapter 3

Setup

3.1 Introduction

Each installation of the GraphOn 14 places unique requirements on the terminal. Baud rate and parity must be set to match those settings in the host. Special cabling may demand the use of a non-default communications port. Other specific configuration needs may exist. To satisfy unique requirements, there must be a way to customize the terminal for use with each system.

In addition, the terminal must be alterable to suit the particular needs of software packages or the preferences of the operator.

In order to allow this customization, the GraphOn 14 is configurable by means of a Setup mode.

The terminal functions which may be altered in the Setup mode fall into three major categories.

Communications functions — these include parameters such as transmission rates and data flow control methods

System compatibility functions — these include functions such as emulation mode and how certain control codes are handled

User preference features — these include features such as keyclick and whether the VT220/VT100 mode displays data on a light or dark background

Setup mode consists of a number of Setup screens, each of which displays the settings of logically related terminal functions. These screens are:

Directory Setup : Provides a quick way to move between the various screens. It also supports several high level aspects of the terminal such as saving and recalling terminal parameters and resetting the terminal.

General Setup : Determines main and printer port assignments and additional high level functions.

Devices Setup : Tells the GraphOn 14 what is attached to each of its communications ports.

Communications Setup : Configures each of the communications ports.

Display Setup : Determines the settings of display related features such as screen saver and status line.

Keyboard Setup : Configures the keyboard for user preferences.

Memory Setup : Displays current memory usage as well as terminal firmware and X server revision levels.

Alpha Setup : Sets up all the functions which are unique to VT220/VT100 emulation.

Function Keys Setup : Defines the strings which are transmitted when a function key is pressed. Saves and restores those definitions.

All Setup screens contain English language text, punctuated with reverse video fields. These fields indicate the items which you can select. Use the arrow keys to move the cursor up, down, right, and left from field to field. When the cursor rests on the field you wish to select, press the Enter key in the numeric keypad.

There are two basic types of fields in Setup mode. There are fields you may select to cause something to happen and there are fields you toggle in order to choose between two or more choices.

An example of a field you would select to cause something to happen would be the "Next" field at the top of every Setup screen. That field causes the terminal to display the next Setup screen.

An example of a field which you toggle in order to choose one of several settings would be the first field on the second line of the General Setup screen. That field selects which communications port you will be using to exchange characters with your host computer. As you select it repeatedly by pressing the Enter key, it toggles through the choices that are available to you for use as your main port. (Most users will leave it set to Port A.)

The contents of all Setup mode fields, tab settings, answerback message, function key definitions, etc. are stored in a special memory within the terminal which continues to hold its data after the terminal has been turned off. At power-up, a working copy of this information is created. The terminal then configures itself based on the contents of this copy. When changes are made to fields in Setup mode, only the working copy of Setup memory is altered. This allows either the user or the host to make temporary changes to the terminal configuration without affecting the permanently stored values. The DEC VT220 stores and uses Setup memory in the same manner.

Setup mode provides Save, Recall and Default functions as a means of saving these temporary settings into non-volatile storage, recalling settings from non-volatile storage into the working copy of memory, or setting the working copy to the factory default settings.

Function key definitions are handled the same way, but independently of the other Setup settings. This provides greater flexibility when configuring the terminal. For example, it allows you to save newly defined function keys without saving any temporary (and potentially unwanted) alphanumeric or communications settings downloaded by the host. Separate Save, Recall, and Clear fields are located in the Function Keys Setup screen.

In conclusion:

- Setup allows you to configure much of the functionality of the terminal

- All Setup settings and function key definitions may be saved in non-volatile memory

- The terminal works with a copy of the Setup settings which are saved in non-volatile memory, so it is possible to alter settings temporarily and then recall the permanently stored settings

- Function keys are stored in the same manner as any other Setup data — the definitions are temporary until they are explicitly saved

If a mouse or digitizing tablet is attached to the GraphOn 14, it may be used to move the cursor around the Setup screen and select Setup fields

Setup is English language in a substantially tutorial format

You may give a unique name to the Setup configuration

3.2 Using Setup Mode

A Setup screen consists of a variety of fields interspersed with enough text to describe what each field does. To enter Setup mode, press the Setup key. To make a change to Setup, display the screen which holds the field you want to change, move the cursor to that field, and select it. This process works differently depending upon whether you are using a locally attached mouse.

If a mouse or other input device is connected to the GraphOn 14 and the terminal is properly configured for it, simply move the cursor to the desired field and press any button on the mouse or digitizer stylus.

If no input device is attached to the GraphOn 14, or you are configuring the terminal for a new input device, press the arrow keys to move the cursor from field to field. Pressing the space bar or the Tab key is the same as pressing the right arrow. When you come to the field you wish to change, press the Enter key on the numeric keypad.

When you enter Setup mode, the terminal temporarily replaces the bottom six lines of the screen with a special Setup mode display. The old alphanumeric or graphics information will be restored to the screen when you leave Setup mode.

One of the Setup screens is now displayed. If this is the first time you have entered Setup mode since powering-up or resetting the terminal, the Directory Setup screen will be displayed. Otherwise, the last screen displayed during the previous Setup will be redisplayed.

The Directory screen has several fields used for such functions as saving and recalling non-volatile Setup settings. It also displays a list of fields which provide a means of jumping directly to any of the other Setup screens. These fields provide mouse users very quick access to the remaining screens without requiring a shift in attention from the mouse to the number keys described below.

Another quick method of moving between Setup screens is to press one of the number keys above the QWERTY section of the keyboard. Once Setup mode has been entered, all screens may be accessed directly by pressing single keystrokes. The label above the QWERTY section of the keyboard indicates the screen displayed by each number key "1" through "8". Upon displaying the Alpha screen, pressing "8" again will advance you through the Alpha subscreens.

To display the Function Key screen, press any function key. Not only will the Function Key screen be displayed, but the current definition for that function key will be shown. This is a very quick way to view the contents of one or more function keys.

Figure 3.1 summarizes the contents of the Setup screens.

The top line of every Setup screen has three fields: Next, Directory, and Exit.

Select "Next" to advance to the next Setup screen. When the last Setup screen has been reached, the Directory Setup screen will be displayed again. Press the Return key to move the cursor quickly to "Next."

Select "Directory" to move you straight to the Directory Setup screen.

Select "Exit" to leave Setup mode. You may also exit Setup mode by pressing the Setup key.

OptimaX 200 Setup Screen Summary

Directory

Setup name
Setup screen
directory
save
recall
reset
clear comm
default
quit X session

General

main port
printer port
local/online
7 or 8 bit controls
interactivity adjust
mouse factor

Function Keys

save keys
recall or clear keys
host download
programmability of
unshifted keys
key definitions

Display

screen saver
status line

Devices

Type of devices
attached to serial
ports

Comm

baud rate
parity/word size
handshaking
local echo
NUL treatment
max transmit rate

Keyboard

key click
auto repeat
Break disable
DEL/BS swap
Hold key
Caps/Shift/No Lock
Compose/Meta/Hold

Memory

memory usage
terminal revision
X server revision

Alphanumerics

Standard

smooth scroll
normal/reverse video
VT200/VT100/VT52
wrap around mode
new line mode
cursor style
margin bell
VT100 character set
80/132 columns
soft reset

Enhanced

monitor mode
number of rows
insert/delete line attr
VT100 report
print region
print terminator
answerback
enhancements

Tabs

set/clear

Figure 3.1 Setup Screens

3.3 Setup Mode Keys

When the GraphOn 14 is in Setup mode, the terminal temporarily severs the connection between the keyboard and the host computer and gives complete control of the keyboard to Setup mode. This section describes all keystrokes which have meaning in Setup mode.

Keys which take you to other Setup screens

<u>Key</u>	<u>Action</u>
1	Go to Directory Setup screen
2	Go to General Setup screen
3	Go to Devices Setup screen
4	Go to Communications Setup screen
5	Go to Display Setup screen
6	Go to Keyboard Setup screen
7	Go to Memory Setup screen
8	Go to Alpha Setup screen

Keys Used to Select a Setup Field

<u>Key</u>	<u>Action</u>
Up Arrow	go to the nearest field on the line above the current line
Down Arrow	go to the nearest field on the line below the current line
Left Arrow	go to one field to the left — if at the first field on the line, wrap around to the last field on the previous line
Right Arrow	go to one field to the right — if at the last field on the line, wrap around to the first field on the next line

Space	same as right arrow
Tab	same as right arrow
Return	go to first field in the Setup screen — the first field is always the “Next” field which takes you to the next Setup screen
Enter	select the field the cursor points to — if it is a toggle field, the next choice will be selected; if it is an action field, the indicated function will be performed

Perform a Setup Function

Shift-S	save Setup selections into non-volatile memory if X is not active — same as clicking on “Save” in the Directory Setup screen
Shift-R	recall Setup selections from non-volatile memory — same as clicking on “Recall saved VT220 configuration” in the Directory Setup screen
Shift-D	set the terminal to its default configuration — same as clicking on “Default” in the Directory Setup screen

Setup Short Cuts

Shift-4	toggle Local/Online — same as selecting the “Local/Online” field in the General Setup screen
Shift-5	go to the next Setup screen — same as selecting the “Next” field
Shift-6	select the current Setup field — same as pressing Enter
Shift-0	reset the terminal — same as selecting the “Reset” field in the Directory Setup screen

3.4 Default Setup Configuration

To assist in bringing up the terminal as quickly and painlessly as possible, every terminal is shipped from the factory with each field preset to a carefully selected default value. These defaulted values give many users a terminal which will function with their system immediately.

A default GraphOn 14 is configured as follows:

VT220 emulation with 24 lines of text

The main port is Port A at 9600 baud, 7 bit words, space parity, Xon/Xoff

The input device port is Port B configured for a GraphOn mouse at 1200 baud, 8 bit words, no parity, no Xon/Xoff, NULs accepted

The printer port is Port C configured for a text only printer at 9600 baud, 7 bit words, space parity, Xon/Xoff and DSR handshaking

Very careful consideration has gone into the selection of default settings for the Setup fields of the GraphOn 14. These defaults provide the greatest amount of functionality with the least chance of interference with existing software. A full understanding of the terminal is not required to log on to a host system and do meaningful work. However, before changing the default setting of a field, it is important to gain a full understanding of the possible selections. The following sections provide detailed descriptions you will need when changing Setup fields.

3.5 Directory Setup

This and the following sections describe each Setup screen field by field. Refer to these sections whenever you need in-depth explanations of the fields in Setup mode.

First Line

Setup name

Each Setup can be given a unique name to help make it more easily identifiable. This name can be up to ten characters long or it may be omitted completely. For example, if the terminal is configured for communicating with a 2400 baud modem, you might set its Setup name to “2400 modem.”

Remember that the Setup name is just a text string — it does not necessarily reflect the current configuration of the terminal.

Second line

Directory

Select any of these fields to go directly to a different Setup screen.

Third line

Save

To save Setup selections into non-volatile memory, click on Save. The next time you turn on the terminal, it will automatically be configured using these new settings.

Function key definitions are not saved by this field. This must be done explicitly in the Function Keys Setup screen.

Saving is not allowed when X is running, because X alters certain communications settings which can cause the VT220/VT100 emulation not to run correctly. So, saving in Setup is not allowed until the after X has shut down and it has restored those settings in the terminal.

If saving is attempted during an X session, the message "Setup not saved — must exit X first" will appear on the status line.

Recall

To recall Setup selections stored in non-volatile memory, click on Recall. You might do this to restore your terminal to a known state after someone else has used your terminal or after you have finished using a software package which downloaded its own Setup configuration.

This is a good way to get control of your terminal if you lose host communications during an X session.

Function key definitions are not recalled by this field. To do this, select "recall" in the Function Keys Setup screen.

Fourth line

Reset

Click on Reset to reset the terminal. This reset is similar to turning the terminal off and then on again. The last saved Setup configuration is recalled and all data on screen and in internal buffers is cleared. Function key settings are restored to the last definitions saved. The power up tests are not executed.

Clear comm

Click on Clear comm to reset the communications aspects of the terminal.

If your host or communications equipment causes you to lose communication in the middle of running a software package, it is possible, though rare, that the GraphOn 14 may be left in a state where it does not seem to receive characters from the host. When this happens, clicking on Clear comm may restore the terminal's ability to display these characters.

Default

Click on Default to set all terminal parameters to their factory defaults. Function key definitions are not affected by this field; they may be set to their defaults by selecting "clear" in the Function Keys Setup screen.

Defaulting loads only the working copy of terminal settings — the parameters saved in non-volatile memory are not affected. To default the saved parameters, follow the default operation with a Save operation.

Quit X session

To exit an X session, click on this field. The X server and all clients attached to it will be aborted. The terminal will return to VT220 emulation.

This field may also be selected when the terminal is in VT220 emulation and you have reason to believe that the X server is still running. This might occur, for example, if you reset the terminal in the middle of an X session.

3.6 General Setup

The General Setup screen establishes system level functions of the terminal, including such settings as main port and printer port assignments and local or online mode.

First line

Main port

Select which port is to be the main port — that is, the port which communicates with the host computer.

Printer port

Select which port is to be the printer port. All print requests cause data to be transmitted through this port.

Second line

Local/Online

Select local or online — this usually applies only to the main port, but will apply to all ports when the GraphOn 14 is programmed to pass characters between ports in its special pass through mode.

7- or 8-bit controls

The second field selects whether the terminal uses 7- or 8-bit control codes when transmitting ANSI control sequences to the host. Most existing software recognizes 7-bit controls, though an increasing number of packages recognize the shorter 8-bit controls as well.

In general, your software will set this switch for you if it is able to use 8-bit controls.

Third line

Mouse factor

The two fields on this line allow you to adjust the interactive feel of your GraphOn 14 in X. Instructions for using this mode are contained in Chapter 4 Using an Input Device in X. The first field contains the current setting of the mouse factor, which determines the frequency with which mouse reports are generated. The second field redefines the up and down arrow keys to adjust the mouse factor up and down interactively.

3.7 Devices Setup

This screen tells the terminal what type of device is attached to each of the serial ports. The terminal uses this information to select output drivers for locally connected printers. It is also used to configure the GraphOn 14 for graphic input devices such as mice.

Changes made in this Setup screen take effect upon leaving Setup mode.

First three lines

These fields allow you to establish what type of device is attached to each of the serial ports.

Port Select the port you wish to configure.

Device type Select the type of device attached to the selected port.
Valid device types are:

computer
printer
input device

If a port is connected directly to a host computer or indirectly through a modem, select “computer” for the port device type.

Printer type If a port is connected to a printer, select “printer,” then select the type of printer. If the printer is a type not recognized by the GraphOn 14, select “text printer” — the terminal will send only displayable ASCII characters, carriage returns and line feeds. Note that this will function only in VT220/VT100 emulation, not in X.

The printer types supported by the GraphOn 14 are:

text printer
DEC (LA-50/75, LN03, etc.)
ThinkJet (Epson MX/RX emulation mode)
FX-80/FX-100
Okidata 92/93
FX-85/FX-185
Okidata 192/193
Okidata 84
HP LaserJet+
QMS/Talaris

DEC printer selection

If the printer type is set to “DEC,” an additional field appears which tells the terminal what character sets are supported by the DEC printer. “Multinational” is the proper setting for DEC printers which support the DEC Multinational Character Set. “National/line” instructs the terminal to send only standard characters plus those contained in the DEC Special Graphics Set. “National only” restricts the terminal from attempting to select any character set — only the characters in the printer’s standard character set can be printed.

Printer width

If any printer type other than text printer is selected, another field appears which selects whether narrow or wide paper is being used.

Printer width

If any printer type other than text printer is selected, another field appears which selects whether narrow or wide paper is being used.

This field allows the alphanumeric print driver to determine whether to put the printer into compressed mode when printing 132 columns. If a 132 column alphanumeric display is being printed on narrow paper, the print driver puts the printer in compressed mode in order to fit 132 columns on an 8.5" wide sheet. (The LaserJet+ does not always have the right font installed to print compressed characters, so this feature is not supported on that printer.)

This field has no effect when printing a bit dump of the screen.

Print termination

If a graphics printer is selected, specify whether a form feed should be transmitted after each screen dump. This print terminator applies only to bitmap dumps to a graphics printer. To select the print terminator sent at the end of a character dump from the VT220/VT100 emulation, go to the Alphanumeric Enhanced Functions Setup screen.

B/W inversion

This field determines whether the bitmap data sent to the printer during a graphics dump is inverted or not. If B/W inversion is disabled, only the "on" dots are printed. This causes white areas of the screen to print black. If B/W inversion is enabled, only the "off" dots are printed. This yields a print in which the black areas of the screen are printed black, and the white areas are printed white.

In general, you will want to leave this field set to enabled when printing X screens. You may want to disable B/W inversion when printing a bit dump of an alphanumeric screen which has predominantly white characters on a black background.

Sixel level

If the printer type is set to "DEC," a field appears which specifies the resolution of the bit dump to be sent to the printer.

Sixel level 1 is used with low resolution printers with a pixel aspect ratio of 1:2, such as the LA50. The GraphOn 14 must combine data from pairs of vertically adjacent pixels in order to print to these printers — the end result is often quite suitable, but it has half the resolution of the image on the screen.

Sixel level 2 is used with higher resolution printers such as the LN03, which support a pixel aspect ratio of 1:1. It provides a dot for dot bit dump, generating an exact copy of the graphics bitmap.

The LA210 selection is similar to sixel level 2, but it selects the 1:1.02 pixel aspect ratio supported by the LA210.

Orientation

The orientation field appears only if you set the printer type to either DEC or HP LaserJet+. On these printers, this field allows you to choose how the printed image is oriented on the copy medium.

Standard orientation is also known as portrait format. The long axis of the image is oriented along the short axis of the paper. Copies fit on an 8-1/2" x 11" sheet.

Rotated orientation, also called landscape format, produces a copy with the long axis of the image on the long axis of the paper. On DEC printers, rotation 90° counterclockwise results in an image which is also enlarged to a size twice that of standard orientation. The image fits on a standard page.

Rotated orientation to an HP LaserJet+ produces an image which is the same size as standard orientation, but is rotated 90° counterclockwise.

Expanded orientation on DEC printers produces an image in portrait format which is twice as large as a standard image. Because wide paper is necessary for the expanded image, this orientation is only useful on the wide-carriage DEC printers.

Expanded orientation on the HP LaserJet+ creates a printout in landscape format which is 50% larger than the standard size.

Input Device Protocol

If a port is connected to a graphic input device such as a mouse, select the device protocol. The choices are:

GraphOn mouse
Summagraphics mouse
MM1201 tablet

Absolute/Relative

If "MM1201 tablet" is selected, another field appears which asks whether to run the tablet in absolute or relative mode.

Select "absolute" mode to tie the coordinates of the tablet directly to those of the screen. For example, if you point a third of the way across the bottom edge of the tablet, the GraphOn 14 cursor will appear a third of the way across the bottom edge of the screen.

Select "relative" to have motion of the tablet's stylus or puck move the cursor a similar distance and direction relative to its previous position. The cursor will not be forced to absolute coordinates on the screen. This mode works in a manner very similar to a mouse.

3.8 Communications Setup

This screen configures the communications of each serial port.

Changes made in this Setup screen take effect upon leaving Setup mode.

First line

Port The first field selects the port which will be described by all following fields in this screen.

Baud rate The second field on this line sets the baud rate for the selected port. The choices are:

50	2400
75	3600
110	4800
134	7200
150	9600
300	19.2K
600	38.4K
1200	57.6K
1800	

Parity/word size The third field sets the parity and word size for the selected port. The choices are:

- 7 bits/mark
- 7 bits/space
- 7 bits/even
- 7 bits/odd
- 7 bits/none
- 8 bits/even
- 8 bits/odd
- 8 bits/none

Parity checking

The last field turns parity checking on or off. If set to off, all characters received at the port are placed in the input buffer and processed, regardless of any transmission errors which may have been detected. The terminal gives no indication of any errors. If parity checking is turned on, characters received with any transmission errors are not displayed. Instead, a message appears on the status line for about two seconds, indicating the type of error and on which port the error occurred.

Second line

Outgoing Handshaking...

The first two fields indicate the type of handshaking signal or signals generated by the terminal when its input buffer is filling. XON/XOFF is supported at all ports. Hardware handshaking for flow control is supported on the DTR and RTS pins of Port A and the DSR pin of Port B. No outgoing hardware handshaking for flow control is supported at Port C.

...XON/XOFF

When XON/XOFF is selected, the terminal automatically transmits XON and XOFF codes, as necessary, to control the flow of characters from the host. Select “no XON/XOFF” if XON/XOFF handshaking is not supported by the host.

...DTR/DSR (and RTS on Port A only)

If “no DTR” (or “no DSR” on Port B) is selected, DTR is manipulated exactly as if the terminal were a VT200. Select “No DTR” if DTR handshaking is not supported by the host. If it is used, DTR is used for flow control and will be lowered when the port’s input buffer begins to fill. If RTS is selected, it is used for flow control in the same manner as DTR described above. RTS handshaking is supported on Port A only.

Incoming handshaking...

The last two fields indicate the types of incoming handshaking signals which the port will obey. XON/XOFF is supported at all ports. Incoming hardware handshaking for flow control is supported at DSR and

CTS on Port A, DTR on Port B, and DSR on Port C. The “DSR=CD” setting which is available only on Port A may be used to reset the terminal when a locally attached modem drops its carrier detect line.

...XON/XOFF

If the port is set to obey XON/XOFF, a received XOFF control code causes the terminal to stop transmitting characters until it receives the next XON control code. If the port is not set to obey XON/XOFF, received XON and XOFF control codes are treated as normal data characters. When XON and XOFF control codes are treated as normal data characters, they may be passed through to a device on another port, programmed into function keys, and displayed in Monitor mode in VT220/VT100 emulation. In short, they are handled as all other characters.

...DSR/DTR (and DSR=CD on Port A only)

Select this field to require a positive hardware handshaking signal at the appropriate pin or pins listed above. When “DSR=CD” is selected (supported on Port A only), the “DSR” pin is used to recognize the carrier detect signal from a modem. If the DSR line drops for more than one second during an X session, the terminal determines that the modem has lost connection to the host. The terminal will then reset itself and display the message: “X session disconnected by host or modem.”

The default Setup configuration requires incoming hardware handshaking at Port C only. The GraphOn 14 requires that a printer be attached before it will attempt to execute print commands. This default setting allows the GraphOn 14 to use a “printer ready” signal to determine if a printer is attached.

Third line

Local echo

The first field selects local echo. Characters typed at the keyboard are normally not automatically displayed on the screen. The computer or other receiving device will usually “echo” transmitted characters back to the terminal, which then displays them. Local echo should

be turned off when the host echoes characters back to the terminal. If local echo is on when it should be off, you will likely see two characters displayed for every character you type. Otherwise, turn local echo on to have the terminal automatically display all characters typed at the keyboard.

Fourth line

NUL Treatment

The first field indicates whether NUL characters received at the port are to be discarded or accepted into the input buffer. Some systems use NULs as pad characters and the terminal should discard those characters.

Sometimes, however, NUL characters represent valid information which must not be ignored. For example, all input devices supported by the GraphOn 14 make extensive use of NUL characters as part of their motion reports. Obviously, these characters must be accepted into the input buffer just as all other characters.

Note that if NULs are discarded, then they cannot be passed through to a printer (or other auxiliary device) in printer controller mode and that they cannot be displayed in Monitor mode nor downloaded as part of a function key assignment when using the GraphOn-compatible function key download sequence.

Effective transmit rate

The last field specifies the maximum effective transmit rate. The choices are:

- full speed
- 600 baud
- 1200 baud
- 2400 baud
- 4800 baud
- 9600 baud

Select "full speed" to transmit characters out that port as quickly as possible, i.e. each character immediately follows the preceding one. Set an alternate setting to cause the terminal to insert delays between characters.

This field is useful if your host has trouble receiving incoming characters at high transmission rates. Character transmissions can be slowed such that the throughput to the host is the same as if the characters were transmitted at a lower baud rate. This reduced “effective transmit rate” is thus selected in terms of the equivalent baud rates listed above.

If an effective transmit rate is selected which is faster than the baud rate, characters will be transmitted as if this field were set to “full speed.”

3.9 Display Setup

Two display related functions are configured in the Display Setup screen.

First line

Screen saver

This field enables screen saver. The screen saver feature, if selected, causes the terminal to darken the screen if no input is received at the terminal for 10 minutes. Any activity at the keyboard, main port, or mouse will immediately cause the terminal to restore the screen.

Status line

The second field turns the status line on or off. Its function is identical to the Status key. The status line is described in Chapter 7 Status Line.

3.10 Keyboard Setup

All keyboard related terminal functions are configured in the Keyboard Setup screen. The only exception are the user/host definable function keys, which are supported in the Function Key Setup screen.

First line

Key click

Click on the first field to toggle key click. When this feature is on, the keyboard produces a “click” whenever a valid key stroke is accepted by the terminal. The click is not generated if the keyboard is locked or if an invalid key is pressed. Key click is the only way to get audible feedback when a key is auto repeating.

Auto repeat

The next field selects whether the keys are allowed to auto repeat. Turn auto repeat off to disable the keyboard auto repeat function. Keys will not repeat automatically no matter how long they are held down. Turn auto repeat on to have keys repeat when they have been held down for longer than one half second. Some special keys may still not repeat, depending upon the setting of the next field.

Auto repeat extent

The third field determines how many keys are allowed to auto repeat. If “all except control keys” is selected, the following keys do not auto repeat:

Setup	Esc
Status	Break
Print	Return
Compose	Hold
Ctrl and any key	

If “all keys” is selected, all keys may auto repeat regardless of whether the Ctrl key is down.

Second line

Break disable

The first field enables and disables the unshifted Break key. Shifted Break is always enabled.

DEL/Back Space

The second field determines whether the Delete $\langle \text{X} \rangle$ and Back Space $\langle \square \rangle$ keys have their standard functions, or whether their positions are swapped. If they are swapped, the Delete $\langle \text{X} \rangle$ key generates the BS control code, and the Back Space $\langle \square \rangle$ key generates the DEL code.

Third line

Hold

The first field selects whether the Hold key must be pressed to allow characters to be displayed again after the Hold key is pressed, or whether any key which transmits a character will end the Hold condition.

If "Hold" is the only key that will end Hold and the Hold key has been pressed to freeze the contents of the display, the Hold key must be pressed again to restart screen updating. Any other keys pressed are transmitted without affecting the screen. If "any key" ends Hold, pressing any key which transmits a character will restart screen updating. Select "any key" for use with systems doing non-standard XON/XOFF handshaking. See Chapter 8 Communications.

Lock Key

The last field on this line specifies the action of the Lock Key. The key may function as a Caps Lock key, a Shift Lock key, or it may be set to have no action whatsoever. See Chapter 2 Keyboard for more information on the Lock key.

Fourth line

Compose key

The only field on this line determines the function of the Compose Character key in VT220/VT100 emulation. This key always functions as a Meta key when running X, no matter how this field is set.

If the field is set to "Compose," the Compose Character key is used to access characters in the DEC Multinational Character Set in a manner equivalent to the Compose Character key on the VT200.

If the field is set to "Meta," the Compose key performs the Meta function supported by several UNIX editors. To use the Meta key, hold it down and then type another key. The character for that key will be transmitted with its eighth bit set, if eight bit word size is selected in the Communications Setup screen.

If the field is set to "Hold," the Compose key functions as another Hold key. The placement of the Compose Key matches the placement of the No Scroll key on the VT100 keyboard.

3.11 Memory Setup

The Memory Setup screen of the GraphOn 14 displays the status of memory usage and the revision levels of the terminal firmware and the X Server. It does not contain any user-alterable fields.

First line

Memory usage

The first line reports local memory usage. It includes the amount of memory currently being used to store font and other raster data, and the total amount available for raster storage.

Second line

Available for status information downloaded by the GraphOn X Server Software.

Third line

Terminal revision This line reports the revision level of the firmware installed in your GraphOn 14.

Fourth line

X Server revision This line reports the revision level of the X Server distributed as part of the GraphOn X Server Software. Since this information is downloaded by the X Server, X must be run before the revision level can be reported.

3.12 Alpha Setup

The Alphanumeric Setup screen is actually made up of three different subscreens. These subscreens are:

- Standard functions
- Enhanced functions
- Set/Clear Tabs

The fields in the Alphanumeric Setup screen apply only to VT220/VT100 emulation. They have no effect in X.

First line

Alpha subscreen The first field indicates what type of parameters are being set up in this alpha subscreen — standard, enhanced, or tab stops.

Standard Alpha functions

Smooth scroll

The next field selects smooth scroll or jump scroll. Since smooth scroll reduces the rate at which characters are displayed, be sure that you enable handshaking at the main port if smooth scroll is selected.

Normal/Reverse video

This field selects whether text appears as white characters on a black background (normal video) or black characters on a white background (reverse video).

Second line

Emulation

The first field selects the alphanumeric terminal emulation. Set this field to equal the type of terminal your software expects you to be using. The choices are:

VT220
VT100

Emulation submode

The second field selects the emulation submode. Both VT220 and VT100 terminals provide switches in their own Setup modes which select what emulations to run. If the GraphOn 14 is emulating a VT220, you may select VT200, VT100 or VT52 mode. If it is emulating a VT100, you may select ANSI or VT52 mode.

For example, to have your GraphOn 14 emulate a VT220 which is emulating a VT100, select VT220 emulation in VT100 mode.

Wrap around mode

The third field selects wrap around mode. Wrap around determines what the cursor will do when the host attempts to display characters past the right margin of the screen. When wrap around is off, the cursor stops at the right margin, with each following character overlaying the previously stored character. When wrap around is on, the cursor wraps around to the start of the next line before displaying the following characters.

New line mode

The fourth field selects new line mode. When new line mode is off, the Return and Enter keys generate single carriage return codes. Received line feed characters are interpreted as line feeds only. When new line mode is on, the Return and Enter keys generate a pair of codes — a carriage return and a line feed. Received line feeds are processed as carriage return/line feed pairs.

Third line

Cursor style

The first two fields select the cursor style. The cursor may be block or underline. It may blink approximately twice each second or it may be steady.

Margin bell

The third field enables or disables the margin bell. The margin bell feature warns you when the cursor is approaching the end of the current line. When the margin bell is turned on, the bell will sound when there are only eight columns left on the current line.

VT100 character set

The fourth field selects whether the US or UK ASCII character set is used in VT100 mode. The only difference between the two character sets is the character displayed when the hexadecimal code 23 is received. This is the code generated by pressing Shift-3. The US set displays a '#' and the UK set displays '£'. If this field is changed, the newly chosen set is assigned to both of the internal character sets.

Fourth line

80 or 132 columns

The first field selects 80 or 132 columns of text. Any change to this field takes effect upon leaving Setup. At that time, the screen will be cleared depending upon the setting of the next field.

Clear upon changing 80/132

The second field determines whether all text in the VT220/VT100 emulation should be cleared whenever the number of columns changes. The VT100 and VT220 clear their screens when they change from 80 columns to 132 or back again. To emulate this effect, set this

field to “cleared.” If this field is set to “not cleared,” text is not lost when the number of columns changes.

Soft reset

The third field is an action field which performs a soft reset of many of the aspects of the VT220/VT100 emulation, without clearing its text. Soft reset is useful when you are switching between software packages that don't always clean up after themselves. For example, if you exit a program and find that the numeric keypad is displaying letters rather than numbers, select soft reset to restore the keypad to its usual state.

Enhanced Alphanumeric Functions

First line

Monitor Mode

The first field on this line enables and disables monitor mode. This is identical to the “Display controls” mode of the VT200. This mode determines the terminal's treatment of received control codes. When the monitor mode is off, control codes and ESC sequences are processed normally. When it is on, all characters, including control codes, are displayed on the screen without any other processing. The only exceptions to this are LF, VT, and FF, which are displayed, then processed as carriage return/line feed pairs. This is a program development aid which allows the program designer to view the codes received by the terminal without the terminal processing them. Control codes are displayed as special characters. Standard 7-bit control codes are displayed using their ASCII names. 8-bit control codes are shown as two hexadecimal values displayed in a single character cell.

If the current main port is configured to use incoming XON and XOFF control codes as flow control, these characters will not be displayed. If NULs are being discarded, NUL control codes will not be displayed. The fields which affect both of these features are located the Communications Setup screen.

Number of lines of text

The final field on this line determines the number of rows of text. This number may range from a minimum of 1 to a maximum of 30. The default setting is 24 lines.

Be aware that most programs written specifically for the VT100 or VT200 expect 24 rows. When running such software, you must:

- a) restore the VT220/VT100 emulation to 24 rows or
- b) modify the software package to allow it to deal with a non-standard number of rows.

Second line

Insert/Delete line attributes

The first field selects how to handle attributes when an Insert or Delete Line command is executed. When either of these commands is executed by the terminal, a blank line appears at the cursor position (insert line) or the bottom of the scrolling region (delete line). If this field is set to "maintained", the blank line will have the same visual attributes as the line which was previously displayed at that location. This is compatible with the VT100. If the field is set to "cleared," the blank line will contain no attributes. This is compatible with the VT220 and most non-DEC systems.

VT100 mode ID

The second field selects how the GraphOn 14 will respond when the host requests the terminal ID by using the ANSI Device Attributes command. If the emulation is in VT200 mode, it always responds by telling the system it is a VT220. If the terminal is in VT100 mode (either in VT220 emulation in VT100 mode or in the real VT100 emulation), it can respond in one of the following ways:

- same as current emulation (VT200 or VT100)
- VT220
- VT240
- VT125
- VT100/printer
- VT100
- VT102
- VT101

In most cases, you will want to leave this field set to "same as current emulation."

Third line

Print extent

This line contains two fields pertaining to printing the ASCII data on the display. The first selects which lines to print. You may select whether the Print Screen command (using the Print key or by command from the host) prints all rows or only rows in the scrolling region.

Print termination

The second field selects whether or not to send a form feed at the end of the print. This usually causes the printer to advance the paper to the next top of form.

Fourth line

Answerback

The first field is the answerback message. To define a new message, select the answerback field, type the new string of characters, and press Enter to end the definition. The answerback message is transmitted to the computer whenever the computer requests that the message be sent. You may send the answerback message from the keyboard by holding down the Ctrl key and pressing Break.

Enhancements

The last field specifies which GraphOn 14 enhancements are allowed while the VT220/VT100 emulation is active. If this field is set to "no" enhancements, the GraphOn 14 will look exactly like the terminal it emulates, either a VT220 or a VT100 with advanced video and printer port options.

If "full" enhancements is selected, not only will all the basic emulation sequences work correctly, but software using the terminal will have access to all GraphOn 14 System Functions.

If VT100 emulation is selected, “VT102” enhancements is available as a third choice. If this is selected, the VT100 emulation will support those additional commands supported by the VT102. These commands consist of the following:

- Lock and unlock the keyboard
- Turn local echo on and off
- Next displayable character is displayed using the VT100 character set selection in the Standard Functions Alpha Setup screen

GraphOn recommends that “full” enhancements be used whenever possible. Full enhancements must be selected in order for the X Server to configure the terminal for X. Use an alternate setting only if your software does not work correctly in this enhanced environment.

Set/Clear Alphanumeric Tabs

Second line

Clear all tabs Click on the first field to clear all tabs.

Set tab every 8 columns Click on the second field to set tabs every 8 columns.

Third and Fourth lines

Tab ruler These lines hold a tab ruler which displays the current tab stop settings. To set or clear a tab stop in any column, move the cursor to that column and press Enter or any mouse button.

3.13 Function Keys Setup

This Setup screen deals with defining, viewing, and clearing function keys. Remember that the function keys work only in VT220/VT100 emulation in order to maintain X compatibility.

First line

Save function keys

Select the first field in this line to save all function key definitions into non-volatile memory.

Recall function keys

Select the second field to recall the saved function key definitions.

Clear function keys

Select the third field in this line to clear all current function key definitions. The definitions saved in non-volatile memory are not affected until a Save function keys operation is performed.

Second line

Host downloading

Select this field to enable or disable downloading of the function keys by the host.

VT220 compatible

The second field specifies how unshifted function keys work. If "VT220 compatible" is selected, the unshifted function keys transmit the same predefined strings transmitted by a VT220. Shift- and Ctrl-function keys are always user or host definable.

If "user definable" is selected, the VT220 compatible sequences are not transmitted. Instead, sequences defined by the user or the host are transmitted.

Third and fourth lines

The three fields on the third line serve to identify the function key whose definition is displayed on the fourth line.

Function key

The first two fields designate the function key and whether it is unshifted, shifted, or Ctrl-shifted. In the case of defining a mouse or digitizer button, the second field indicates whether the button is being pressed or released.

Destination

The third field indicates the destination for this string and is stored as part of the definition of the string. Strings may be transmitted “online,” processed “locally,” or sent “to printer.”

The destination of a currently defined function key may be changed without having to reenter the function key definition.

Definition

If the function key has already been defined, its definition will be displayed on the fourth line. If the definition is too long to fit on the line, the first 78 characters will be displayed and the status line will show:

Press PF1 to scroll

If you don't want to see any more of the definition, just ignore the message and move about the Setup as you please. If you do want to see more, press PF1 to scroll the definition one character at a time.

To define a new string, point to the fourth line and click on it. Any preexisting definition will be removed and an underline cursor will appear at the left end of the line. Type the new string, then press Enter to end the definition. If you enter more than 78 characters, the text will scroll left as necessary. Press the left arrow key to backspace if you make a mistake.

3.14 General Information on Function Keys

Fifteen function keys are provided in the top row of the keyboard which support up to 45 user- or host-defined functions. These function keys (15 unshifted, 15 shifted, and 15 control-shifted) may be loaded by the user in Setup mode or, optionally, by the host. They may be used to send any user-defined character and/or control code string to the computer, the GraphOn 14 screen, or the printer.

These keys are ideally suited for any situation in which particular strings of characters must be typed repetitively. Applications programs may use them to simplify operator input. You will probably find them to be extremely useful whenever the same sequence of keys must be typed and retyped.

The GraphOn 14 maintains a table of function key definitions. This table is 600 characters long and holds both text strings and control information. This control information allows the terminal to keep track of how long each string is and how is it to be processed — online, locally, printed.

The string assigned to a function key may be arbitrarily long. Its length is limited only by the amount of memory available in the function key table at the time the assignment is made.

Four characters of control information are stored in the table with each function key definition. This control information must be accounted for when figuring how much room remains for subsequent function key definitions. For example, if three function keys are defined and the strings assigned to each key are 35, 10, and 12 characters in length, then the amount of space remaining in the table is 731 characters.

$$600 - (4+35) - (4+10) - (4+12) = 531 \text{ characters}$$

This leaves room for one additional function key to be assigned a string of up to 527 characters, or many additional function keys to be assigned shorter strings.

The Function Key Setup screen provides the means for displaying and defining function keys from the keyboard.

As described in Section 3.1, the table containing the in-use function key definitions is located in volatile memory. These definitions may be saved into non-volatile memory so that they are available whenever the terminal is turned on, they may be recalled from non-volatile memory independently of other Setup settings, and their definitions in the in-use table may be cleared. These three functions, "save," "recall," and "clear," may be selected at any time in the Function Keys Setup screen.

Chapter 4

Using a Graphic Input Device

4.1 Introduction

The GraphOn 14 supports several graphic input device protocols:

- GraphOn Mouse (Mouse Systems 5-byte protocol)
- Summagraphics Summamouse protocol
- MM1201 digitizer in both absolute and relative modes

Complex cursor control features are supported to provide tight coupling of such a cursor steering device with The X Window System.

4.2 Attaching an Input Device

To use a mouse or tablet, connect the device to the GraphOn 14 and tell Setup mode what type of device is being used. If you are using the GraphOn mouse, simply plug it into Port B at the back of the GraphOn 14. The default Setup configuration is already set up to communicate with a GraphOn mouse attached to this port.

The terminal must be configured to communicate with any other type of device. Use the Devices Setup screen to pick the type of device and the Communications Setup screen to set baud rate, parity, etc.

If you do change any fields in the Communications or Devices Setup screens, these changes will not take effect until you exit Setup.

The easiest way to verify that the input device is connected correctly is to exit, then re-enter Setup mode and attempt to move the checkmark cursor which appears in Setup. If mouse motion moves the cursor and moves it smoothly, then the device and the terminal are configured correctly.

4.3 Using an Input Device in X

The X Window System makes extensive use of the mouse and the special cursor controlling functions implemented in the GraphOn 14. It downloads cursor bitmaps, picks the cursor to be used, switches cursors at window boundaries, etc. Nothing needs to be configured by the user in order for this to happen.

There is one aspect of cursor use which can be improved with a little feedback from the user. The GraphOn 14 supports a special mode which allows you to adjust the interactive feel of the mouse interface.

If mouse reports are transmitted too often by the GraphOn 14, an object being dragged by the mouse can lag behind the cursor. This occurs if the X Server draws the object too many times in intermediate locations, so that the object can't keep up with the cursor, which is driven locally. It can be fixed by sending fewer mouse reports, causing fewer updates to the object's position.

However, if mouse reports are generated too infrequently, the motion of the object can appear to be too jerky.

The proper balance between these conflicting needs can be determined empirically by adjusting the rate of mouse reports while dragging an object. The rate of mouse reports may be set by entering a number between 1 and 32 in the mouse factor field of the General Setup screen or may be set interactively as described next.

The Interactivity Adjustment Mode field in the General Setup screen enables a mode which allows you to adjust the interactive feel of your GraphOn 14. This mode may be turned on either inside or outside of X. When it is on, the up and

down arrow keys do not transmit codes to the X Server. Instead, they increase or decrease, respectively, the minimum amount of time between mouse reports. In effect, they reduce or increase the frequency at which mouse reports are transmitted.

Simply turn this mode on, exit Setup, grab the type of object you feel you will be dragging most often, and drag it around the screen. While doing this, press the up arrow to increase the time between reports. This will cause the object to follow the cursor more closely, but to be updated less often. Press the down arrow to decrease the time, generating smoother motion. Turn on the status line by pressing the Status key to see the number of 13 msec intervals between reports. The default value is "6", or approximately 100 msec between reports. Find the proper medium, and then return to Setup to turn off this mode.

Don't forget to save the setting in Setup after you have quit X.

4.4 Using an Input Device in VT220/VT100 Emulation

It is very easy to use the switches or buttons on the input device to replace up to three keyboard keys. The GraphOn 14 considers these buttons to be simply extensions of the keyboard — specifically, these switches are treated as additional user or host definable function keys. Two function key definitions are allowed for each switch — one definition is used when the switch is pressed, the other when it is released. The definitions for these switches, as for any other function keys, may consist of none, one, or many characters.

Chapter 5

Printing

5.1 General

A printer may be attached to any serial port connector at the back of the terminal. Once attached and properly configured in Setup mode, the printer may be used to make copies of the contents of the GraphOn 14 display and copies of text as it is received from the host and displayed. See Appendix A Installation for assistance on connecting a printer to the GraphOn 14.

In all cases, requests to execute printer commands are ignored if no printer is attached. This keeps the terminal from locking up while it attempts to send data to a nonexistent printer.

5.2 Keyboard Print Functions

Print Key

Pressing the unshifted Print key causes the terminal to print the current display in the most efficient manner possible. In VT220/VT100 emulation, it prints the ASCII contents of the VT220/VT100 emulation. If X is running, a bit dump of the screen is printed.

Shift-Print forces the terminal to do a graphics bit dump of the screen, regardless of what the screen contains. Shift printing of alphanumerics provides a way to get an exact copy of the formatted alphanumeric screen — downloaded, reverse video, and double high, double wide characters are printed as they appear on the screen.

If a graphics bit dump is to be generated, the printer must be one of the graphics printers supported by the GraphOn 14 for graphic output. Because the method of communicating with graphics printers varies widely between different types of printers, the type of printer being used must first be selected in the Devices Setup screen.

While the print is in progress, no changes to the data on the screen are allowed. Keys entered at the keyboard and characters received from the host are saved and processed after the print is complete. This ensures that the image sent to the printer is exactly the same as the image appearing on the screen at the moment the Print key is pressed.

In graphics bit dump, the entire screen is always printed. At the end of the print, a form feed is sent to the printer to advance the paper to the next top of page (depending upon the setting of another field in the Devices Setup screen).

In an ASCII dump, the entire page of text or just the contents of the scrolling region may be printed, depending upon the setting of a field in the Enhanced Functions Alphanumeric Setup screen. The scrolling region is selected by the computer. It may be any number of adjacent lines of characters.

In an ASCII dump, double width lines are transmitted as single width lines. Double height lines are printed as two single width lines, each containing single height characters. Trailing spaces on each line are not printed in order to speed the printing. The printer may or may not advance the paper to the start of the next page after the print is complete, depending upon another field in the Enhanced Functions Alphanumeric Setup screen.

Shift-Print in Setup mode generates a bit map dump of the current Setup screen.

Auto Print Mode

Pressing Ctrl-Print causes the terminal to enter Auto Print mode. Pressing Ctrl-Print a second time turns it off. When the terminal is in Auto Print mode, characters received from the host are displayed on the screen and are also sent to the printer. Auto Print is available only in VT220/VT100 emulation.

Received characters are not sent directly to the printer. Instead, the terminal displays a full line of text on the screen and then transmits that line to the printer.

The process of printing one line at a time in this manner allows the terminal to take the received information, which may be in a special format recognized only by the terminal, and create a line of properly spaced text using only displayable characters and spaces which all ASCII printers understand.

5.3 Cancelling a Print Operation

In general, there are two reasons for cancelling a print operation once it has begun. The first is that you simply decide that you do not want the print to continue. The second is that the printer is not ready to accept the data. If this happens, the terminal may “lock up” waiting for the printer to become ready.

A print operation may be cancelled by pressing the Setup key at any time during printing. When Setup is pressed, the following message is displayed on the status line:

Cancelling ...

So that the printer will not be left in an undefined state which may hinder the next print operation, the terminal does not stop printing immediately. Instead, it attempts to print the remainder of the current line. This will return the print head to the left margin, where the next print operation will expect to find it. When printing a graphics bit dump, the terminal also attempts to return the printer to alphanumeric mode, which it normally does at the end of a graphics bitmap dump.

The “Cancelling ...” message will be cleared when the terminal has finished printing the remainder of the line. Regardless of how long it takes to print that line, however, the message will be displayed a minimum of two seconds, to ensure that it is seen.

While the terminal attempts to print the remainder of the current line, it monitors the ready signal from the printer. If the printer is ever busy for longer than approximately four seconds, the terminal determines that the printer is not functioning correctly. The terminal then immediately halts all printer activity and displays the following message:

Print aborted - Initialize the printer

Since the terminal was unable to leave the printer in a known state, it displays a message requesting that the user manually reinitialize the printer. This will move the print head to the left margin and make sure that the printer is in its alphanumeric mode.

The Status key or Setup key may be pressed to clear this message from the status line.

Pressing Setup to cancel a print operation cancels only what is currently being printed. It does not terminate either of the two alphanumeric print modes. In auto print mode, for example, pressing Setup will abort printing of the current line, but will not take the terminal out of auto print mode. Similarly, pressing Setup will not terminate printer controller mode (this mode is accessible only via ESC sequence).

Chapter 6

Attaching Multiple Host Computers

6.1 Overview

The user of a GraphOn 14 terminal can communicate with two or even three host computers without swapping cables or buying RS-232 switches. The three serial ports at the back of the GraphOn 14 are truly general purpose — any kind of serial device may be attached to any or all of the ports, including more than one computer.

6.2 Connecting the Host to Port B or Port C

In its default state, the GraphOn 14 communicates with a single host computer on Port A. This makes Port A the default main port. If you wish to use Port B or Port C instead, perform the following steps:

- connect a properly wired interface cable to new main port
- go to the Devices Setup screen and inform the GraphOn 14 that a computer is attached to that port
- go to the General Setup screen and select the new main port

Chapter 8 Communications gives the pinouts for each of the serial ports of the GraphOn 14.

6.3 Communicating with Multiple Hosts

Although only one host may be used at a time, it is possible to connect multiple hosts to the GraphOn 14, then select which host is to be used. To do this, connect appropriate cables from the hosts to the terminal, then redefine the main port whenever you want to change hosts. This switches the entire terminal from one host to the other, giving each host complete use of all the facilities of the GraphOn 14, including both VT220/VT100 with up to 30 lines of text and the ability to run the X Window System.

Do not attempt to change hosts in the middle of an X session. X puts the terminal in a very unique configuration which will cause communications from a second host to be nonsensical. Host switching should occur only during VT220/VT100 emulation.

The main port may be changed by entering the General Setup screen and selecting the appropriate port. Alternately, function keys can be loaded with the ESC sequence to download Setup with a new main port.

To select a new main port from a function key, program that key to process the one of the following strings locally:

```
ESC P ; 10 ## S 1 / 0 ESC \ - Select Port A
ESC P ; 10 ## S 1 / 1 ESC \ - Select Port B
ESC P ; 10 ## S 1 / 2 ESC \ - Select Port C
```

These sequences may also be sent by the currently active host, causing that host to pass control to another host. Appendix D gives a summary of these ESC sequences.

Chapter 7

Status Line

7.1 General

The GraphOn 14 can display a status line at the bottom of the display which contains information on the current state of the terminal. Over the course of operation, the terminal uses the status line to convey three different types of information.

During normal use, the status line displays the current status of the terminal. The operator may turn the status line on or off as desired.

Occasionally, however, an event internal to the terminal may occur of which the operator will always want to be informed. In these instances, the terminal turns the status line on and displays a warning message.

The status line is also used in the Setup mode. In this case, it holds information to help the operator alter the characteristics of the terminal.

The use of the status line to display normal status and warning messages is described in this chapter. It may be turned on and off by pressing the Status key. The on/off state of the status line is saved as part of the terminal's power up configuration when a Save operation is performed in Setup mode.

7.2 Status Line Location

The status line appears as a row of alphanumeric characters and spaces located at the very bottom of the screen. In normal VT220/VT100 emulation, the status line is displayed below the text — it does not affect its display in any way.

When the VT220/VT100 emulation is set to contain 30 rows, it extends all the way down to the bottom of the screen. In this situation, the status line overlays the last line of text. The same is true in X; since all available display area is used to display the graphics bitmap, the status line overlays the bottom 20 scan lines of the display. Text or graphics covered by the status line is not lost or otherwise affected — it simply cannot be seen until the status line is turned off. If anything is written to the area of the screen hidden by the status line, it will be displayed when the status line is removed.

Since the status line does cover the bottom of the X display, you will probably want to turn the status line off when running X. Occasional enabling of the status line may be useful, especially when setting the Interactivity Adjustment setting with the arrow keys. See Chapter 4 Using a Graphic Input Device.

Figure 7.1 shows status line placement in the GraphOn 14. The top diagram shows the location of the status line relative to a standard 24 line VT220/VT100 emulation. The second diagram shows status line placement relative to the full screen X bitmap.

7.3 Current Terminal Status

During normal operation of the GraphOn 14, the status line shows the current status of the terminal. It is divided into fields, each of which indicates the status of one or more terminal functions.

Figures 7.2 and 7.3 show representations of the status line and the locations of each of its fields, depending upon the type of display that is active. Table 7.1 describes the contents of each field.

The status line may be either displayed or not displayed at your discretion. You may turn the status line on and off by using the Status key. If the status line is off, press Status to turn it on. Press Status again to turn the status line off.

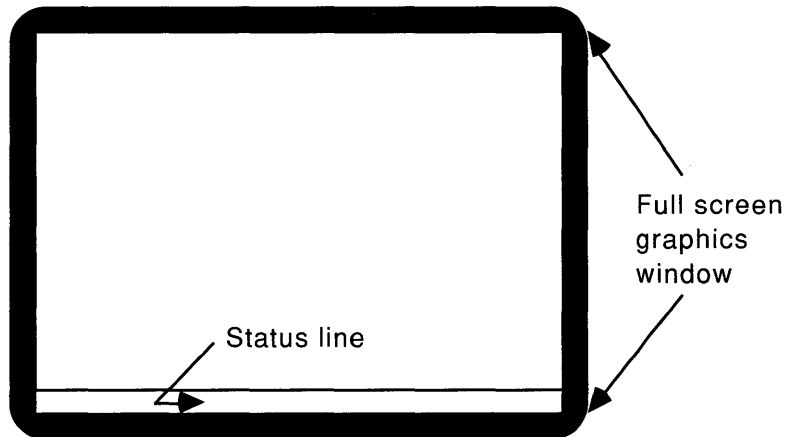
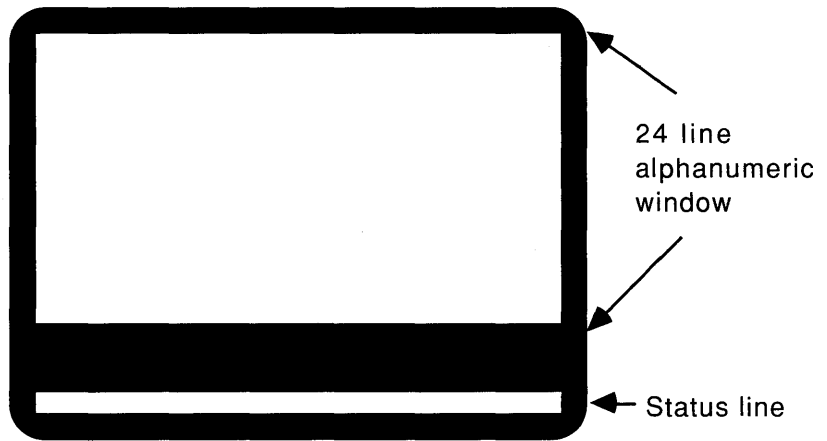


Figure 7.1 Status Line Placement



Figure 7.2 Status Line in VT220/VT100 Emulation



Figure 7.3 Status Line in X

Table 7.1 Status Line Fields

Field #	Contents	Description
1	VT220 VT100 VT52 X11	Currently selected emulation or X
2	<blank> Ptr not rdy	Indicates that the GraphOn 14 has been waiting more than four seconds for the printer to become ready — ready the printer or press Setup to halt the print operation
3	<blank> Insert	Indicates whether the terminal is in character insert mode — this field is displayed in VT220/VT100 mode only
4	<blank> nn	Blank unless in Interactivity Adjustment Mode, when it shows the minimum number of 13 msec intervals between mouse reports — this field is displayed in X only
5	<blank> Screen copy Auto print Printer ctrl Monitor	Current print operation in progress or whether Monitor mode is selected

6	XXX XXX	Current row and column numbers of the cursor — VT220/VT100 mode only
7	XXXX XXXX	Coordinates of the graphics cursor, relative to the upper left corner of the screen — only when a graphics cursor is displayed in X

7.4 Error Conditions

From time to time, the terminal may sense certain error conditions. This may be due to the failure of one of the terminal's self tests, or to a valid condition of which you may want to be notified.

When such a warning is displayed, the terminal turns on the status line. This ensures that you will see the message, regardless of whether the status line was enabled or disabled.

Self Test Messages

An error message is displayed on the status line if the self tests detect an error condition. This may occur at power up or in response to an explicit request to run the self tests. If more than one error is detected, several messages may be displayed at once.

The error messages which may be reported by the power up tests are listed in Table 7.2. Appendix B Troubleshooting describes what action should be taken if one or more of these messages does appear.

Table 7.2 GraphOn 14 Self Test Error Messages

DRAM	-	dynamic RAM failure
SRAM	-	static RAM failure
Setup #	-	checksum error in Setup control memory
Setup	-	Setup settings defaulted due to checksum error
FnKey	-	function keys defaulted
ROM	-	checksum error in program ROM
KB	-	keyboard failure
Incompatible keyboard	-	old-style GO-200 series keyboard which will work in VT220/VT100 mode but will not work correctly in X

When the operator has read the message, the status line may be returned to its normal state by pressing the Status key or the Setup key.

Printer Warning Messages

If a local print operation is in progress and you press Setup in order to stop the printing, the terminal will turn on the status line and display:

 Cancelling ...

The terminal will then attempt to transmit the remainder of the line currently being printed, as described in Chapter 5 Printing. When the terminal has finished sending the line, the message will be cleared from the status line.

If the terminal is unable to transmit the remainder of the line, it cancels the print operation in midstream and displays the following message:

 Print aborted - Initialize the printer

This warning reminds you that the printer has been left in an undefined state. When the printer has been initialized, press Status to clear the message.

Serial Port Receive Errors

If an error is detected when a character is received at a serial port, the status line is turned on, and the port at which the error occurred is displayed along with the nature of the error. Possible errors are:

- Parity error
- Framing error
- Overrun error
- Buffer overflow

Incoming characters are tested for the first three errors listed above only if parity checking is enabled in the Communication Setup screen. Buffer overflow is reported whenever it occurs.

Serial port receive errors are removed from the status line automatically after about two seconds.

Chapter 8

Communications

8.1 Overview

The GraphOn 14 communicates asynchronously with a computer or modem over a full duplex line.

The communications interface adheres to the Electronic Industry Association (EIA) standard RS-232-C. RS-232-C is a specification which describes an asynchronous serial communications protocol in terms of connector pin assignments as well as the signals applied to those pins.

All serial ports of the standard configuration GraphOn 14 follow RS-232-C. RS-423 is a similar protocol which is compatible with RS-232-C in most cases. If your application requires RS-423 (or RS-422), your GraphOn 14 can easily be modified. Contact GraphOn Customer Service for more information.

Two forms of flow control, XON and XOFF control codes and DTR or DSR hardware ready signals, are supported at all serial ports.

8.2 Serial Data Format

RS-232-C is a serial protocol. This means that each character and control code is transmitted and received one bit at a time.

It is also an asynchronous protocol. This means that each character is fully self-contained and may be transmitted independently of all other characters. Characters may be transmitted singly or in groups.

So that the terminal knows when one character stops and another starts, each character is framed with start and stop bits. The start bit is sent first, followed by the data bits. The least significant data bit is transmitted first. An extra bit is often transmitted after the data bits to help ensure that the other bits were transmitted and received correctly. This is called the parity bit. If even parity is selected, that bit is set to 0 or 1 so that the sum of the bits in the character, including the parity bit, is even. Similarly, if odd parity is selected, the sum of all bits must be odd. Finally, either one or two stop bits are sent — two stop bits are used at 110 baud, one stop bit at all other baud rates.

The format of a serially transmitted character is illustrated in Figure 8.1.

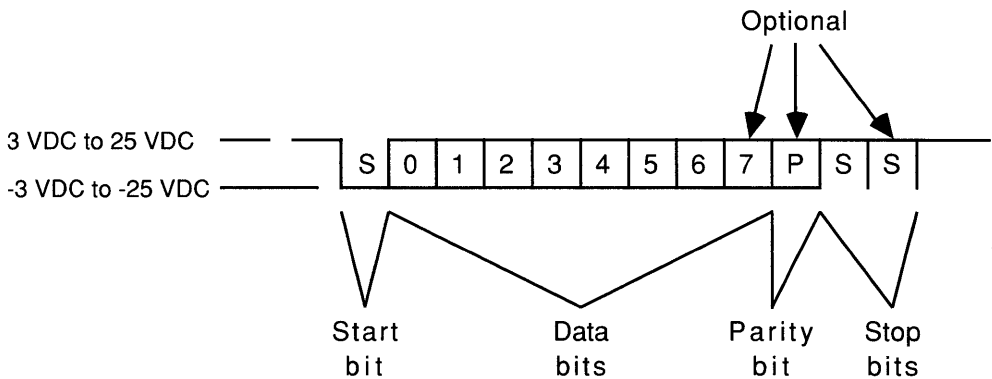


Figure 8.1 Serial Data Format

8.3 Serial Port Concepts

Generalized Device Connections

The GraphOn 14 supports generalized serial port usage. This means that any type of device supported by the GraphOn 14 may be connected to and used on any of its serial ports. There are no hardware limitations on which port is used for which device, other than the details of connector sex, pinouts, etc.

This flexibility is what makes it simple to connect more than one computer or multiple printers to your GraphOn 14.

For example, although the default Setup has the GraphOn 14 configured to communicate with a computer on Port A and a printer on Port C, you could very easily connect the computer to Port C and the printer on Port A. Just connect properly configured cables to your choice of serial ports and then enter Setup mode to tell the GraphOn 14 what you have done. Select main and printer ports in the General Setup screen, device types such as printer model in the Devices Setup screen, and communications parameters such as baud rate in the Communications Setup screen.

Input Buffer

The GraphOn 14 processes most received characters very quickly. Some operations, however, take longer to process than normal displayable characters. For example, although the terminal requires approximately seven milliseconds to clear the screen in VT220/VT100 emulation, the computer may continue to send new characters during this time. The terminal cannot process these characters until the clear screen operation is complete.

In order to avoid losing incoming characters while it is performing long functions, the terminal places incoming characters in an "input buffer". The input buffer is an area of memory which holds received characters until the terminal is ready to process them. The terminal can take a long time processing some functions, and then catch up when processing shorter functions, such as displaying characters.

The input buffer has the effect of averaging the execution times of the various functions specified by control codes and ESC sequences.

The length of the input buffers varies with the assumed use of the port. Port A, the default main port, has an input buffer which can hold 1023 bytes. Ports B and C, which normally don't need such large buffers, can hold up to 127 bytes in their input buffers.

NUL control codes are normally not placed in the buffer. They are used as pad characters by some systems and they usually perform no function in VT220/VT100 emulation. By discarding them immediately and not placing them in the buffer, processing is accelerated and they do not take up space in the buffer. DEL characters are also used as pad characters in some systems, but they are always buffered in the GraphOn 14.

There are times, though, when NUL characters should not be discarded. The most common case might be the downloading of 8-bit raster data from the host, as is often done in X. Other cases may include monitor mode or printer controller mode. In monitor mode, it may be desirable for NUL characters to be displayed along with all other control codes. In printer controller mode, the computer may transmit a string of NULs to a printer or plotter attached to the GraphOn 14 in order to generate a delay at the hard copy device. If the terminal discards those NULs, the delay at the hard copy device may be too short. And some graphics devices use NULs as valid data bytes.

The terminal's treatment of NULs depends upon the setting of a field in the Communications Setup screen for the selected port. The X server manipulates this field as necessary when it is running.

The control characters XON and XOFF are also not normally placed in the input buffer. As described below, they are normally used by the computer to halt the flow of characters coming from the terminal. In this case, they are processed as soon as they are received and are not put in the buffer.

If, however, the selected port is not configured to obey XON/XOFF, incoming XON and XOFF codes are treated as data rather than flow control. They are put in the input buffer and treated as any other control codes.

Flow Control

Normally, the terminal takes characters out of the input buffer very quickly. There are times, though, when the terminal will perform certain functions which greatly restrict the flow of characters out of the buffer. It is at these times that the buffer is most likely to overflow. These are:

- performing many long execution time functions in succession (rarely a problem because of the length of the buffer)
- entering Setup mode (which stops the terminal from processing all received characters)
- smooth scrolling (which artificially slows the rate of character processing)
- pressing the Hold key or Ctrl-S (which stops the processing of any characters received at the main port)

To avoid buffer overflow during these conditions, the terminal provides two methods of controlling the flow of incoming characters. The first is a software method which uses the XON and XOFF control codes. The second uses a hardware line to tell the host when it is ready to accept more characters.

The following discussion is described in terms of handshaking with a host computer, but it applies equally well to any other device that might be attached.

XON/XOFF handshaking works as follows:

- 1) The input buffer begins to fill.
- 2) When the buffer is filled to the point of holding 100 characters, an XOFF character (Ctrl-S) is transmitted to the host. This indicates to the host that it must stop transmitting characters.
- 3) The host stops transmitting characters.
- 4) Characters in the buffer continue to be processed. When the buffer has 16 characters left, an XON character (CTRL-Q) is transmitted to the host. This indicates that the host may now continue to send characters.
- 5) The host restarts transmissions to the terminal.

If the host ignores the first XOFF and continues to fill the buffer, a second XOFF is sent. This occurs when the buffer fills to 112 characters.

DTR or RTS (on Port A only) handshaking, if enabled, occurs in a similar fashion. When the buffer fills to 100 characters, the terminal lowers its hardware handshaking signal, indicating to the computer that the buffer is filling. When the buffer again empties out to 16 characters, the line is raised, indicating that the terminal is ready to receive more characters.

XON and XOFF characters received at the main port are normally treated as flow control from the host. If XOFF is received, the terminal stops transmissions to the host. It resumes transmissions when a subsequent XON is received. The use of these codes for flow control may be disabled by setting the incoming XON/XOFF field in the Communications Setup screen to "obey no XON/XOFF."

8.4 Main Port Communications

Remote and Local Echo

In most full duplex systems, characters entered at the keyboard and transmitted to the host are not automatically displayed on the screen by the terminal. Instead, transmitted characters are echoed back to the terminal by the host. The terminal then displays them just as it displays all other received characters. Although "remote echo" requires extra communications activity, the advantage is that the host has complete control over the contents of the terminal screen.

If the host does not remotely echo characters, the terminal may be configured to locally echo characters typed at the keyboard. This is done by enabling Local Echo in the Communications Setup screen for the port used as the main port.

Hold Key

Pressing the Hold key causes the terminal to freeze the contents of the screen. Characters received after the Hold key is pressed are simply placed in the input buffer and left there until the Hold condition ends.

When Hold is pressed, the terminal does not transmit any codes to the host. As a result, the computer will continue to send characters to the terminal and the input buffer will begin to fill. The buffer will not overflow, though, because as the buffer becomes full, the terminal invokes whichever form of handshaking has been selected the Communications Setup screen for that port. XOFF is sent and/or the hardware handshaking line is lowered.

When the Hold key is pressed a second time, the terminal begins to process the characters in the buffer. When the buffer becomes sufficiently empty, the terminal sends an XON and/or raises the hardware handshaking line, signalling that the computer may once again resume its transmissions.

Keys pressed while Hold is in effect are transmitted to the host. Some systems, however, are configured to perform a non-standard form of XON/XOFF handshaking in which any character may restart the flow of characters stopped by an XOFF. In this case, if a key is transmitted during Hold, the host may restart transmitting even though the screen is still frozen. To avoid the loss of characters which would result, the Hold field in the Keyboard Setup screen may be set to "any key ends Hold." This field setting instructs the GraphOn 14 to turn off Hold whenever any key is pressed which transmits a character to the host. This will avoid any problems with this variation of XON/XOFF handshaking.

If XON/XOFF handshaking is enabled and VT220/VT100 emulation is active, the Ctrl-S (XOFF) and Ctrl-Q (XON) keys perform the same functions as the Hold key. The user who wishes to temporarily halt the flow of characters to the terminal may press Ctrl-S. Ctrl-Q is pressed to restart the flow. The terminal recognizes the intent of a pressed Ctrl-S key and, rather than immediately sending an XOFF, simply simulates the pressing of the Hold key to halt the processing of incoming characters. Pressing Ctrl-Q simulates a second pressing of the Hold Screen key, once again starting the processing of characters.

Treating the Ctrl-S and Ctrl-Q keys in this way synchronizes the operator's use of XON and XOFF with the terminal's use of those codes. It avoids the situation, for example, in which 1) the terminal sends XOFF due to buffer filling, 2) the operator presses Ctrl-S (XOFF) because he wants to stop the flow of characters to the display, and 3) the terminal sends XON because the buffer is now empty. In this case, it would have appeared to the operator that his XOFF was ignored.

In X, the Ctrl-S and Ctrl-Q keys are not treated specially. They are just transmitted to the X Server, which passes them off to the appropriate X client.

8.5 Printer Port Communications

Detecting Whether a Printer Is Attached

The GraphOn 14 checks to see if a printer or other auxiliary device is attached to the current printer port before performing any type of print command. The GraphOn 14 considers a device to be attached if, at any time since power-up, the terminal has sensed a ready level on the incoming hardware handshaking pin of that port.

If printer ready has never been sensed, the GraphOn 14 assumes there is no auxiliary device and ignores all print requests from the computer and the keyboard.

If printer ready has been sensed at any time since power-up, all print requests will be honored, although printing may be delayed if the device currently indicates that it is not ready.

The GraphOn 14 will always consider a print device attached and ready if incoming hardware handshaking is disabled at the currently defined printer port.

Port C, the default printer port, is designed to report "printer not ready" if nothing is attached to that port. This very conveniently disables the Print key if no printer is attached. Ports A and B report "ready" if nothing is attached to their hardware handshaking inputs, giving these ports somewhat less stringent handshaking requirements.

Flow Control

The GraphOn 14's support of XON/XOFF and hardware handshaking is consistent with the requirements of standard serial printers.

The terminal recognizes an XOFF transmitted by the printer as a signal that the printer's input buffer is filling and that no more characters should be sent. The terminal then waits for an XON from the printer before transmitting any more characters.

The level of the incoming hardware handshaking pin at the printer port connector is also continuously monitored. If XON/XOFF is provided by the printer, then the terminal's handshaking pin may be wired to a signal such as DTR on the printer which usually indicates the readiness of the printer. If XON/OFF is not provided, the pin should be wired to a signal on the printer which indicates the state of its input buffer.

Any hardware handshaking transition from not ready to ready forces the GraphOn 14 to assume a received XON.

If required, either form of handshaking may be disabled, although it is almost always permissible to leave both enabled. Depending upon the auxiliary device and the cable used, it may be necessary to have the terminal ignore the DSR input, thus possibly requiring that XON/XOFF be used.

8.6 Serial Port Connector Pinouts

Port A

The Port A communications channel conforms to the EIA RS-232-C specification. The connector is a male DB-25 connector. Table 8.1 summarizes the signals available at Port A.

Table 8.1 Port A Connector Signals

Pin 1	Protective Ground Supplies chassis ground, which is wired internally to Pin 7.
Pin 2	Transmitted Data (output) Supplies serially encoded characters and break signals.
Pin 3	Received Data (input) Receives serially encoded characters.

- Pin 4 **Request to Send** (output)
Asserted at all times except when RTS handshaking is enabled and the buffer is filling.
- Pin 5 **Clear to Send** (input)
Must be asserted for terminal to transmit if configured to “obey DSR” in the Communications Setup screen. Otherwise, it is ignored at all times.
- Pin 6 **Data Set Ready** (input)
Must be asserted for terminal to transmit if configured to “obey DSR” in the Communications Setup screen. Otherwise, it is ignored at all times.
- Pin 7 **Signal Ground**
Supplies the common ground reference potential for all pins on the connector.
- Pin 8 **Data Carrier Detect** (input)
Ignored at all times.
- Pin 11 same as pin 19
- Pin 12 **Speed Indicator** (input)
Ignored at all times.
- Pin 15 **Transmit Clock** (input)
Ignored at all times.
- Pin 17 **Receive Clock** (input)
Ignored at all times.
- Pin 19 **Speed Select** (output)
Asserted at all times.
- Pin 20 **Data Terminal Ready** (output)
Asserted at all times except under the following circumstances:
- 1) during 3.5 second Break signal generated by pressing Shift Break (only if Port A is main port)
 - 2) when DTR handshaking is enabled and the buffer is filling

Pin 22	Ring Indicator (input) Ignored at all times.
Pin 23	same as Pin 19
Pins 9, 10, 13, 14, 16, 18, 21, 24, 25	not used

Port B

The Port B communications channel conforms to the EIA RS-232-C specification. The connector is a female DB-25 connector. Table 8.2 summarizes the signals available at Port B.

Table 8.2 Port B Connector Signals

Pin 1	Protective Ground Supplies chassis ground, which is wired internally to Pin 7.
Pin 2	Received Data (input) Receives serially encoded characters.
Pin 3	Transmitted Data (output) Supplies serially encoded characters and break signals.
Pin 4	Request to Send (input) Ignored at all times.
Pin 5	Clear to Send (output) Asserted at all times.
Pin 6	Data Set Ready (output) Asserted at all times except under the following circumstances: <ul style="list-style-type: none"> 1) during 3.5 second Break signal generated by pressing Shift Break (only if Port B is main port) 2) when DSR handshaking is enabled and the input buffer is filling

Pin 7	Signal Ground Supplies the common ground reference potential for all pins on the connector.
Pin 8	Data Carrier Detect (output) Asserted at all times.
Pin 20	Data Terminal Ready (input) Must be asserted for terminal to transmit if configured to “obey DSR” in the Communications Setup screen. Otherwise, it is ignored at all times.
Pins 9-19, 21-25	not used

Port C

The Port C communications channel conforms to the EIA RS-232-C specification. The connector is a male DB-9 connector. Table 8.3 summarizes the signals available at Port C.

Table 8.3 Port C Connector Signals

Pin 1	Protective Ground Supplies chassis ground, which is wired internally to Pin 7.
Pin 2	Transmitted Data (output) Transmits serially encoded characters.
Pin 3	Received Data (input) Receives serially encoded characters.
Pin 5	Data Terminal Ready (output) Asserted at all times.

- Pin 6 **Data Set Ready** (input)
Accepts the ready signal (usually DTR) from the attached device. If Port C is the printer port, the terminal uses this pin to determine whether a device is attached and whether it is ready.
- Pin 7 **Signal Ground**
Provides the common ground reference potential for all pins of this connector.
- Pins 4, 8, 9 not used

Appendix A

Installation

A.1 Setting Up the Terminal

This chapter will guide you through the process of setting up and connecting your new GraphOn 14 terminal.

First, the terminal will be set up and turned on without being connected to the computer. This will help familiarize you with the terminal while minimizing the number of problems which might arise from interconnection with the computer.

Second, the terminal will be connected to the host computer, a mouse or tablet, and possibly a local printer. Once these connections are verified, your terminal will be ready to use.

Unpacking

Gently unpack the box containing your terminal. It should contain the following items:

- One GraphOn 14 terminal monitor
- One GraphOn 14 terminal keyboard
- One GraphOn 14 User's Guide
- One power cord
- One warranty card

If anything is missing, contact GraphOn Customer Support.

Site Considerations

The GraphOn 14 may be placed on almost any flat working surface. The terminal does require, however, enough clearance between the monitor enclosure and its surroundings to ensure sufficient ventilation. There should be three inches of clearance around the sides and top of the terminal. In addition, there should always be unrestricted air flow to the underside of the terminal. Never use your GraphOn 14 on a carpeted or similar surface which might block the flow of air to the bottom panel of the terminal.

As there are no vents at the back of the terminal, no special clearance needs to be provided. All that is needed is sufficient room for the connectors which you will plug into the back of the terminal.

Attaching the Keyboard

Once the monitor enclosure has been placed on its working surface, the keyboard may be attached.

Place the keyboard in front of the monitor enclosure. Plug the connector at the end of the keyboard cable into its mating connector on the front of the left side of the base of the monitor enclosure.

Applying Power

Plug the female end of the power cord into the power connector on the back of the terminal. Plug the other end into an appropriate three-prong power outlet.

You are now ready to turn on the terminal. Set the power switch at the back of the terminal to "ON".

You may have noticed the five LEDs on the keyboard light up briefly, then four of them turn off again. The Power LED remains lit. This is the only sign of activity you should see until the monitor warms up, which takes approximately eight

seconds. During this time, the terminal is running tests of its various memories and of the keyboard.

The self tests generally finish executing just before the monitor has warmed up, although individual monitors may take differing amounts of time. You may see the end of the RAM test, which happens to display a variety of randomly stippled patterns on the screen. This is quite normal — just wait briefly until the screen clears and the status line appears.

Your terminal is functioning correctly if a copyright message is displayed briefly and the keyboard bell rings once. This means that the power up testing was successful.

If any of the tests fail, the keyboard bell will ring three times. The status line will contain an indication of which test(s) failed. If this occurs, refer to Appendix B Troubleshooting for help.

Adjusting Screen Brightness

The brightness of the screen is adjusted at the factory before shipping. Nonetheless, some readjustment may be necessary when the terminal is installed in its new location.

On the underside of the head of the monitor enclosure, in back on the right, you will find a screen brightness knob. Turn it clockwise to make the screen brighter, counterclockwise to make the screen more dim.

A.2 Connecting to Other Devices

Configuring the Terminal Using Setup Mode

Now you must configure the GraphOn 14 so that it can communicate correctly with your system. The default configuration of the GraphOn 14, as shipped from the factory, is appropriate for many users. Nevertheless, you may need to alter a few Setup fields to adapt the terminal to your system. This is done by using the Setup mode as described in Chapter 3.

An initial system checkout can be done after configuring only the following items for the main port in the Communications Setup screen (enter Setup, then press “4” to enter this Setup screen):

- Local Echo
- Baud rate
- Word size/parity
- Handshaking protocol

In addition, configure the following communications settings for the printer port if a local printer will be attached:

- Baud rate
- Word size/parity
- Handshaking protocol
- Type of graphics printer (in Devices Setup screen)

Refer to Chapter 3 for instructions on using Setup mode.

After making the desired selections, save the new configuration by selecting the Save field in the Setup Directory screen or by holding down the Shift key and pressing “S”.

Host Interface

The default main port connector at the back of the terminal is Port A. It uses a standard RS-232-C male DB-25 connector. The pin layout of the connector is described in Chapter 8 Communications and is the same as that of the main port of the VT100 or VT220 . Make sure that your cable is wired correctly for this connector layout.

Attach the cable to the Port A connector at the back of the terminal.

If you wish to use Port B or Port C as the main port, perform the following steps:

- connect a properly wired interface cable to the new main port
- go to the Devices Setup screen and inform the GraphOn 14 that a computer is attached to that port
- go to the General Setup screen and select the port as the new main port
- if using Port C, you will probably need to disable incoming DSR handshaking

Chapter 8 Communications gives the pinouts for each of the serial ports.

Graphic Input Device Interface

If you have a GraphOn mouse that you wish to connect to your GraphOn 14, simply plug its 25-pin connector directly into Port B at the back of the terminal. You need not make any adjustments in Setup — a GraphOn Mouse connected to Port B is part of the default configuration of the GraphOn 14.

If you wish to connect any other input device which the GraphOn 14 supports, perform the following steps:

- connect a properly wired interface cable from the device to the port you wish to use
- go to the Devices Setup screen and inform the GraphOn 14 of the type of input device that is attached to that port
- go to the Communications Setup screen and set the baud rate, parity/word size and handshaking parameters to agree with those parameters set in the input device

Printer Interface

Connecting the cable from the printer to the terminal is very similar to connecting the computer to the terminal. The only note of caution is that the default printer port of the terminal uses a 9-pin connector. This connector is the same as the printer port connector on a VT220. Most printers will require a cable which connects pin 2 to pin 3, pin 3 to pin 2, pin 20 (at the printer) to pin 6 (at the terminal), and pin 7 (at the printer) to pin 7 (at the terminal). This means that a “null modem” cable usually must be used. This cable flips the transmit and receive wires and the DSR and DTR wires, so that the transmit line from the terminal goes to the receive line of the printer, etc. Consult the user manual for your printer and Chapter 8 Communications, which gives the pinouts for each of the serial ports.

With the power turned off, connect the cable from the printer to the Port C connector at the back of the terminal.

If you wish to use Port A or Port B as the printer port, perform the following steps:

- connect a properly wired interface cable to the new printer port
- go to the Devices Setup screen and inform the GraphOn 14 that a printer is attached to that port
- go to the General Setup screen and select the port as the new printer port

Regardless of which port is the printer port, you will want to go to the Devices Setup screen to select the type of printer which you have attached to that port and to the Communications Setup screen for that port to configure the communication parameters of baud rate, parity/word size, and handshaking.

Final Checkout

Now with the terminal properly configured and all cables connected, turn on the terminal. When the bell rings indicating that the self tests are complete, attempt to transmit and receive characters from the computer. If this is successful, press the Print key to send the contents of the screen to the printer, if one is attached to the terminal.

If both main and printer port communications are successful, you are on your way. The terminal is now in a standard VT220 configuration, so it is quite possible that no other changes to Setup will be necessary. If you are going to run X, no Setup adjustments are necessary — GraphOn's X server will take care of the rest. GraphOn does recommend, however, that you take the time (either now or later) to become acquainted with all the Setup fields. You may discover user preference features which do not affect compatibility with the host, but which increase your enjoyment of the terminal. Don't forget to save any new Setup choices by selecting the Save field in the Setup Directory screen or by pressing Shift-S.

A.3 Installing the X Window System

Running the X Window System on the GraphOn 14 requires that GraphOn's X Server be installed on the host system. The X Server is part of the host-based GraphOn X Server Software, which is distributed separately. Instructions for loading the GraphOn X Server Software are contained in documentation shipped with the software.

If you do not have the GraphOn X Server Software, contact your system administrator or GraphOn sales representative.

Appendix B

Troubleshooting

B.1 Initial Power Up

Symptom

Display is dark,
all keyboard LEDs
are dark

Problem/Solution

Terminal is not getting power -

Make sure AC power cord is plugged
securely into its receptacle at the back of the
terminal and into a live AC power outlet.

Display comes up, but
all keyboard LEDs are
dark - power up
tests report "KB" error

Faulty keyboard connection -

Make sure that keyboard connector is
plugged securely into its receptacle at the
left side of the terminal base.

Display is dark but
keyboard is OK

Screen brightness is set too low -

Make sure that brightness knob on the
right-hand underside of the monitor
enclosure is turned sufficiently clockwise.

B.2 Diagnostics Failure

Symptom

Problem/Solution

“DRAM” or “SRAM”
error reported on
status line

Internal diagnostics detected a RAM error -

Refer servicing to qualified personnel.

“FnKey” or “Setup”
error reported on
status line

Internal diagnostics detected invalid data in
function key memory or Setup memory -

May be the result of a previously run RAM
test. Turn power off and back on again to
see if the default values are stored correctly.

If it happens more than once, refer servicing
to qualified personnel.

“ROM” error reported
on status line

Internal diagnostics detected an error in program
ROM -

Refer servicing to qualified personnel.

“KB” error reported
on status line

Internal diagnostics detected a keyboard error -

Make sure that keyboard connector is
plugged securely into its receptacle at the
left side of the terminal base.

Otherwise, refer servicing to qualified
personnel.

“Incompatible keyboard”
error reported on status line

Internal diagnostics detected an incompatible
GraphOn keyboard -

This can occur when a keyboard from a
GO-200 Series terminal is attached to the
GraphOn 14. Install the keyboard originally
shipped with your GraphOn 14.

B.3 Host Communications

Symptom

Cannot send or receive
characters

Problem/Solution

Communications not properly configured -

Make sure terminal is “online,” in General
Setup screen.

Make sure cables are installed and wired
correctly at both the terminal and the
computer.

Make sure baud rate and parity/word size of
the computer matches the settings in the
terminal’s Communications Setup screen.

Hold Screen or Ctrl-S was pressed -

Press Hold Screen again and/or press
Ctrl-Q.

Defective communications IC -

Refer servicing to qualified personnel.

Receiving garbled characters

Baud rate is set incorrectly -

Make sure baud rate of the computer matches baud rate of the terminal, in the Communications Setup screen.

Some characters are OK, others are missing or displayed with a backward question mark

Parity/word size is set incorrectly -

Make sure the parity/word size of the computer matches the parity/word size of the terminal, in the Communications Setup screen.

Numeric keypad keys or arrow keys do not work correctly when using a keypad editor

Parity/word size is set incorrectly -

Make sure the parity/word size of the computer matches the parity/word size of the terminal, in the Communications Setup screen.

8 bit control codes are being generated when the system is expecting 7 bit controls -

Set to transmit 7 bit controls in the General Setup screen.

Cannot transmit Ctrl-Q or Ctrl-S from the keyboard

XON/XOFF is enabled, forcing the terminal to treat the Ctrl-Q(XON) and Ctrl-S(XOFF) keys specially -

Disable XON/XOFF handshaking in the Communications Setup screen for the port defined as the main port. See Chapter 8 Communications.

Characters are received correctly, but typed characters are not displayed

Host is not echoing characters back to the terminal -

Enable Local Echo, in Communications Setup screen.

Characters are received correctly, but each typed character is displayed twice

Host is echoing characters back to the terminal -

Disable Local Echo, in Communications Setup screen.

“Buffer Overflow” message displayed on status line

Terminal cannot keep up with incoming flow of characters -

Enable XON/XOFF or hardware handshaking in the Communications Setup screen for the port defined as the main port.

B.4 Printer Communications

Symptom

Cannot print anything to locally attached printer

Problem/Solution

Communications not properly configured -

Make sure cables are installed and wired correctly at both the terminal and the printer. See Chapter 8 Communications for detailed descriptions of the pinouts of the printer port connector. In particular, make sure that the transmit pin of the printer port is connected to the receive pin of the

printer. If using Port C as the printer port (this is the default), most printers will require a null modem cable which swaps pins 2 and 3 and which carries a ready signal from the printer (usually DTR - pin 20) to the ready input of Port C (DSR - pin 6).

Make sure baud rate of the printer matches baud rate of the terminal, in Communications Setup screen.

Make sure that the port attached to the printer is defined as the printer port in the General Setup screen.

Make sure the printer is powered up, has paper, and is on line.

Defective communications IC -

Refer servicing to qualified personnel.

Prints garbled characters

Baud rate is set incorrectly -

Make sure baud rate of the printer matches baud rate of the terminal, in the Communications Setup screen.

Prints some characters OK, others are missing or displayed with an error character

Parity/word size is set incorrectly -

Make sure the parity/word size of the printer matches the parity/word size of the terminal, in the Communications Setup screen.

Printer port flow control is set incorrectly -

Make sure that the form of handshaking which is used by the printer is enabled in the

Communications Setup screen for the port used as the printer port. If using hardware “ready” handshaking, make sure that the ready signal from the printer is brought to the DSR pin (Port A or C) or DTR pin (Port B) on the printer port.

Alphanumerics prints correctly, but graphics is printed as nonsense alphanumeric characters

Graphics printer type is set incorrectly -

Make sure that the terminal knows what type of graphics printer is attached to it, in Devices Setup screen.

Graphics starts printing correctly, but begins printing nonsense alphanumeric characters part way into the print

Printer port flow control incorrect -

Make sure that the form of handshaking which is used by the printer is enabled in the Communications Setup screen for the port used as the printer port. If using hardware “ready” handshaking, make sure that the ready signal from the printer is brought to the DSR pin (Port A or C) or DTR pin (Port B) on the printer port.

Alphanumerics prints correctly, but not graphics to an Epson printer, a ThinkJet (which uses Epson protocol), or any supported laser printer

Word size/parity is set incorrectly -

Epson graphics protocol requires that 8 bits of data be sent in each character. Usually word size/parity should be set to 8 bits/no parity.

B.5 Alphanumerics

Symptom

Problem/Solution

Does not correctly run software written for a VT220

Terminal is not configured as a VT220 -

Make sure that VT220 emulation is selected in the Standard Functions Alphanumeric Setup screen.

Does not correctly run software written for a VT100

Terminal is not configured as a VT100 -

Make sure that VT100 emulation is selected in the Standard Functions Alphanumeric Setup screen.

Foreign characters are being displayed when they shouldn't be

Host is transmitting 8-bit data to the terminal -

Set word size to 7 bits, in Communications Setup screen.

If VT100 emulation is selected, turn off enhancements in the Standard Functions Alphanumeric Setup screen.

B.6 Bringing Up X

Symptom

Problem/Solution

X Server does not execute — get “Incompatible Terminal” message

Enhancements to VT220/VT100 are disabled -

Select “full enhancements” in the Enhanced Functions Alphanumeric Setup screen.

B.7 Downloading Setup and Function Keys

Symptom

Problem/Solution

Cannot download Setup fields

Enhancements to VT220/VT100 are disabled -

Select "full enhancements" in the Enhanced Function Alphanumeric Setup screen.

Cannot download function keys

Host download of function keys is disabled -

Enable host download of function keys in the Function Key Setup screen.

Cannot properly define a function key which contains NUL

NULs are being discarded by the terminal -

Allow processing of NULs by setting "NULs accepted" in the Communications Setup screen.

Cannot properly define a function key which contains Ctrl-S or Ctrl-Q

Received Ctrl-S(XOFF) and Ctrl-Q(XON) are being used for flow control by the terminal -

Set terminal to treat incoming XON and XOFF as data instead of flow control by setting the main port to obey "no XON/XOFF" in the Communications Setup screen.

Appendix C

Character Set Tables

C.1 Overview

The GraphOn 14 supports both 7 and 8 bit control codes in VT220/VT100 emulation. Figure C.1 shows the C0 and C1 control code sets and the default GR and GL graphics sets. The C0 and C1 sets never change. The GL and GR sets, on the other hand, may be redefined in order to access more than two character sets.

The VT220 and VT100 emulations in the GraphOn 14 support a variety of character sets. These sets are:

US ASCII

The standard character set used by most applications. Consists of upper and lower case letters, numbers, punctuation, and special characters.

This set is available to any DEC emulation in the GraphOn 14.

DEC Supplemental Graphics

Supplies the additional characters which, when added to the US ASCII set, form the DEC Multinational Character Set. All the characters needed to form various national character sets may be found in this expanded set.

This set is available in VT200 mode only.

UK ASCII

Same as US ASCII, except the pound sign “#” is replaced with the Pound Sterling “£”.

This set is available only in VT100 emulation or in the VT220 emulation of a VT100.

DEC Special Graphics

Also known as the VT100 special graphics set, this set replaces the lower case characters with special characters and characters for performing simple line graphics.

This set is available in VT100 or VT200 modes.

Monitor Mode

The Monitor Mode character sets are displayed when the terminal is in monitor mode. Displayable 7-bit characters are displayed as US ASCII. Displayable 8-bit characters are displayed from the DEC Supplemental Graphics set. 7-bit control codes are displayed using special characters which display two letters in one character cell. These two letters provide an abbreviation for the ASCII name of that control code. 8-bit control codes display 2 hexadecimal digits in a single cell. These digits describe the hexadecimal value of the received control code.

C0 and C1 Control Codes

	Column	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
Row	Bits	0 ₀ 0 ₀	0 ₀ 0 ₁							1 ₀ 0 ₀	1 ₀ 0 ₁						
0	0000	NUL	DLE														
1	0001	SOH	DC1								PU1						
2	0010	STX	DC2								PU2						
3	0011	ETX	DC3								STS						
4	0100	EOT	DC4							IND	CCH						
5	0101	ENQ	NAK							NEL	MW						
6	0110	ACK	SYN							SSA	SPA						
7	0111	BEL	ETB							ESA	EPA						
8	1000	BS	CAN							HTS							
9	1001	HT	EM							HTJ							
A	1010	LF	SUB							VTS							
B	1011	VT	ESC							PLD	CSI						
C	1100	FF	FS							PLU	ST						
D	1101	CR	GS							RI	OSC						
E	1110	SO	RS							SS2	PM						
F	1111	SI	US							SS3	APC						

Figure C.1 C0/C1 Controls

US ASCII

	Column	0	1	2	3	4	5	6	7
Row	Bits	0 ₀ 0 ₀ 0	0 ₀ 0 ₀ 1	0 ₀ 0 ₁ 0	0 ₀ 0 ₁ 1	0 ₁ 0 ₀ 0	0 ₁ 0 ₀ 1	0 ₁ 0 ₁ 0	0 ₁ 0 ₁ 1
0	0000	NUL	DLE	SP	0	@	P		p
1	0001	SOH	DC1	!	1	A	Q	a	q
2	0010	STX	DC2	"	2	B	R	b	r
3	0011	ETX	DC3	#	3	C	S	c	s
4	0100	EOT	DC4	\$	4	D	T	d	t
5	0101	ENQ	NAK	%	5	E	U	e	u
6	0110	ACK	SYN	&	6	F	V	f	v
7	0111	BEL	ETB	'	7	G	W	g	w
8	1000	BS	CAN	(	8	H	X	h	x
9	1001	HT	EM	)	9	I	Y	i	y
A	1010	LF	SUB	*	:	J	Z	j	z
B	1011	VT	ESC	+	;	K	[	k	{
C	1100	FF	FS	,	<	L	\	l	|
D	1101	CR	GS	-	=	M	]	m	}
E	1110	SO	RS	.	>	N	^	n	~
F	1111	SI	US	/	?	O	_	o	DEL

Figure C.2 US ASCII (left half of DEC Multinational Set)

DEC Supplemental Graphics

	Column	8	9	A	B	C	D	E	F
Row	Bits	¹ 0 ₀₀	¹ 0 ₀₁	¹ 0 ₁₀	¹ 0 ₁₁	¹ 1 ₀₀	¹ 1 ₀₁	¹ 1 ₁₀	¹ 1 ₁₁
0	0000		DCS		°	À		à	
1	0001		PU1	ı	±	Á	Ñ	á	ñ
2	0010		PU2	¢	²	Â	Ò	â	ò
3	0011		STS	£	³	Ã	Ó	ã	ó
4	0100	IND	CCH			Ä	Ô	ä	ô
5	0101	NEL	MW	¥	µ	Å	Õ	å	õ
6	0110	SSA	SPA		¶	Æ	Ö	æ	ö
7	0111	ESA	EPA	§	•	Ç	Œ	ç	œ
8	1000	HTS		π		È	Ø	è	ø
9	1001	HTJ		©	¹	É	Ù	é	ù
A	1010	VTS		ª	º	Ê	Ú	ê	ú
B	1011	PLD	CSI	«	»	Ë	Û	ë	û
C	1100	PLU	ST		¼	Ì	Ü	ì	ü
D	1101	RI	OSC		½	Í	Ý	í	ý
E	1110	SS2	PM			Î		î	
F	1111	SS3	APC		¿	Ï	ß	ï	

Figure C.3 DEC Supplemental Graphics (right half of DEC Multinational Set)

UK ASCII

	Column	0	1	2	3	4	5	6	7
Row	Bits	0_00	0_01	0_10	0_11	1_00	1_01	1_10	1_11
0	0000	NUL	DLE	SP	0	@	P	`	p
1	0001	SOH	DC1	!	1	A	Q	a	q
2	0010	STX	DC2	"	2	B	R	b	r
3	0011	ETX	DC3	£	3	C	S	c	s
4	0100	EOT	DC4	\$	4	D	T	d	t
5	0101	ENQ	NAK	%	5	E	U	e	u
6	0110	ACK	SYN	&	6	F	V	f	v
7	0111	BEL	ETB	'	7	G	W	g	w
8	1000	BS	CAN	(	8	H	X	h	x
9	1001	HT	EM	)	9	I	Y	i	y
A	1010	LF	SUB	*	:	J	Z	j	z
B	1011	VT	ESC	+	;	K	[	k	{
C	1100	FF	FS	,	<	L	\	l	|
D	1101	CR	GS	-	=	M	]	m	}
E	1110	SO	RS	.	>	N	^	n	~
F	1111	SI	US	/	?	O	_	o	DEL

Figure C.4 UK ASCII

DEC Special Graphics

	Column	0	1	2	3	4	5	6	7
Row	Bits	0 ₀₀	0 ₀₁	0 ₁₀	0 ₁₁	1 ₀₀	1 ₀₁	1 ₁₀	1 ₁₁
0	0000	NUL	DLE	SP	0	@	P	◆	—
1	0001	SOH	DC1	!	1	A	Q	▀	—
2	0010	STX	DC2	"	2	B	R	H T	—
3	0011	ETX	DC3	#	3	C	S	F F	—
4	0100	EOT	DC4	\$	4	D	T	C R	|
5	0101	ENQ	NAK	%	5	E	U	L F	|
6	0110	ACK	SYN	&	6	F	V	°	⊥
7	0111	BEL	ETB	'	7	G	W	±	⊤
8	1000	BS	CAN	(	8	H	X	N L	|
9	1001	HT	EM	)	9	I	Y	V T	≤
A	1010	LF	SUB	*	:	J	Z	⌋	≥
B	1011	VT	ESC	+	;	K	[	⌈	π
C	1100	FF	FS	,	<	L	\	⌊	≠
D	1101	CR	GS	-	=	M]	⌋	£
E	1110	SO	RS	.	>	N	^	⌉	.
F	1111	SI	US	/	?	O		—	DEL

Figure C.5 DEC Special Graphics

Monitor Mode Graphics

		Column	0	1	2	3	4	5	6	7
Row	Bits	0 ₀ 0 ₀	0 ₀ 0 ₁	0 ₀ 1 ₀	0 ₀ 1 ₁	0 ₁ 0 ₀	0 ₁ 0 ₁	0 ₁ 1 ₀	0 ₁ 1 ₁	
0	0000	N U	D L		0	@	P	.	p	
1	0001	S H	D 1	!	1	A	Q	a	q	
2	0010	S X	D 2	"	2	B	R	b	r	
3	0011	E X	D 3	#	3	C	S	c	s	
4	0100	E T	D 4	\$	4	D	T	d	t	
5	0101	E Q	N K	%	5	E	U	e	u	
6	0110	A K	S Y	&	6	F	V	f	v	
7	0111	B L	E B	'	7	G	W	g	w	
8	1000	B S	C N	(	8	H	X	h	x	
9	1001	H T	E M	)	9	I	Y	i	y	
A	1010	L F	?	*	:	J	Z	j	z	
B	1011	V T	E C	+	;	K	[	k	{	
C	1100	F F	F S	,	<	L	\	l	|	
D	1101	C R	G S	-	=	M	]	m	}	
E	1110	S O	R S	.	>	N	^	n	~	
F	1111	S I	U S	/	?	O	_	o	D T	

Figure C.6 Monitor Mode - \$00 through \$7F

Column		8	9	A	B	C	D	E	F
Row	Bits	10 ₀₀	10 ₀₁	10 ₁₀	10 ₁₁	11 ₀₀	11 ₀₁	11 ₁₀	11 ₁₁
0	0 0 0 0	8 ₀	9 ₀	A ₀	°	À	D ₀	à	F ₀
1	0 0 0 1	8 ₁	9 ₁	i	±	Á	Ñ	á	ñ
2	0 0 1 0	8 ₂	9 ₂	¢	2	Â	Ò	â	ò
3	0 0 1 1	8 ₃	9 ₃	£	3	Ã	Ó	ã	ó
4	0 1 0 0	8 ₄	9 ₄	A ₄	B ₄	Ä	Ô	ä	ô
5	0 1 0 1	8 ₅	9 ₅	¥	μ	Å	Õ	å	õ
6	0 1 1 0	8 ₆	9 ₆	A ₆	¶	Æ	Ö	æ	ö
7	0 1 1 1	8 ₇	9 ₇	§	•	Ç	Œ	ç	œ
8	1 0 0 0	8 ₈	9 ₈	¤	B ₈	È	Ø	è	ø
9	1 0 0 1	8 ₉	9 ₉	©	1	É	Ù	é	ù
A	1 0 1 0	8 _A	9 _A	ª	º	Ê	Ú	ê	ú
B	1 0 1 1	8 _B	9 _B	«	»	Ë	Û	ë	û
C	1 1 0 0	8 _C	9 _C	A _C	¼	Ì	Ü	ì	ü
D	1 1 0 1	8 _D	9 _D	A _D	½	Í	Ý	í	ÿ
E	1 1 1 0	8 _E	9 _E	A _E	B _E	Î	D _E	î	F _E
F	1 1 1 1	8 _F	9 _F	A _F	¿	Ï	B	ï	□

Figure C.7 Monitor Mode - \$80 through \$FF

Appendix D

Escape Sequences

D.1 VT220/VT100 Emulation Commands

Control Codes

<u>Function</u>	<u>Control Code</u>
Send Answerback	ENQ(ctrl-E)
Bell	BEL(ctrl-G)
Back Space	BS(ctrl-H)
Tab	HT(ctrl-I)
Line Feed	LF(ctrl-J)
Vertical Tab (same as Line Feed)	VT(ctrl-K)
Form Feed (same as Line Feed)	FF(ctrl-L)
Carriage Return	CR(ctrl-M)
Shift G1 character set into GL	SO(ctrl-N)
Shift G0 character set into GL	SI(ctrl-O)
Abort ESC sequence	CAN(ctrl-X)
Abort ESC sequence	SUB(ctrl-Z)

Cursor Motion

<u>Function</u>	<u>Mnemonic</u>	<u>Sequence</u>
Cursor Up	CUU	ESC [<i>Pn</i> A
Cursor Down	CUD	ESC [<i>Pn</i> B
Cursor Forward	CUF	ESC [<i>Pn</i> C
Cursor Backward	CUB	ESC [<i>Pn</i> D
Cursor Position	CUP	ESC [<i>Pn</i> ; <i>Pn</i> H
Horizontal and Vertical Position	HVP	ESC [<i>Pn</i> ; <i>Pn</i> f
Index	IND	ESC D
Reverse Index	RI	ESC M
Next Line	NEL	ESC E

Screen Erasure

<u>Function</u>	<u>Mnemonic</u>	<u>Sequence</u>
Erase in Display erase from cursor to end of page erase from top of page to cursor erase entire screen	ED	ESC [<i>Ps</i> J <i>Ps</i> = 0 <i>Ps</i> = 1 <i>Ps</i> = 2
Erase in Line erase from cursor to end of line erase from start of line to cursor erase entire line	EL	ESC [<i>Ps</i> K <i>Ps</i> = 0 <i>Ps</i> = 1 <i>Ps</i> = 2
Selective Erase in Display (VT200 mode only) erase from cursor to end of page erase from top of page to cursor erase entire screen	DECSED	ESC [? <i>Ps</i> J <i>Ps</i> = 0 <i>Ps</i> = 1 <i>Ps</i> = 2
Selective Erase in Line (VT200 mode only) erase from cursor to end of line erase from start of line to cursor erase entire line	DECSEL	ESC [? <i>Ps</i> K <i>Ps</i> = 0 <i>Ps</i> = 1 <i>Ps</i> = 2
Erase Character (VT200 mode only)	ECH	ESC [<i>Pn</i> X

Line Attributes

<u>Function</u>	<u>Mnemonic</u>	<u>Sequence</u>
Double Height Line	DECDHL	ESC # 3 (top half) ESC # 4 (bottom half)
Double Width Line	DECDWL	ESC # 6
Single Width Line	DECSWL	ESC # 5

Screen Alignment Pattern

<u>Function</u>	<u>Mnemonic</u>	<u>Sequence</u>
Fill screen with 'E's	DECALN	ESC # 8

Character Attributes

<u>Function</u>	<u>Mnemonic</u>	<u>Sequence</u>
Select Graphic Rendition reset to no attributes bold intensity underline blink reverse turn off bold (VT200 mode only) turn off underline (VT200 mode only) turn off blink (VT200 mode only) turn off reverse (VT200 mode only)	SGR	ESC [<i>Ps</i> ; ... ; <i>Ps</i> m <i>Ps</i> = 0 <i>Ps</i> = 1 <i>Ps</i> = 4 <i>Ps</i> = 5 <i>Ps</i> = 7 <i>Ps</i> = 22 <i>Ps</i> = 24 <i>Ps</i> = 25 <i>Ps</i> = 27
Select Character Attributes (VT200 mode only) turn off all attributes (does not apply to SGR) turn on "not erasable" attribute turn off "not erasable" attribute	DECSCA	ESC [<i>Ps</i> " q <i>Ps</i> = 0 <i>Ps</i> = 1 <i>Ps</i> = 2

Scrolling Region

<u>Function</u>	<u>Mnemonic</u>	<u>Sequence</u>
Set Top and Bottom Margins	DECSTBM	ESC [<i>Pn</i> ; <i>Pn</i> r

Saving and Restoring the Cursor

<u>Function</u>	<u>Mnemonic</u>	<u>Sequence</u>
Save Cursor	DECSC	ESC 7
Restore Cursor	DECRC	ESC 8

Character Sets

<u>Function</u>	<u>Mnemonic</u>	<u>Sequence</u>
Select US ASCII	SCS	
as G0		ESC (B
as G1		ESC) B
as G2 (VT200 mode only)		ESC * B
as G3 (VT200 mode only)		ESC + B
Select UK ASCII (VT100 mode only)		
as G0		ESC (A
as G1		ESC) A
Select DEC Supplemental Graphics (VT200 mode only)		
as G0		ESC (<
as G1		ESC) <
as G2		ESC * <
as G3		ESC + <
Select DEC Special Graphics		
as G0		ESC (0
as G1		ESC) 0
as G2 (VT200 mode only)		ESC * 0
as G3 (VT200 mode only)		ESC + 0
Lock Shift G0 into GL	LS0	SI
Lock Shift G1 into GL	LS1	SO
Lock Shift G1 into GR	LS1R	ESC ~
Lock Shift G2 into GL	LS2	ESC n
Lock Shift G2 into GR	LS2R	ESC }
Lock Shift G3 into GL	LS3	ESC o
Lock Shift G3 into GR	LS3R	ESC |
(Lock Shifts function in VT200 mode only)		
Single Shift G2	SS2	SS2 or ESC N
Single Shift G3	SS3	SS3 or ESC O

Editing

<u>Function</u>	<u>Mnemonic</u>	<u>Sequence</u>
Delete Line	DL	ESC [<i>Pn</i> M
Insert Line	IL	ESC [<i>Pn</i> L
Delete Character	DCH	ESC [<i>Pn</i> P
Insert Character (VT200 mode only)	ICH	ESC [<i>Pn</i> @

Tab Stops

<u>Function</u>	<u>Mnemonic</u>	<u>Sequence</u>
Horizontal Tabulation Set	HTS	ESC H
Tabulation Clear	TBC	ESC [<i>Ps</i> g
Clear stop in current column		<i>Ps</i> = 0
Clear all tab stops		<i>Ps</i> = 3

Mode Setting and Resetting

<u>Function</u>	<u>Mnemonic</u>	<u>Sequence</u>
Set Mode	SM	ESC [<i>Ps</i> ; ... ; <i>Ps</i> h
Reset Mode	RM	ESC [<i>Ps</i> ; ... ; <i>Ps</i> l (l = lower case "L")
Keyboard Action	KAM	
locked		ESC [2 h
unlocked		ESC [2 l
Insertion-Replacement	IRM	
insert		ESC [4 h
replace		ESC [4 l
Send-Receive	SRM	
off		ESC [12 h
on		ESC [12 l
Line Feed-New Line	LNM	
on		ESC [20 h
off		ESC [20 l
Cursor Keys	DECCKM	
application		ESC [? 1 h
normal		ESC [? 1 l

ANSI/VT52 <i>not applicable</i>	DECANM	ESC [? 2 h
VT52		ESC [? 2 l
Column	DECCOLM	
132 columns		ESC [? 3 h
80 columns		ESC [? 3 l
Scrolling	DECSCLM	
smooth scroll		ESC [? 4 h
jump scroll		ESC [? 4 l
Screen	DECSCNM	
reverse video		ESC [? 5 h
normal video		ESC [? 5 l
Origin	DECOM	
start of scrolling region		ESC [? 6 h
absolute		ESC [? 6 l
Auto wrap	DECAWM	
on		ESC [? 7 h
off		ESC [? 7 l
Auto repeat	DECARM	
on		ESC [? 8 h
off		ESC [? 8 l
Print Form Feed	DECPFF	
on		ESC [? 18 h
off		ESC [? 18 l
Print extent	DECPEX	
full screen		ESC [? 19 h
scrolling region		ESC [? 19 l
Text cursor enable (VT200 mode only)	DECTCEM	
on		ESC [? 25 h
off		ESC [? 25 l
Keypad Application Mode	DECKPAM	ESC =
Keypad Numeric Mode	DECKPNM	ESC >

Reports

<u>Function</u>	<u>Mnemonic</u>	<u>Sequence</u>
Primary Device Attributes	DA	ESC [c
VT220 response		ESC [? 62 ; 1 ; 2 ; 6 ; 7 ; 8 ; 9 c
VT240 response		ESC [? 62 ; 1 ; 2 ; 3 ; 4 ; 6 ; 7 ; 8 ; 9 c
VT100 w/ printer response		ESC [? 1 ; 11 c
VT100 response		ESC [? 1 ; 2 c
VT101 response		ESC [? 1 ; 0 c
VT102 response		ESC [? 6 c
VT125 response		ESC [? 12 ; 7 ; 1 ; 10 ; 102 c

Secondary Device Attributes (VT200 emulation only)	DA	ESC [> c
VT220 response	ESC [> 1;10 c	
Device Status Report - Terminal Status	DSR	ESC [5 n
Window reports "ok"	ESC [0 n	
Window reports malfunction	ESC [3 n	
Device Status Report - Cursor Position	DSR	ESC [6 n
Window responds with CPR	ESC [Pn ; Pn R	
Device Status Report - Printer Status	DSR	ESC [? 15 n
printer ready	ESC [? 10 n	
printer not ready	ESC [? 11 n	
printer not attached	ESC [? 13 n	
Device Status Report - Function Keys (VT200 emulation only)	DSR	ESC [? 25 n
Function keys are unlocked	ESC [? 20 n	
Function keys are locked	ESC [? 21 n	
Identify Terminal	DECID	ESC Z

Terminal Reset

<u>Function</u>	<u>Mnemonic</u>	<u>Sequence</u>
Return to Initial State	RIS	ESC c
Soft Terminal Reset (VT200 mode only)	DECSTR	ESC [! p

Printing

<u>Function</u>	<u>Mnemonic</u>	<u>Sequence</u>
Media Copy	MC	ESC [Ps i
Print screen		ESC [i
Print cursor line		ESC [? 1 i
Select Printer Controller Mode		ESC [5 i
Terminate Printer Controller Mode		ESC [4 i
Select Auto Print Mode		ESC [? 5 i
Terminate Auto Print Mode		ESC [? 4 i

Dynamically Redefinable Character Set

A down-line loadable character set may be loaded into the terminal using the following Device Control String (VT200 mode only):

ESC P *Pfn* ; *Pcn* ; *Pe* ; *Pcms* ; *Pw* ; *Pt* { *Dscs* *Sxlbp1* ; *Sxlbp2* ; ... ; *SxlbpN* ESC \
where :

<u>Parameter</u>	<u>Description</u>
<i>Pfn</i>	font number — must be 0 or 1
<i>Pcn</i>	Starting character number
<i>Pe</i>	0 = erase all characters in this DRCS 1 = erase only the characters being replaced 2 = erase all characters in all DRCSs
<i>Pcms</i>	0 = default to character matrix of 7 x 10 2 = character matrix of 5 x 10 3 = character matrix of 6 x 10 4 = character matrix of 7 x 10
<i>Pw</i>	0 = default to 80 columns 1 = 80 columns 2 = 132 columns
<i>Pt</i>	0 = default to text 1 = text 2 = full cell
<i>Dscs</i>	the name of this DRCS consisting of 0, 1, or 2 ANSI intermediate characters followed by one ANSI final character
<i>Sxlbp</i>	sixel bit pattern for each character

To clear a DRCS, use the following device control string:

ESC P 1 ; 1 ; 2 { sp @ ESC \

Alpha Mode Compatibility

<u>Function</u>	<u>Mnemonic</u>	<u>Sequence</u>
Compatibility Level (VT200 mode only)	DECSCSCL	ESC [P s " p
VT100 mode		ESC [61 " p
VT200 mode - transmit 8 bit controls		ESC [62 " p
VT200 mode - transmit 7 bit controls		ESC [62 ; 1 " p
VT200 mode - transmit 8 bit controls		ESC [62 ; 2 " p

VT52 ESC Sequences

<u>Function</u>	<u>Sequence</u>
Cursor Up	ESC A
Cursor Down	ESC B
Cursor Right	ESC C
Cursor Left	ESC D
Cursor Home	ESC H
Direct Cursor Address	ESC Y <i>line column</i>
Reverse Line Feed	ESC I
Erase to End of Screen	ESC J
Erase to End of Line	ESC K
Identify	ESC Z
Enter VT100 Special Graphics	ESC F
Exit VT100 Special Graphics	ESC G
Enter Alternate Keypad Mode	ESC =
Exit Alternate Keypad Mode	ESC >
Enter VT100 (ANSI) Mode	ESC <
Enter Auto Print Mode	ESC ^
Exit Auto Print Mode	ESC _
Enter Printer Controller Mode	ESC W
Exit Printer Controller Mode	ESC X
Print Screen	ESC]
Print Cursor Line	ESC V

D.2 GraphOn 14 System Commands

Number of Rows in VT220/VT100 Emulation

<u>Function</u>	<u>Sequence</u>
Set Number of Alpha Rows where: <i>P1</i> = number of rows (1 through 30)	ESC [1 ; 1 ; 1 ; 1 ; 1 ; <i>P1</i> \$ w

Serial Port Pass Through

<u>Function</u>	<u>Sequence</u>
Establish input/output paths where: <i>PI</i> = input path <i>PO</i> = output path	ESC [<i>PI</i> ; <i>PO1</i> ; <i>PO2</i> ; ... ! w 0 = clear all current I/O redirection for this input path 1 = Port A 2 = Port B 3 = Port C 6 = display

GraphOn Terminal ID

<u>Function</u>	<u>Sequence</u>
Request GraphOn terminal type response for GraphOn 14 is	ESC [= { ESC [= 210 {

Downloading Function Keys

Function keys may be loaded into the terminal using the following Device Control String:

ESC P *Pclear* ; *Plock* ; *Pdest* | *FnKy* / <definition> ; *FnKy* / <definition> ; ... ESC \
(DEC format)

or

ESC P *Pclear* ; *Plock* ; *Pdest* % | *FnKy* / <definition> ESC \
(GraphOn format)

where :

<u>Parameter</u>	<u>Description</u>
<i>Pclear</i>	0 = clear all definitions first 1 = alter only the definition being downloaded
<i>Plock</i>	0 = disable subsequent function key download 1 = do not disable future downloading
<i>Pdest</i>	0 = transmit the definition online (as if typed at the keyboard) 1 = process the definition locally 2 = transmit the definition to the local printer
<i>FnKy</i>	Function key number: Shift F6 17 Shift F7 18 Shift F8 19 Shift F9 20 Shift F10 21 Shift F11 23 Shift F12 24 Shift F13 25 Shift F14 26 Shift Help 28 Shift Do 29 Shift F17 31 Shift F18 32 Shift F19 33 Shift F20 34 F6 77 F7 78 F8 79

F9	80
F10	81
F11	83
F12	84
F13	85
F14	86
Help	88
Do	89
F17	91
F18	92
F19	93
F20	94
Ctrl F6	137
Ctrl F7	138
Ctrl F8	139
Ctrl F9	140
Ctrl F10	141
Ctrl F11	143
Ctrl F12	144
Ctrl F13	145
Ctrl F14	146
Ctrl Help	148
Ctrl Do	149
Ctrl F17	151
Ctrl F18	152
Ctrl F19	153
Ctrl F20	154
Right mouse button pressed	251
Right mouse button released	252
Middle mouse button pressed	253
Middle mouse button released	254
Left mouse button pressed	255
Left mouse button released	256

<definition>

If DEC format, pairs of hexadecimal digits representing each character which makes up the string to be assigned to the function key.

If GraphOn format, the string of characters to be assigned to the function key.

Downloading Setup

Setup fields may be loaded into the terminal using the following Device Control String:

```
ESC P 0 ; Pgroup ; Ptype ; P# S <startfield> / <data> ESC \
```

where :

<u>Parameter</u>	<u>Description</u>
<i>Pgroup</i>	number of the Setup group being downloaded 5 = Special 10 = General 20 = Devices 30 = Communications 50 = Display 60 = Keyboard 100 = Alphanumerics
<i>Ptype</i>	type of data being downloaded 0 = standard setup fields 1 = string field
<i>P#</i>	if <i>Pgroup</i> specifies Devices or Communications 1 = Port A 2 = Port B 3 = Port C if <i>Pgroup</i> specifies Alphanumerics must be set to 0 or 1
< <i>startfield</i> >	first field to be downloaded in this group
< <i>data</i> >	download data for one or more fields in this group, consisting predominantly of decimal numbers which specify new settings for each field. Each character in the download data specifies the new setting for a field. Valid characters are 0 through 9, space, and period. There are no separators between numbers. If 0 thru 9 is received, the corresponding field will be set to the specified number. Numbers larger than 9 may be specified by delimiting the digits with periods — for example, twelve is sent as “.12.” If a space is received, that field is skipped over without being altered. In this case, the space is simply a place holder. All other characters are ignored.

For example, the sequence

```
ESC P 0 ; 10 ; 0 ; 0 S 1 / 020 ESC \
```

tells the terminal to set the General group of fields (starting with the first field) to:

Main Port = Port A
Printer Port = Port C
Online

Standard ANSI parameter handling is supported, so the shortened sequence:

```
ESC P ; 10 S 1 / 020 ESC \
```

is equivalent.

Special Setup - Pgroup = 5

<u>String Number</u>	<u>Function</u>	<u>Value</u>
1	Recall setup	0 or 1

Example: to recall saved Setup parameters:

```
ESC P ; 5 S 1 / 0 ESC \
```

Special Setup / String Fields - Pgroup = 5

<u>String Number</u>	<u>Function</u>	<u>Value</u>
1	Setup name	0 to 10 displayable characters

The DCS to download the Setup name is:

```
ESC P ; 5 ; 1 S 1 / <text> ESC \
```

where <text> is from 0 to 10 displayable ASCII characters

General Setup - Pgroup = 10

<u>Field Number</u>	<u>Function</u>	<u>Value</u>
1	Main port 2 = Port C	0 = Port A 1 = Port B
4 - 6	not used	space
7	Transmit Controls	0 = 8 bit ANSI controls 1 = 7 bit ANSI controls
8	not used	space
9	Status line	0 = off 1 = on
10-12	not used	space
13	Interactivity adjustment mode	0 = off 1 = on
14	Mouse Factor	0 = 1 to 31 = 32

Example: to turn the status line on, send

ESC P ; 10 S 9 / 1 ESC \

Devices Setup - Pgroup = 20

The port being downloaded is specified in the parameter *P#*.

<u>Field Number</u>	<u>Function</u>	<u>Value</u>
1	Port type	0 = computer 1 = printer 2 = input device
2	Printer type	0 = text only 1 = LA50/LA100 2 = Thinkjet 3 = FX-80/FX-100 4 = Okidata 92/93 5 = FX-85/FX-185 6 = Okidata 192/193 7 = Okidata 84 8 = LaserJet+ 9 = QMS/Talaris

3	Printer paper width	0 = narrow (8.5 inch) 1 = wide (15 inch)
4	not used	space
5	Termination character for graphics print dump	0 = none 1 = form feed
6	Input device type	0 = GraphOn Mouse 1 = SummaMouse 2 = MM1201 digitizer
7	Digitizer mode	0 = absolute 1 = relative
8	DEC printer selection	0 = multinational 1 = national/line 2 = national only
9	Print orientation	0 = standard 1 = rotated (DEC & LaserJet+ only) 2 = expanded (DEC & LaserJet+ only)
10	Sixel level	0 = level 1 1 = level 2 2 = LA210
11 - 17	not used	space
18	B/W inversion	0 = disabled 1 = enabled

Example: to indicate that Port C is attached to an LA100 with wide paper, send

ESC P ; 20 ; ; 3 S 1 / 111 ESC \

Communications Setup - Pgroup = 30

The port being downloaded is specified in the parameter *P#*.

<u>Field Number</u>	<u>Function</u>	<u>Value</u>
1	Baud rate	0 = 50 1 = 75 2 = 110

3 = 134
 4 = 150
 5 = 300
 6 = 600
 7 = 1200
 8 = 1800
 9 = 2400
 .10. = 3600
 .11. = 4800
 .12. = 7200
 .13. = 9600
 .14. = 19200
 .15. = 38400
 .16. = 57600

- | | | |
|---|--|---|
| 2 | Parity/word size | 0 = 7 bits, mark parity
1 = 7 bits, space parity
2 = 7 bits, odd parity
3 = 7 bits, even parity
4 = 7 bits, no parity
5 = 8 bits, odd parity
6 = 8 bits, even parity
7 = 8 bits, no parity |
| 3 | Parity checking | 0 = off
1 = on |
| 4 | Generates XON/XOFF upon buffer full | 0 = off
1 = on |
| 5 | Generates handshaking signal upon buffer full on DTR if Port A or DSR if Port B (valid only for Port A and Port B - when specifying Port C, the character downloaded for this field must be SPACE) | 0 = off
1 = on
2 = RTS (Port A only) |
| 6 | Obeys incoming XON/XOFF | 0 = off
1 = on |
| 7 | Obeys handshaking signal on DSR and CTS if Port A or DTR if Port B (valid only for Port A and Port B - when specifying Port C, the character downloaded for this field must be SPACE) | 0 = off
1 = on
2 = DSR=CD (Port A only) |

8	Local echo	0 = off 1 = on
11	Treatment of NULs	0 = discarded 1 = accepted
12	Effective transmit rate	0 = full speed 1 = 600 baud 2 = 1200 baud 3 = 2400 baud 4 = 4800 baud 5 = 9600 baud
13	Obeys handshaking signal on DSR (valid only for Port C - when specifying Port A or Port B, the character downloaded for this field must be SPACE)	0 = off 1 = on

Example: to set the baud rate for Port A to 4800, send

```
ESC P ; 30 ; ; 1 S 1 / .11. ESC \
```

Display Setup - Pgroup = 50

<u>Field Number</u>	<u>Function</u>	<u>Value</u>
1	Screen saver	0 = off 1 = on

Example: to disable screen saver, send

```
ESC P ; 50 S 1 / 0 ESC \
```

Keyboard Setup - Pgroup = 60

<u>Field Number</u>	<u>Function</u>	<u>Value</u>
1	Key click	0 = off 1 = on
2	Autorepeat	0 = off 1 = on
3	Keys which autorepeat	0 = all except control keys 1 = all keys

4	not used	space
5	Unshifted BREAK key	0 = enabled 1 = disabled
6	not used	space
7	Keys which end Hold	0 = Hold key only 1 = any key which transmits a character
8	not used	space
9	Numeric keypad	0 = standard 1 = moves GIN cursor if cursor is displayed
10	Function key downloading	0 = disabled 1 = enabled
11	Back Space/Delete keys	0 = normal positions 1 = swapped positions
12	Lock key	0 = Caps lock 1 = Shift lock 2 = no lock
13	Compose Character key	0 = Compose Character 1 = Meta 2 = Hold
14	Unshifted function keys	0 = VT220 compatible 1 = User/host definable

Example: to set key click off, leave autorepeat unaltered, skip the unused field, and disable the unshifted Break key, send

```
ESC P ; 60 S 1 / 0<space> <space> <space> 1 ESC \
```

Alphanumerics Setup - Pgroup = 100

On the GraphOn 14, the parameter *P#* must always be 0 or 1.

The default settings are marked with an asterisk (*).

<u>Field Number</u>	<u>Function</u>	<u>Value</u>
1	Smooth scroll	0 = off 1 = on *
2	not used	space
3	VT52/ANSI mode if VT100 emulation	0 = VT52 1 = ANSI *
4	Wrap around	0 = off * 1 = on
5	New line mode	0 = off * 1 = on
6	VT100 mode character set used at power up and by Single Shift character set select sequences	0 = US * 1 = UK
7	Cursor blink	0 = blink * 1 = steady
8	Cursor form	0 = underline 1 = block *
9	Margin bell	0 = off * 1 = on
10	80 or 132 columns	0 = 80 * 1 = 132
11	Clear window upon 80/132 column mode change	0 = window cleared * 1 = window not cleared
12	Monitor mode	0 = off * 1 = on

- | | | |
|----|---|---|
| 13 | Insert/delete line attributes | 0 = maintained
1 = cleared * |
| 14 | Terminal type reported for ANSI Device Attributes, VT100 mode | 0 = VT100 with printer port option
1 = VT100
2 = VT102
3 = VT101
4 = same as emulation *
5 = VT220
6 = VT240
7 = VT125 |
| 15 | Alpha print extent | 0 = scrolling region
1 = all rows * |
| 16 | Alpha print termination character | 0 = none
1 = form feed * |
| 17 | Alphanumeric mode enhancements | 0 = none
1 = VT102 (only in VT100 emulation)
2 = full * |
| 18 | Alpha emulation | 0 = VT100
1 = VT220 * |
| 19 | Sub-emulation if VT220 emulation | 0 = VT52
1 = VT100
2 = VT200 * |

Example: to change the VT220/VT100 emulation to 132 columns without erasing the text, send

```
ESC P ; 100 S 10 / 11 ESC \
```

Alphanumerics Setup / String Fields - Pgroup = 100

<u>String Number</u>	<u>Function</u>	<u>Value</u>
1	Answerback text	0 to 20 characters

The DCS to download the answerback text is:

```
ESC P ; 100 ; 1 S 1 / <text> ESC \
```


where <text> is from 0 to 20 ASCII characters

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