Intermec
Technologies Corporation

VT220/ANSI Terminal Emulation

PROGRAMMER'S REFERENCE GUIDE

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Intermec Technologies Corporation
Publications Department
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Section 1

Introduction

Radio Network Overview

The radio network with ultra high frequency (UHF), 900 MHz, or 2.4 GHz radio products enables a user to operate an INTERMEC® wireless terminal emulation station as if it was a VT220 terminal. The mobility of the wireless station enables the user to take it any place in the facility and interface with a large variety of networks and host computers. This results in increased data collection, improved time control, and the ability to run a large number of applications without the need to custom program, change software, or learn new programming languages or protocols.

The radio network also:

- Provides industry standards.
- Supports Ethernet Version 2 (DIX) and IEEE 802.3, and these connections: 10BASE2 (thin), 10BASE5 (thick), and 10BASE-T (UTP).
- Automatically recognizes the model of the wireless station on the network. Wireless station models that support VT220 terminal emulation are RT3210, RT1100, RT1700, and RT5900 Radio Terminals; and PEN*KEY® 6400 and 6500 Computers.

Purpose of This Guide

The purpose of this programmer's guide is to describe wireless terminal emulation stations and how they emulate VT220 terminal operation. This guide describes:

- How the wireless stations' keyboards and overlays emulate VT220 terminal operation.
- Received codes and transmitted keyboard codes that the wireless stations support.
- Extended commands for the wireless stations.
- Wireless station support for VT330 and VT340 applications.

Intended Audience

This programmer's guide was prepared with the assumption that you are already familiar with the operation of the VT220 terminal. The intended audience is the host computer programmer who is familiar with the VT220/ANSI data stream, and needs to design interfaces to the wireless stations.

What to Read First

Before you begin using the wireless station as an emulation product, read the section about the wireless station you are using. The information will give you a basic understanding of the equipment you will be working with. You can also skim the appropriate program commands for programming guidance on the VT220/ANSI commands the wireless station supports.

If your radio network has not yet been installed, read first the installation and operations guide provided with your software. The guide describes how to install the hardware and software, and then configure the software according to the requirements of your site.

Organization of this Guide

This guide is divided into sections that specifically address the operation and programming of wireless stations. This Introduction contains a brief overview of this programmer's guide. Sections 2 through 7 describe how the wireless stations' annunciators and keyboards emulate VT220 terminal operation. Specific sections are:

Section 2, "RT3210 Radio Data Terminal"
Section 3, "RT1100 Radio Data Terminal"
Section 4, "RT1700 Radio Data Terminal"
Section 5, "RT5900 Radio Data Terminal"
Section 6, "PEN*KEY 6400 Computer"
Section 7, "PEN*KEY 6500 Computer"

The remaining sections do the following:

- Section 8, "Programming," describes the character sets, received codes, transmitted codes, and other commands the wireless station supports. This section also describes how to set local editing mode (a feature of the VT330/VT340 terminal), and how to create forms.
- Section 9, "Extended Commands," describes the extended commands that print, scan bar codes, and send communications over the wireless station's RS-232 port.
- Appendix A contains bar code scanning information.

Conventions

To help you quickly locate and interpret information, this publication uses the conventions in the following chart.

Convention	Meaning
ALL CAPS	Wireless station firmware menu options.
[KEY]	On the wireless station, press the key or keys specified in brackets.

If You Need Help

The best way to reach us is by phone. Following are Customer Response Hotline phone numbers.

In the United States, call: 1-800-221-9236
In Canada, call: 1-800-633-6149

Related Publications

The following publications provide information beyond the purpose of this programmer's guide. The numbers in parentheses refer to publication part numbers.

Wireless Stations

The user's guide for each wireless station describes each firmware menu option in detail and how to operate and maintain the computer.

Specific user's guides are:

PEN*KEY Model 6400 **(961-047-093)**
PEN*KEY Model 6500/6550 **(961-047-099)**
RT1100 **(961-047-069)**
RT1700 **(961-047-068)**
RT3210 **(961-047-074)**
RT5900 **(961-047-121)**

Maintaining NiCd Batteries User's Guide
(961-028-063)

The battery user's guide describes how to maintain the life of nickel-cadmium batteries.

Controllers and Gateways

6950 Enterprise Gateway Server User's Guide
(961-047-091)

The user's guide for the 6950 Enterprise Gateway Server describes how to install and configure the gateway server.

MBA3000 Multiple Base Adapter User's Guide
(961-047-032)

This guide describes how to operate the MBA3000 Multiple Base Adapter.

RCB4030 Base and Base/Controller User's Guide
(961-047-075)

The user's guide for the RCB4030 Base and Base/Controller describes how the device operates. The guide also describes how to install the device, interpret its LEDs, set its switches, and troubleshoot it.

Wireless Network Access Server User's Guide
(961-051-006)

This user's guide describes how to configure the Wireless Network Access Server software that runs on a host.

Access Points and Base Radios

***6710 Access Point User's Guide* (961-047-081)**

The user guide for the 6710 Access Point describes how to install, configure, and troubleshoot the access point on the open wireless LAN.

***RB3000 Base Station User's Guide* (962-047-012)**

This guide describes how to operate the RB3000 and RB3001 Base Stations.

***RCB4030 Base and Base/Controller User's Guide* (961-047-075)**

The user's guide for the RCB4030 base describes how the base operates. The guide also describes how to install the base, interpret its LEDs, set its switches, and troubleshoot.

Comparing the Keyboards

So that you can compare your wireless station's keyboard with the VT220 keyboard, an illustration of the VT220 keyboard has been placed on the next page. As you read how your wireless station's keyboard and overlay emulate VT220 operation, you may want to frequently refer to Figure 1-1 (standard VT220 keyboard) and the figure in this publication for the wireless station you are using.

If you are unfamiliar with the location of the keys on the VT220's keyboard, study the figure now to learn where the keys are located and the different parts of the keyboard.

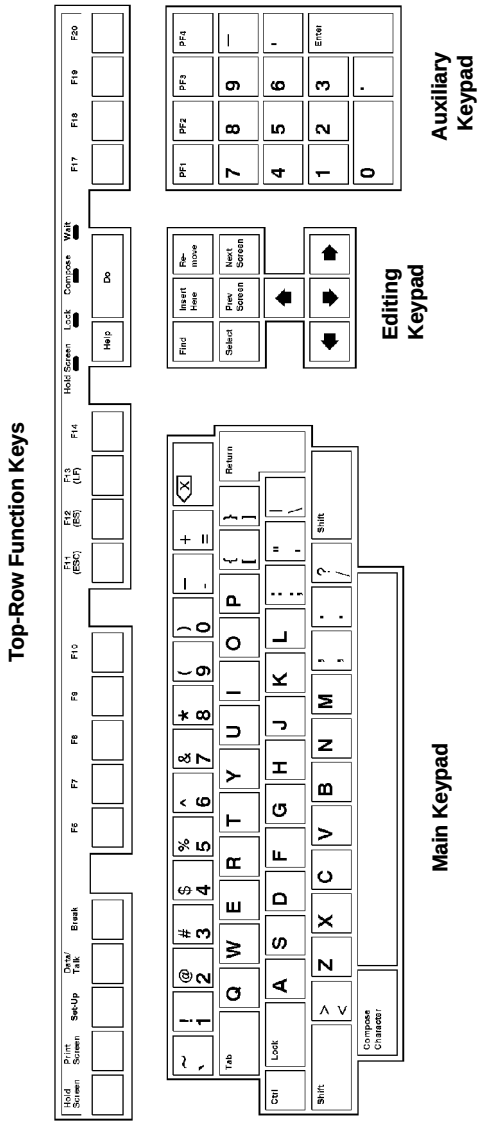


Figure 1-1
VT220 Terminal Standard Keyboard (North American)

Section 2

RT3210 Radio Terminal

VT220/ANSI Display Emulation

The RT3210 Radio Terminal's 128 by 128 pixel liquid crystal display (LCD) shows radio terminal and VT220 prompts, and information you type. Because the VT220 terminal's screen is 80 columns by 24 lines, the radio terminal represents a part of the information on the larger VT220 screen.

" **NOTE:** *RT3210 Radio Terminals have UHF radios only.*

Character Sizes

The radio terminal supports two character sizes: 7-by-9 dot and 5-by-7 dot. The sizes affect how much information appears in the display; each dot occupies one pixel. The 5-by-7 dot characters are smaller, but let you view a larger portion of the 1920-byte screen represented on the VT220 terminal. To change the character size, open the firmware by pressing [FUNC]+[SPACE]. Then select the following options in this order: SET-UP PARMS (password: CR52401), DISPLAY OPTS, CHARACTER SIZE.

When the radio terminal powers up, it defaults to a 7-by-9 dot character size. This size is the larger of the two character sets, and yields a screen size of 16 columns by 9 lines of display information (the bottom line is reserved for annunciators and system messages). The total number of characters this size can display is 144.

The 5-by-7 dot character size yields a screen size of 21 columns by 15 lines (the bottom line is reserved for annunciators and system messages). The total number of characters this size can display is 315.

Screen Modes

The radio terminal has these screen modes: center cursor, corner, page, lazy, screen lock, and locked. The modes present a window onto a standard VT220 display buffer. You can set the type of screen mode through the radio terminal's firmware menus.

You can move the cursor by using the four direction arrows on the radio terminal's diamond-shaped keypad. When you try to move the cursor onto one of the boundaries, an error tone sounds and the display retains its last position.

The screen modes govern which portion of the larger VT220 terminal's screen the radio terminal first presents and how the window moves as the cursor moves.

Center Cursor Mode

Center cursor mode works best for applications that use the entire VT220 data stream's 80-character by 24-line logical display. In this mode, the cursor remains in the center of the radio terminal's window.

As the cursor moves within the window, the radio terminal's display window moves to keep it centered. When the cursor moves off the right, left, top, or bottom edge of the VT220 terminal's display, the window remains fixed despite the cursor's movement.

Corner Mode

Corner mode begins with the window in the upper left corner of the larger VT220 terminal. It keeps the cursor in the lower right corner of the display. Corner mode works best for applications that use the upper left corner of the logical screen.

As the cursor moves off the right or bottom edge of the radio terminal's display, the window moves to show the cursor. When you use corner mode with the [FUNC] or [ALT] key, you can move the cursor a predetermined number of key presses in all four directions.

Page Mode

Page mode provides predefined pages within the larger VT220 terminal. The size of these pages depends on the number of rows and columns selected for display. The radio terminal moves the window by a multiple of the page size. As the cursor moves off the edge of the radio terminal's display, the window changes to the next page.

Lazy Mode

Lazy mode starts the cursor in the upper left corner of the display. The cursor moves across the display in the scrolled direction. When the cursor goes beyond the edge of the display, the data begins to move in the scrolled direction and the cursor remains at the edge of the display. When you try to go beyond an outside boundary, an error tone sounds.

Locked Mode

If locked mode is selected through the firmware menus, the view window is locked to the upper left-hand corner of the display. The screen does not window around, and only the area that has been selected to be the screen size is visible. Locked mode disables the windowing keys, or only allows you to window around the physical display size selected through the firmware menus.

Display Annunciators

The bottom line of the radio terminal's display is reserved for annunciators that show the radio terminal's current status or operation in progress. The following annunciators can appear.

The radio terminal is **transmitting** information to the base station.

The radio terminal is **receiving** information from the base station. This annunciator appears only when the information is for the radio terminal's unique address number.

Communications loss. No communication with the host computer has occurred for at least 60 seconds. The radio terminal may be out of radio range, the base station may not have power, or communications from the host computer to the base station may not be properly set up.

Radio terminal's keyboard is in **function mode**. The key you press on the keyboard with [FUNC] returns the function or programmable function key code assigned by the programmer, or does an operation. Key codes and operations are located just above the keys and to the left (black lettering).

The radio terminal's keyboard is in **alternate mode**. The key you press on the keyboard in combination with [ALT] types the character or does the operation just above the key and to the right (yellow lettering).

The radio terminal's keyboard is in **control mode**. The key you press on the keyboard in combination with [CTRL] generates the 7-bit control character commonly used in DEC applications.

The **battery** needs to be recharged. When this annunciator appears, you have only two minutes of operating time left before the radio terminal disables operator input and radio communications. After two minutes, the message "CONNECT UNIT TO CHARGER" blinks.

Recharging. The radio terminal is connected to a battery charger.

The radio terminal's battery pack is **fully charged**. This annunciator is used by the fast charge algorithm to indicate the fully charged condition.

High speed. The base station is transmitting information at 9600 baud (versus 4800 baud).

Radio terminal's keyboard is in **character mode** (versus line edit mode). The radio terminal is sending, to the host computer, each key as you press it. (No annunciator appears for line edit mode.)

The radio terminal's keyboard is in **shift lock mode**. The letters you press on the keyboard after you press [SFT] will be in uppercase, until you press [SFT] again.

Keyboard

The radio terminal has a 47-key keyboard (Figure 2-1). The keys are color-coded according to function to make recognition and key entry easier. The key in the upper left corner of the keyboard is the power on and power off button. Press the button once to turn the radio terminal on. To turn it off, press the button a second time and hold it about three seconds. Following are the remaining keys and their descriptions.

Key(s)	Description
[FUNC]	Places keyboard into function mode.
[ALT]	Places keyboard into alternate mode.
[SFT]	Places keyboard into shift mode.
[CTRL]	Places keyboard into control mode.
[←]	Sends a backspace or a delete key, depending on how the firmware is set up.
	Cursor control key that allows you to move the cursor around the radio terminal's display.
[A]–[Z]	Send letters a through z or A through Z.
[.]	Sends a period.
[–]	Sends a hyphen.
[SPACE]	Sends one space.
[0]–[9]	Send numbers 0 through 9 or SS3 p through SS3 y.

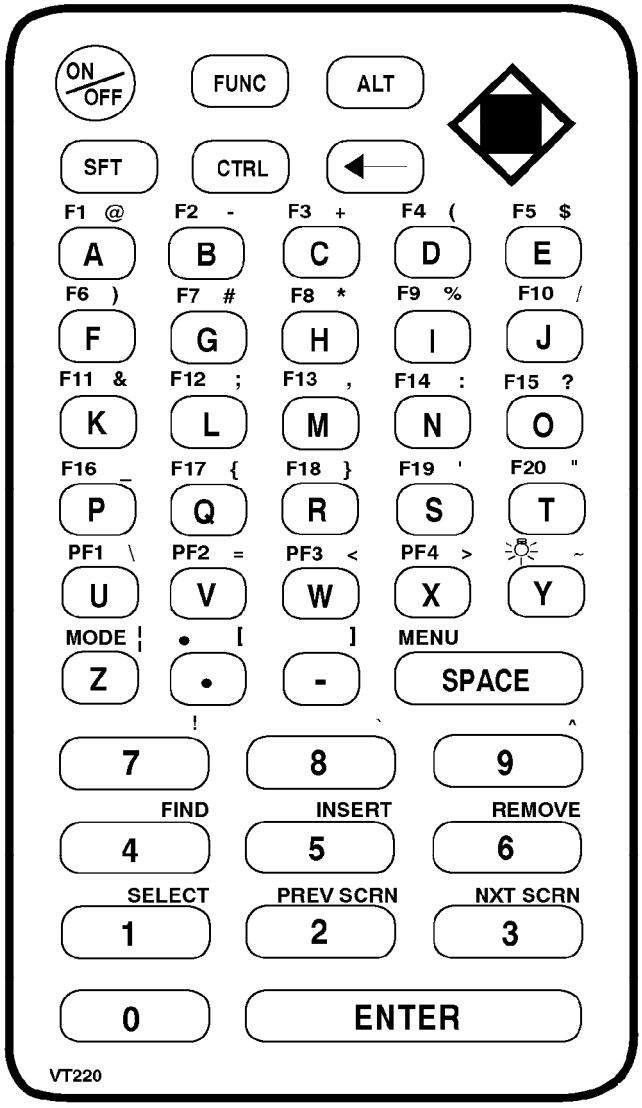


Figure 2-1
RT3210 Keyboard

Overlay

Type the characters and do the operations printed on the overlay when the keyboard is in function [FUNC] mode or alternate [ALT] mode. Figure 2-1 shows that the [FUNC] key is to the left and the [ALT] key is to the right. Characters printed on the overlay have the same relative relationship; the operation above a key and to the left (black lettering) indicates function mode, and the character or operation above a key and to the right (yellow lettering) indicates alternate mode.

You can also use the cursor control key in the upper right corner of the keyboard in combination with the function and alternate modes.

Radio terminal keys and their colors are listed in the following chart.

Key	Color	Letters
ON/OFF	White	Black
[FUNC]	Blue	White
[ALT]	Blue	White
[SFT]	Blue	White
[CTRL]	Blue	White
[←]	Blue	White
[A]–[Z]	Tan	White
[.]	Tan	White
[–]	Tan	White
[SPACE]	Tan	White
[0]–[9]	White	Black
[ENTER]	Green	White

Main Keypad

The VT220 terminal's main keypad has standard keys and function keys. Standard keys type letters, numbers, and symbols. Function keys do special operations.

Standard Keys

Table 2-1 describes how to use the radio terminal to type letters, numbers, and symbols.

Table 2-1
RT3210 Standard Keys

To Type	Press
a–z	[A] – [Z]
A–Z	[A] – [Z] or [SFT]+[A] – [SFT]+[Z]
0–9	[0] – [9] or [SFT]+[0] – [SFT]+[9]
@ (at)	[ALT]+[A]
– (hyphen)	[ALT]+[B]
+ (plus)	[ALT]+[C]
((left parenthesis)	[ALT]+[D]
$ (dollar)	[ALT]+[E]
) (right parenthesis)	[ALT]+[F]
# (pound)	[ALT]+[G]
* (asterisk)	[ALT]+[H]
% (percent)	[ALT]+[I]
/ (forward slash)	[ALT]+[J]
& (ampersand)	[ALT]+[K]
; (semicolon)	[ALT]+[L]
, (comma)	[ALT]+[M]
: (colon)	[ALT]+[N]
? (question mark)	[ALT]+[O]

Table 2-1 (Continued)
RT3210 Standard Keys

To Type	Press
_ (underscore)	[ALT]+[P]
{ (left brace)	[ALT]+[Q]
} (right brace)	[ALT]+[R]
' (single quote)	[ALT]+[S]
" (double quote)	[ALT]+[T]
\ (backslash)	[ALT]+[U]
= (equal)	[ALT]+[V]
< (less than)	[ALT]+[W]
> (greater than)	[ALT]+[X]
~ (tilde)	[ALT]+[Y]
| (vertical bar)	[ALT]+[Z]
[(left bracket)	[ALT]+[.]
] (right bracket)	[ALT]+[–]
. (period)	[.]
- (hyphen)	[–]
! (exclamation mark)	[ALT]+[7]
` (grave accent)	[ALT]+[8]
^ (circumflex)	[ALT]+[9]

Special Function Keys

Table 2-2 describes how to use the radio terminal to do special VT220 terminal function operations. Note that the radio terminal does not support key operation COMPOSE CHARACTER, which creates characters that do not exist as standard keys on the VT220 keyboard.

Operation of the delete key depends on how the KEYBOARD OPTS parameter is set in the radio terminal's firmware. The key either sends a delete (DEL, hexadecimal 7F) or a backspace (BS, hexadecimal 08). To select backspace mode or delete mode, open the firmware by pressing [FUNC]+[SPACE]. Then select the following options in this order: SET-UP PARMS (password: CR52401), KEYBOARD OPTS, DELETE MODE or BACKSPACE MODE.

Table 2-2
RT3210 Special Function Keys

To Do Function Operation	Press
Delete	[←]
Tab	[CTRL]+[I] or [CTRL]+[→]
Return	[ENTER]
Ctrl	[CTRL]
Lock	Not supported
Shift (uppercase characters)	[SFT]
Space bar	[SPACE]
Compose character	Not supported

Editing Keypad

The VT220 terminal's editing keypad has editing keys and cursor control keys. Editing keys have functions assigned to them by the application software in use. Refer to your application's software manual for the programmed values of the editing keys. Arrow keys allow you to move the cursor and page through the radio terminal's display.

Editing Keys

Table 2-3 describes how to use the radio terminal to do VT220 terminal editing operations.

Table 2-3
RT3210 Editing Keys

To Do Editing Operation	Press
Find	[ALT]+[4]
Insert here	[ALT]+[5]
Remove	[ALT]+[6]
Select	[ALT]+[1]
Prev screen	[ALT]+[2]
Next screen	[ALT]+[3]

Cursor Control Key

The blue cursor control key in the upper right corner of the keyboard operates in keyboard function, alternate, unshifted, and control modes. The following pages describe all cursor control key operations.

Windowing Within the VT220 Screen

The cursor control key operates in a local windowing mode when you use the key in combination with [FUNC] or [ALT]. "Local" means the radio terminal does **not** send characters to the host computer.

The windowing mode is always enabled. It provides a "window" into the VT220's screen (Figure 2-2), and allows you to move the radio terminal's display window by using the four corners of the cursor control key. Each corner of the diamond moves the window in that direction. In this manual, the corners are represented by arrows.

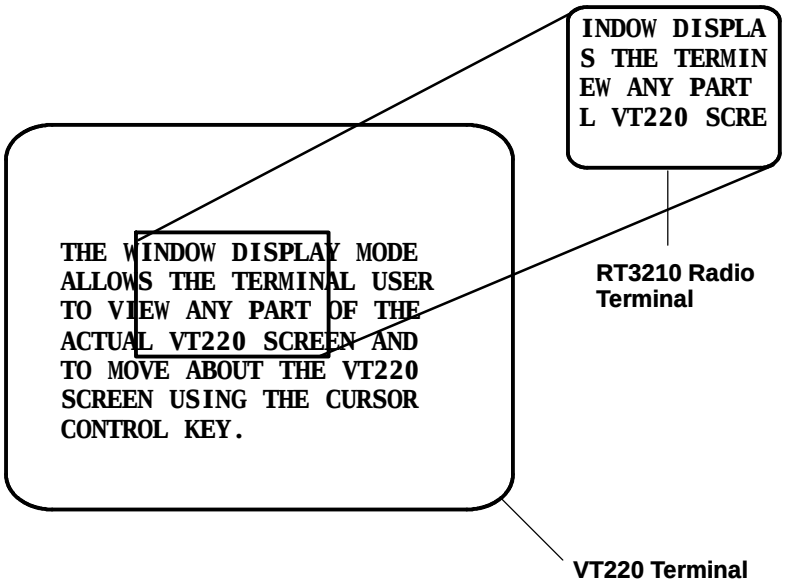


Figure 2-2
RT3210 Windowing Mode

If you try to move the cursor off the display in any direction, the window shifts one line or column in the direction of the cursor movement. This lets you move the viewing window around within the larger VT220's screen. The display does not wrap around when the window reaches the top or side boundaries of the larger screen. A beep error tone sounds when you try to move the window beyond one of the boundaries.

Paging Through the Display

Use the cursor control key in combination with [FUNC] to page through the radio terminal's display. Each corner of the diamond moves the cursor in that direction.

To Move	Press
One page right	[FUNC]+[**"**]
One page left	[FUNC]+[**A**]
One page up	[FUNC]+[**Y**]
One page down	[FUNC]+[**B**]

Scrolling Through the Display

Use the cursor control key in combination with [ALT] to scroll through the radio terminal's display. Each corner of the diamond moves the cursor in that direction.

To Move	Press
One space right	[ALT]+[**"**]
One space left	[ALT]+[**A**]
One space up	[ALT]+[**Y**]
One space down	[ALT]+[**B**]

Auxiliary Keypad

The VT220 terminal's auxiliary keypad consists of numeric keys (which enter numeric data) and programmable function (PF) keys. The PF keys have operations assigned to them by the application software in use. Refer to your application's software manual for the uses of the PF keys.

Press [FUNC] to lock the radio terminal into auxiliary keypad mode. To unlock it, press [FUNC] again. Table 2-4 describes how to use the radio terminal to do VT220 terminal auxiliary operations.

Table 2-4
RT3210 Auxiliary Keypad

For Auxiliary Operation	Press
0–9	[FUNC]+[0] – [FUNC]+[9]
– (hyphen)	[FUNC]+[–]
, (comma)	Not supported
. (period)	[FUNC]+[.]
Enter	[FUNC]+[ENTER]
PF1–PF4	[FUNC]+[U] – [FUNC]+[X]

Top-Row Function Keys

Function keys [F1] through [F4] on the radio terminal's keyboard are reserved for future expansion. On the VT220 terminal's keyboard, function keys [F1] through [F5] are used for hold screen, print screen, set-up, data/talk, and break. The radio terminal supports only the break function, which is [FUNC]+[E] on the radio terminal's keyboard. Function keys [F6] through [F20] are user-defined keys (UDKs) that have operations assigned to them by the application software in use. Refer to your application's software manual for their programmed uses.

Table 2-5
RT3210 Top-Row Function Keys

To Do Function	Press
F5–F20	[FUNC]+[E] – [FUNC]+[T]

Transmission Mode

Use the transmission mode (labeled "mode" on the overlay) to put the radio terminal into line edit (block) mode or character mode. To alternate between modes, press [FUNC]+[Z]. The modes are described on pages 8-55 and 8-56 in Section 8, "Programming."

When "lock mode" is disabled through the firmware menus, you can press the mode key to toggle between line edit mode and character mode. When lock mode is enabled, you cannot toggle between line edit (block) mode and character mode. The default setting is "disabled."

Backlight

Use the backlight to read the radio terminal's display in dim light. To turn the light on, press [FUNC]+[Y]. To turn it off, press [FUNC]+[Y] again.

You can use the firmware's setup menus to set the length of time the backlight stays on before the radio terminal "goes to sleep" to conserve power. Refer to the radio terminal's user's guide for more information about backlighting.

" **NOTE:** *The longer the backlight stays on, the sooner the battery will need to be recharged.*

Section 3

RT1100 Radio Terminal

VT220/ANSI Display Emulation

The RT1100 Radio Terminal's 128 by 128 pixel liquid crystal displays (LCD) shows radio terminal and VT220 prompts, and information you type. Because the VT220 terminal's screen is 80 columns by 24 lines, the radio terminal represents a part of the information on the larger VT220 screen.

" **NOTE:** *Radio terminals in the RT1100 Series have UHF, 900 MHz, or 2.4 GHz radio modules.*

Host View Size

For VT220 terminal emulation, the host view size is 24 characters high by 80 characters wide.

Screen Size

You can select the number of display lines and characters per line. The options are 12 or 16 characters per line by 4, 6, 8, or 9 lines.

The default is 9 lines and 16 characters. To change the screen size, open the firmware and then select the following options in this order: LCD PARMS, SCREEN SIZE.

Screen Modes

The radio terminal has these screen modes: center cursor, corner, page, lazy, screen lock, screen lock, and locked. The modes present a window onto a standard VT220 terminal's 80-character by 24-line display buffer. You can set the type of screen mode through the radio terminal's firmware menus.

The screen modes govern which portion of the larger VT220 terminal's screen the radio terminal first presents and how the window moves as the cursor moves.

Center Cursor Mode

Center cursor mode works best for applications that use the entire VT220 data stream's 80-character by 24-line logical display. In this mode, the cursor remains in the center of the radio terminal's window.

As the cursor moves within the window, the radio terminal's display window moves to keep it centered. When the cursor moves off the right, left, top, or bottom edge of the VT220 terminal, the window remains fixed despite the cursor's movement.

Corner Mode

Corner mode begins with the window in the upper left corner of the larger VT220 terminal. It keeps the cursor in the lower right corner of the display. Corner mode works best for applications that use the upper left corner of the logical screen.

As the cursor moves off the right or bottom edge of the radio terminal's display, the window moves to show the cursor. When you use corner mode with the gold-colored key, you can move the cursor a predetermined number of key presses in all four directions.

Page Mode

Page mode provides predefined pages within the larger VT220 terminal. The size of these pages depends on the number of rows and columns selected for display. The radio terminal moves the window by a multiple of the page size. As the cursor moves off the edge of the radio terminal's display, the window changes to the next page.

Lazy Mode

Lazy mode starts the cursor in the upper left corner of the display. The cursor moves across the display in the scrolled direction. When the cursor goes beyond the edge of the display, the data begins to move in the scrolled direction and the cursor remains at the edge of the display. When you try to go beyond an outside boundary, an error tone sounds.

Screen Lock Mode

Screen lock mode allows a specified screen size to be set up and locked. Only the commands issued to the selected screen size are operated on. For example, if the host sends characters to the display, and the number of characters to display is greater than the number of columns specified, the last column(s) on the screen are overwritten.

Locked Mode

If locked mode is selected through the firmware menus, the view window is locked to the upper left-hand corner of the display. The screen does not window around, and only the area that has been selected to be the screen size is visible. Locked mode disables the windowing keys, or only allows you to window around the physical display size selected through the firmware menus.

Display Annunciators

Annunciators show the radio terminal's current status or operation in progress. The following annunciators can appear in the radio terminal's display.

TX The radio terminal is **transmitting** information to the base station.

CL **Communications loss**. No communication with the host computer has occurred for at least 60 seconds. The radio terminal may be out of radio range, the base station may not have power, or communications from the host computer to the base station may not be properly set up.

A The radio terminal's keyboard is in **black shift mode**. The key you press while the terminal is in this mode does programmable function key operations, or sends the character printed in black on the overlay and to the upper left of the key.

" The radio terminal's keyboard is in **gold shift mode**. The key you press while the terminal is in this mode sends the character or does the function printed in gold on the overlay and to the upper right of the key.

Y	The radio terminal's keyboard is in **shift mode**. The letter key you press while the keyboard is in this mode sends letters in uppercase.
C	The **battery** is charging.
^	The radio terminal is in **control mode**. The key you press while the terminal is in this mode sends a control character.
X	**Keyboard action mode (KAM)** has been set. The radio terminal ignores all keystrokes that send characters to the host. This state stays on until KAM has been reset.
S C A N	**Laser scanner** is in use. This annunciator ensures you are aware of the laser scanner and the cautions you must exercise. Read and obey the caution labels on your laser scanner so that you do not injure your eyes.
K	The radio terminal is in **keypad mode**.
C	The radio terminal is in **character mode**. The radio terminal sends, to the host computer, each key as it is pressed.
B	The radio terminal is in **line edit (block) mode**. The radio terminal is sending, to the host computer, cumulative data when you press a terminating key.
e	The radio terminal is in **local edit mode**, which is a feature of the VT330/VT340 terminal.
+ -	The **battery** needs to be recharged. When this annunciator appears, you will not be able to operate your radio terminal until you place it on a charger.

Keyboard

The radio terminal has a 47-key keyboard with keys defined to emulate VT220 terminal operation (Figure 3-1). Keys are color-coded according to function to make recognition and key entry easier. The key in the upper left corner of the keyboard turns the radio terminal on. To turn it off, press the key for about 3 seconds.

Following are the remaining keys and their descriptions.

Key(s)	Description
[A]–[Z]	Send letters a through z or A through Z, depending on how the shift lock is set.
[SP]	Sends one space.
[←]	Sends a backspace or a delete key, depending on how the firmware is set up.
	Places keyboard into black shift mode.
	Places keyboard into gold shift mode.
[0]–[9]	Send numbers 0 through 9 or SS3 p through SS3 y, depending on how the keypad mode is set.
	Places keyboard into keypad mode.
[ENTER]	Sends CR, CR LF, or SS3 M, depending on terminal mode settings.

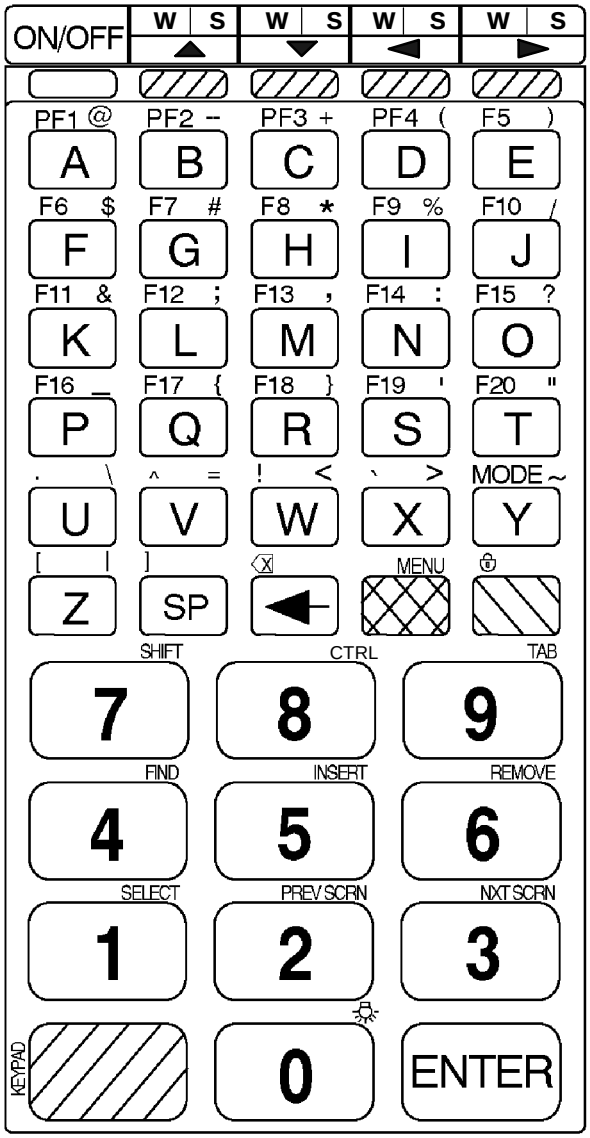


Figure 3-1
RT1100 Keyboard

Overlay

Type the characters and do the operations printed on the overlay when the keyboard is in black shift [BLACK] mode or gold shift [GOLD] mode. On the keyboard (Figure 3-1), note that [BLACK] is to the left and [GOLD] is to the right. Characters printed on the overlay have the same relative relationship; the character or operation above a key and to the left (black lettering) indicates black shift mode, and the character or operation above a key and to the right (gold lettering) indicates gold shift mode. An annunciator along the right side of the display shows the current mode.

The following chart lists radio terminal keys and their colors.

Key	Color	Letters
ON/OFF	Light gray	None
[A]–[Z]	Dark gray	White
[SP]	Dark gray	White
[←]	Dark gray	White
	Black	None
	Gold	None
[0] – [9]	Light gray	Black
	Brown	None
[ENTER]	Green	White

Main Keypad

The VT220 terminal's main keypad has standard keys and function keys. Standard keys type letters, numbers, and symbols. Function keys do special operations.

Standard Keys

Table 3-1 describes how to use the radio terminal to type letters, numbers, and symbols.

Table 3-1
RT1100 Standard Keys

To Type	Press
a–z	[A]–[Z]
A–Z	[GOLD]+[7]+[A] – [GOLD]+[7]+[Z]
0–9	[0]–[9]
@ (at)	[GOLD]+[A]
– (hyphen)	[GOLD]+[B]
+ (plus)	[GOLD]+[C]
((left parenthesis)	[GOLD]+[D]
) (right parenthesis)	[GOLD]+[E]
$ (dollar)	[GOLD]+[F]
# (pound)	[GOLD]+[G]
* (asterisk)	[GOLD]+[H]
% (percent)	[GOLD]+[I]
/ (forward slash)	[GOLD]+[J]
& (ampersand)	[GOLD]+[K]
; (semicolon)	[GOLD]+[L]
, (comma)	[GOLD]+[M]
: (colon)	[GOLD]+[N]
? (question mark)	[GOLD]+[O]

Table 3-1 (Continued)
RT1100 Standard Keys

To Type	Press
_ (underscore)	[GOLD]+[P]
{ (left brace)	[GOLD]+[Q]
} (right brace)	[GOLD]+[R]
' (single quote)	[GOLD]+[S]
" (double quote)	[GOLD]+[T]
\ (backslash)	[GOLD]+[U]
= (equal)	[GOLD]+[V]
< (less than)	[GOLD]+[W]
> (greater than)	[GOLD]+[X]
~ (tilde)	[GOLD]+[Y]
| (vertical bar)	[GOLD]+[Z]
. (period)	[BLACK]+[U]
^ (circumflex)	[BLACK]+[V]
! (exclamation mark)	[BLACK]+[W]
` (grave accent)	[BLACK]+[X]
[(left bracket)	[BLACK]+[Z]
] (right bracket)	[BLACK]+[SP]

Special Function Keys

Table 3-2 describes how to use the radio terminal to do special VT220 terminal function operations. Note that the radio terminal does not support key operation COMPOSE CHARACTER, which creates characters that do not exist as standard keys on the VT220 keyboard.

Operation of the delete key depends on how the PROTOCOL OPTS parameter is set in the radio terminal's firmware. The key either sends a delete (DEL, 7F hexadecimal) or a backspace (BS, 08 hexadecimal).

To change from delete mode to backspace mode, open the firmware by pressing [GOLD]+[BLACK]. Then select the following options in this order: SET-UP PARMS (password: CR52401), PROTOCOL OPTS, VT220, DEL TO BS.

Table 3-2
RT1100 Special Function Keys

To Do Operation	Press
Delete	[BLACK]+[←]
Backspace	[←]
Tab	[GOLD]+[9]
Return	[ENTER]
Ctrl	[GOLD]+[8]
Lock (sets and clears shift lock)	[BLACK]+[GOLD]
Shift (uppercase characters)	[GOLD]+[7]
Space bar	[SP]
Compose character	Not supported

Editing Keypad

The VT220 terminal's editing keypad has editing keys and cursor control (arrow) keys. Editing keys have functions assigned to them by the application software in use. Refer to your application's software manual for the uses of the editing keypad keys. The cursor control keys in black shift or gold shift mode allow you to scroll through the radio terminal's local display memory.

Editing Keys

Table 3-3 describes how to use the radio terminal to do VT220 terminal editing operations.

Table 3-3
RT1100 Editing Keys

To Do Editing Operation	Press
Find	[GOLD]+[4]
Insert here	[GOLD]+[5]
Remove	[GOLD]+[6]
Select	[GOLD]+[1]
Prev screen	[GOLD]+[2]
Next screen	[GOLD]+[3]

Cursor Control Keys

The following chart describes how to use the radio terminal to do VT220 terminal cursor control.

To Do Cursor Key	Press
↑	[**Y**]
↓	[**B**]
←	[**A**]
→	[**"**]

In addition to sending VT220 cursor control sequences, the arrow keys at the top of the keyboard allow you to move the cursor through the radio terminal's display. The keys operate in a local windowing mode, which is enabled with the black shift or gold shift key.

This mode provides a "window" into the VT220's screen and allows you to move the radio terminal's display window (Figure 3-2). Each key moves the window in the direction indicated by the arrow.

If you try to move the cursor off the display in any direction, the window shifts one or eight lines or columns in the direction of the cursor movement. This lets you move the viewing window around within the larger VT220 terminal screen. The display does not wrap when the window reaches the top or side boundaries of the virtual VT220 screen. A beep tone sounds when you try to move the window beyond a top, bottom, left, or right boundary.

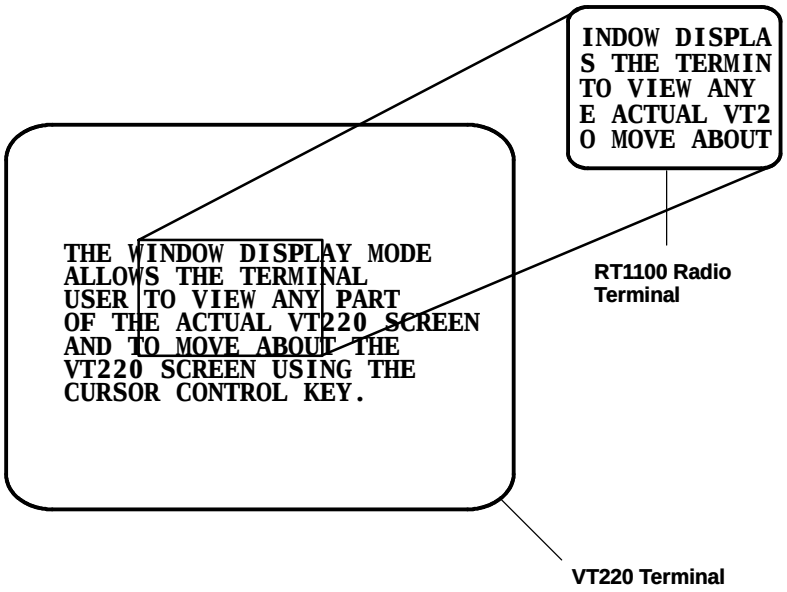


Figure 3-2
RT1100 Windowing Mode

Use the arrow keys in combination with [GOLD] and [BLACK] to move through the radio terminal's display a single space at a time (indicated by "S" on the overlay) or eight spaces at a time (indicated by "W" on the overlay). The following chart shows key combinations.

To Move Display	Press
One space right	[GOLD]+[**"**]
One space left	[GOLD]+[**A**]
One space up	[GOLD]+[**Y**]
One space down	[GOLD]+[**B**]
Eight spaces right	[BLACK]+[**"**]
Eight spaces left	[BLACK]+[**A**]
Eight spaces up	[BLACK]+[**Y**]
Eight spaces down	[BLACK]+[**B**]

Auxiliary Keypad

The VT220 terminal's auxiliary keypad consists of numeric keys (which enter numeric data) and programmable function (PF) keys. The PF keys have operations assigned to them by the application software in use. Refer to your application's software manual for the programmed uses of the PF keys.

Table 3-4 describes how to use the radio terminal to do VT220 terminal auxiliary keypad operations.

Table 3-4
RT1100 Auxiliary Keypad

For Auxiliary Operation	Press
0–9	[KEYPAD]+[0] – [KEYPAD]+[9]
– (hyphen)	[KEYPAD]+[GOLD]+[B]
, (comma)	[KEYPAD]+[GOLD]+[M]
. (period)	[KEYPAD]+[BLACK]+[U]
Enter	[KEYPAD]+[ENTER]
PF1–PF4	[BLACK]+[A] – [BLACK]+[D]

Top-Row Function Keys

On the VT220 terminal's keyboard, function keys [F1] through [F5] are used for hold screen, print screen, set-up, data/talk, and break. The radio terminal supports only the break function, which is [BLACK]+[E] ([F5]) on the radio terminal's keyboard.

Function keys [F6] through [F20] are user-defined keys (UDKs) that have operations assigned to them by the application software in use. Refer to your application's software manual for their uses.

Table 3-5
RT1100 Top-Row Function Keys

To Do Function	Press
F5–F20	[BLACK]+[E] – [BLACK]+[T]

Control Keys

Table 3-6 lists some control key combinations. On the radio terminal's keyboard, the control key is [GOLD]+[8].

Table 3-6
RT1100 Control Keys

To Do Action	Press
ESC (escape)	[GOLD]+[8]+[3]
FS (file separator)	[GOLD]+[8]+[4]
GS (group separator)	[GOLD]+[8]+[5]
RS (record separator)	[GOLD]+[8]+[6]
US (unit separator)	[GOLD]+[8]+[7]
DEL (delete)	[GOLD]+[8]+[8]

Transmission Mode

Use the transmission mode (labeled "mode" on the overlay) to put the radio terminal into line edit (block) mode or character mode. To alternate between modes, press [BLACK]+[Y]. The modes are described on pages 8-55 and 8-56 in Section 8, "Programming."

When "lock mode" is disabled through the firmware menus, you can press the mode key to toggle between line edit mode and character mode. When lock mode is enabled, you cannot toggle between line edit (block) mode and character mode. The default setting is "disabled."

Local Edit Mode

If your application software program supports local editing you can use the radio terminal in local edit mode, which is a feature of the VT330/ VT340 terminal. Local edit mode is described on page 8-62 in Section 8.

Backlight

Use the backlight to read the radio terminal's display in dim light. To turn the light on, press [GOLD]+[0] (zero). To turn it off, press [GOLD]+[0] again.

You can use the firmware's setup menus to set the length of time the backlight stays on before the radio terminal's backlight "goes to sleep" to conserve power. Refer to the radio terminal's user's guide for more information about backlighting.

" **NOTE:** *The longer the backlight stays on, the sooner the battery will need to be recharged.*

Section 4

RT1700 Radio Terminal

VT220/ANSI Display Emulation

The RT1700 Radio Terminal's liquid crystal display (LCD) shows radio terminal and VT220 prompts, and information you type. Because the VT220 terminal's screen is 80 columns by 24 lines, the radio terminal represents a part of the information on the larger VT220 screen.

" **NOTE:** *Radio terminals in the RT1700 Series have UHF, 900 MHz, or 2.4 GHz radio modules.*

Host View Size

The host view size is 24 characters high by 80 characters wide.

Screen Size

You can select the number of display lines and characters per line. The options are 12, 17, 22, or 26 characters per line by 4, 6, 8, 10, 12, 16, or 21 lines. The default is 22 characters per line by 8 lines.

To change the screen size, open the firmware by pressing [GOLD]+[BLACK]. Then select the following options in this order: LCD PARMS, SCREEN SIZE.

Screen Modes

The radio terminal has these screen modes: center cursor, corner, page, lazy, screen lock, and locked. The modes present a window onto a standard VT220 terminal's 80-character by 24-line display buffer. You can set the type of screen mode through the radio terminal's firmware menus.

The screen modes govern which portion of the larger VT220 terminal's screen the radio terminal first presents and how the window moves as the cursor moves.

Center Cursor Mode

Center cursor mode works best for applications that use the entire VT220 data stream's 80-character by 24-line logical display. In this mode, the cursor remains in the center of the radio terminal's window.

As the cursor moves within the window, the radio terminal's display window moves to keep it centered. When the cursor moves off the right, left, top, or bottom edge of the larger 80x24 display, the window remains fixed despite the cursor's movement.

Corner Mode

Corner mode begins with the window in the upper left corner of the larger VT220 terminal. It keeps the cursor in the lower right corner of the display. Corner mode works best for applications that use the upper left corner of the logical screen.

As the cursor moves off the right or bottom edge of the radio terminal's display, the window moves to show the cursor. When you use corner mode with the gold-colored key, you can move the cursor a predetermined number of key presses in all four directions.

Page Mode

Page mode provides predefined pages within the larger VT220 terminal. The size of these pages depends on the number of rows and columns selected for display. The radio terminal moves the window by a multiple of the page size. As the cursor moves off the edge of the radio terminal's display, the window changes to the next page.

Lazy Mode

Lazy mode starts the cursor in the upper left corner of the display. The cursor moves across the display in the scrolled direction. When the cursor goes beyond the edge of the display, the data begins to move in the scrolled direction and the cursor remains at the edge of the display. When you try to move the cursor beyond an outside boundary, an error tone sounds.

Screen Lock Mode

Screen lock mode allows a specified screen size to be set up and locked. Only the commands issued to the selected screen size are operated on. For example, if the host sends characters to the display, and the number of characters to display is greater than the number of columns specified, the last column(s) on the screen are overwritten.

Locked Mode

If locked mode is selected through the firmware menus, the view window is locked to the upper left-hand corner of the display. The screen does not window around, and only the area that has been selected to be the screen size is visible. Locked mode disables the windowing keys, or only allows you to window around the physical display size selected through the firmware menus.

Display Annunciators

Annunciators show the radio terminal's current status or operation in progress. The following annunciators can appear in the radio terminal's display. Refer to the radio terminal's user guide for detailed information about the annunciators that can appear for various battery conditions.

T X	The radio terminal is **transmitting** information to base station.
C L	**Communications loss**. No communication with the host computer has occurred for at least 60 seconds. The radio terminal may be out of radio range, the base station may not have power, or communications from the host computer to the base station may not be properly set up.
A	The radio terminal's keyboard is in **black shift mode**. The key you press while the terminal is in this mode does programmable function key operations, or sends the character printed in black on the overlay and to the upper left of the key.
"	The radio terminal's keyboard is in **gold shift mode**. The key you press while the terminal is in this mode sends the character or does the function printed in gold on the overlay and to the upper right of the key.
Y	The radio terminal's keyboard is in **shift mode**. The letter key you press while the keyboard is in this mode sends letters in uppercase.
+ - –	The **battery** needs to be recharged. When this annunciator appears, you will not be able to operate your radio terminal until you place it on a charger.

C	The **battery** is charging.
E	The radio terminal is connected to a charging source; however, charging is not possible.
^	The radio terminal is in **control mode**. The key you press while the terminal is in this mode sends a control character.
X	**Keyboard action mode (KAM)** has been set. The radio terminal ignores all keystrokes that send characters to the host. This state stays on until KAM has been reset.
SCAN	**Laser scanner** is in use. This annunciator ensures you are aware of the laser scanner and the cautions you must exercise. Read and obey the caution labels on your laser scanner so that you do not injure your eyes.
B	The radio terminal is in **line edit (block) mode**. The radio terminal is sending, to the host computer, cumulative data when you press a terminating key.
K	The radio terminal is in **keypad mode**.
C	The radio terminal is in **character mode**. The radio terminal is sending, to the host computer, each key as you press it.
e	The radio terminal is in **local edit mode**, which is a feature of the VT330/VT340 terminal.

Keyboards

The RT1700 Radio Data Terminal has either a 37-key keyboard or standard 57-key keyboard. The 37-key keyboard does not have the primary alphabetic keys found on the standard keyboard.

Standard 57-Key Keyboard

The keys on the standard keyboard (Figure 4-1) are color-coded according to function to make recognition and key entry easier. Press the key in the upper left corner to turn the radio terminal on. To turn it off, press the key for about 3 seconds. Following are the remaining keys and their descriptions.

Key(s)	Description
[A] – [Z]	Send letters a through z or A through Z, depending on how the shift lock is set.
[SP]	Sends one space.
[←]	Sends a backspace or a delete key, depending on how the firmware is set up.
	The black key places the keyboard into black shift mode.
	The gold key places the keyboard into gold shift mode.
[0] – [9]	Send numbers 0 through 9 or SS3 p through SS3 y, depending on how the keypad mode is set.
	The brown key in the lower left corner places the key- board into keypad mode. Brown keys in the top three rows do function, programmable function, or scanning operations.
[ENTER]	Sends CR, CR LF, or SS3 M, depending on terminal mode settings.
[SCAN]	The brown scan key enables an integrated scanner to be operated after this key is pressed.

" **NOTE:** *If you press an unlabeled key (such as the key to the left of the brown [F5] key, or a shift key (black, gold, brown) plus a number or letter (such as [BLACK]+[A]), the radio terminal will beep and flush the type ahead buffer.*

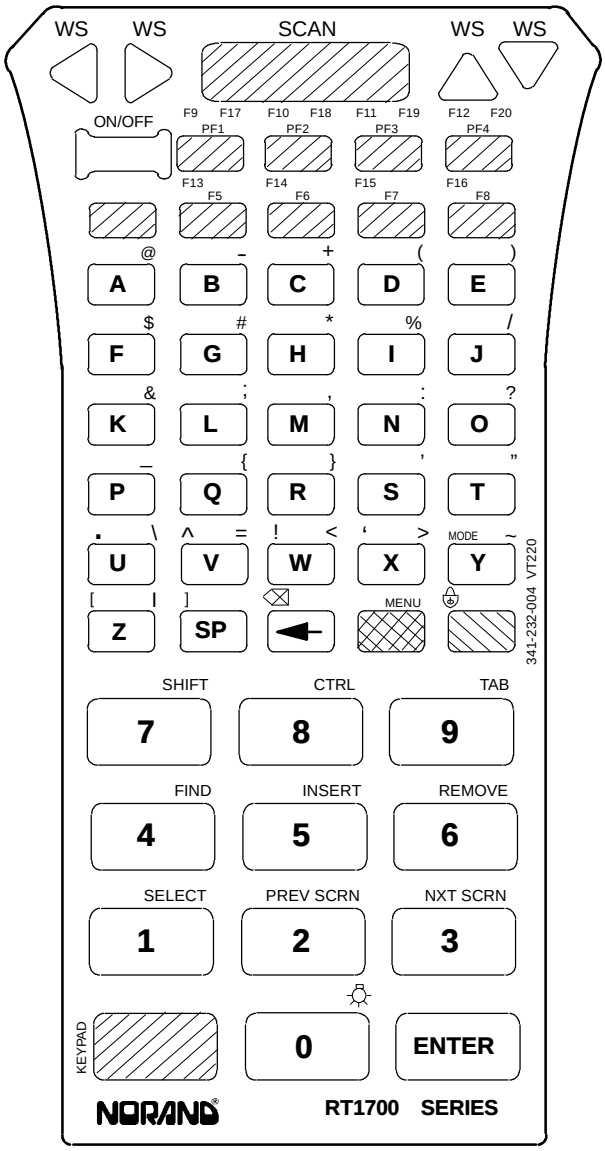


Figure 4-1
RT1700 57-Key Keyboard

The following chart lists standard keyboard keys and their colors.

Key	Color	Letters
ON/OFF	Light gray	None
[A] – [Z]	Dark gray	White
[SP]	Dark gray	White
[←]	Dark gray	White
	Black	None
	Gold	None
[0] – [9]	Light gray	Black
	Brown	None
[ENTER]	Green	White
[SCAN]	Brown	None

37-Key Keyboard

The 37-key keyboard (Figure 4-2) has standard numeric and [ENTER] keys, plus application-defined function keys. It does not have alphabetic keys in its primary plane.

Because a radio terminal with a 37-key keyboard does not have alphabetic keys in its primary plane, follow these procedures when using its firmware and downloading software:

- To access password-protected menus, press [F12] and then [F11], and enter the password. For example, the password for the SET-UP PARMS menu is 52401.
- To initiate the COLD START? menu option, press [F10] to answer "yes."
- To download software, hold down the [F1] key as you power up the radio terminal to go into download mode. This is similar to holding down the [I] key on the standard 57-key keyboard.

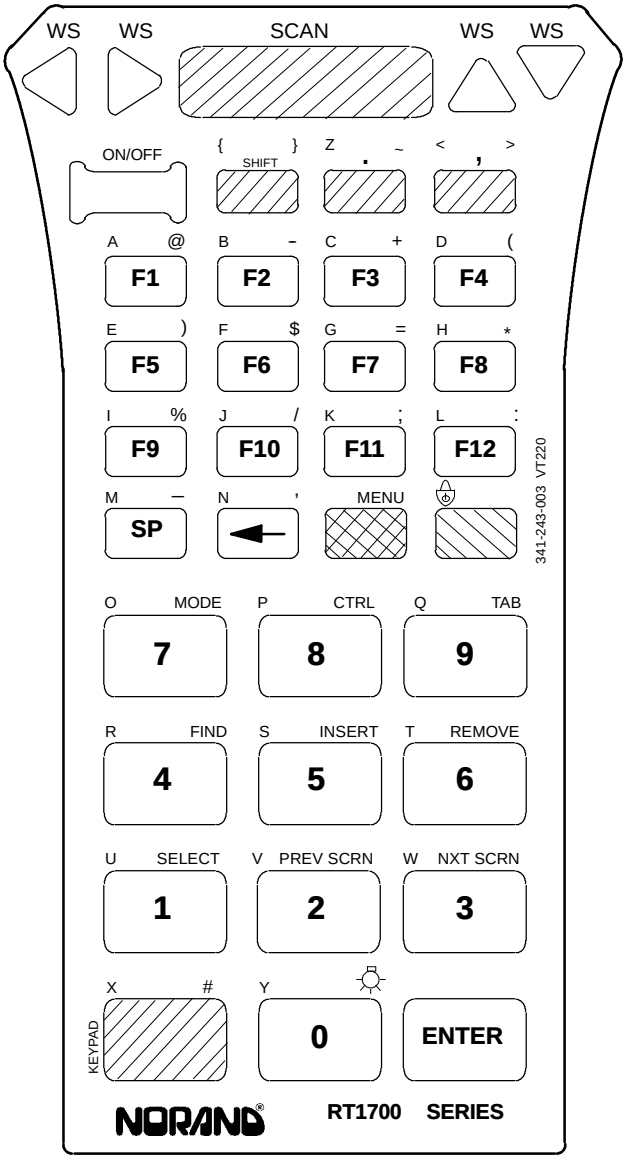


Figure 4-2
RT1700 37-Key Keyboard

The keys are color-coded according to function to make recognition and key entry easier. Press the key in the upper left corner to turn the radio terminal on. To turn it off, press the key for 3 seconds. Following are the remaining keys and their descriptions.

Key(s)	Description
[F1] – [F12]	Perform operations defined by the application.
[SP]	Sends one space.
[←]	Sends a backspace or a delete key, depending on how the firmware is set up.
	The black key places the keyboard into black shift mode.
	The gold key places the keyboard into gold shift mode.
[0] – [9]	Send numbers 0 through 9 or SS3 p through SS3 y, depending on how the keypad mode is set.
	The brown key in the lower left corner places the keyboard into keypad mode.
[ENTER]	Sends CR, CR LF, or SS3 M, depending on terminal mode settings.
[SCAN]	The brown scan key enables an integrated scanner to be operated after this key is pressed.

Overlays

Type the characters and do the operations printed on the overlays when the keyboard is in black shift ([BLACK]) mode or gold shift ([GOLD]) mode.

Note that [BLACK] is to the left and [GOLD] is to the right on the keyboards (Figure 4-1 and Figure 4-2). Characters printed on the overlays have the same relative relationship; the character or operation above a key and to the left (black lettering) indicates black shift mode, and the character or operation above a key and to the right (gold lettering) indicates gold shift mode. An annunciator in the display shows the current mode.

Main Keypad

The 57-key and 37-key keyboards have standard keys and function keys. Standard keys type letters, numbers, and symbols. Function keys do special operations.

Standard Keys

Table 4-1 describes how to type letters, numbers, and symbols.

Table 4-1
RT1700 Standard Keys

To Type	57-Key Keyboard	37-Key Keyboard
a–l	A–L	[SHIFT]+[F1] – [SHIFT]+[F12]
m	M	[SHIFT]+[SP]
n	N	[SHIFT]+[←]
o–q	O–Q	[SHIFT]+[7] – [SHIFT]+[9]
r–t	R–T	[SHIFT]+[4] – [SHIFT]+[6]
u–w	U–W	[SHIFT]+[1] – [SHIFT]+[3]
x	X	[SHIFT]+ [KEYPAD]

Table 4-1 (Continued)
RT1700 Standard Keys

To Type	57-Key Keyboard	37-Key Keyboard
y	Y	[SHIFT]+[0]
z	Z	[SHIFT]+[.]
A–L	[GOLD]+[7]+[A] – [GOLD]+[7]+[L]	[BLACK]+[F1] – [BLACK]+[F12]
M	[GOLD]+[7]+[M]	[BLACK]+[SP]
N	[GOLD]+[7]+[N]	[BLACK]+[←]
O–Q	[GOLD]+[7]+[O] – [GOLD]+[7]+[Q]	[BLACK]+[7] – [BLACK]+[9]
R–T	[GOLD]+[7]+[R] – [GOLD]+[7]+[T]	[BLACK]+[4] – [BLACK]+[6]
U–W	[GOLD]+[7]+[U] – [GOLD]+[7]+[W]	[BLACK]+[1] – [BLACK]+[3]
X	[GOLD]+[7]+[X]	[BLACK]+ [KEYPAD]
Y	[GOLD]+[7]+[Y]	[BLACK]+[0]
Z	[GOLD]+[7]+[Z]	[BLACK]+[.]
[0] – [9]	[0] – [9]	[0] – [9]
@ (at)	[GOLD]+[A]	[GOLD]+[F1]
– (hyphen)	[GOLD]+[B]	[GOLD]+[F2]
+ (plus)	[GOLD]+[C]	[GOLD]+[F3]
((left parenthesis)	[GOLD]+[D]	[GOLD]+[F4]
) (right parenthesis)	[GOLD]+[E]	[GOLD]+[F5]
$ (dollar)	[GOLD]+[F]	[GOLD]+[F6]
# (pound)	[GOLD]+[G]	[GOLD]+[KEYPAD]
* (asterisk)	[GOLD]+[H]	[GOLD]+[F8]
% (percent)	[GOLD]+[I]	[GOLD]+[F9]
/ (forward slash)	[GOLD]+[J]	[GOLD]+[F10]

Table 4-1 (Continued)
RT1700 Standard Keys

To Type	57-Key Keyboard	37-Key Keyboard
& (ampersand)	[GOLD]+[K]	Not applicable
; (semicolon)	[GOLD]+[L]	[GOLD]+[F11]
, (comma)	[GOLD]+[M]	[,]
: (colon)	[GOLD]+[N]	[GOLD]+[F12]
? (question mark)	[GOLD]+[O]	Not applicable
_ (underscore)	[GOLD]+[P]	[GOLD]+[SP]
{ (left brace)	[GOLD]+[Q]	[BLACK]+[SHIFT]
' (single quote)	[GOLD]+[S]	[GOLD]+[←]
" (double quote)	[GOLD]+[T]	Not applicable
\ (backslash)	[GOLD]+[U]	Not applicable
= (equal)	[GOLD]+[V]	[GOLD]+[F7]
< (less than)	[GOLD]+[W]	[BLACK]+[,]
> (greater than)	[GOLD]+[X]	[GOLD]+[,]
~ (tilde)	[GOLD]+[Y]	[GOLD]+[.]
| (vertical bar)	[GOLD]+[Z]	Not applicable
. (period)	[BLACK]+[U]	[.]
^ (circumflex)	[BLACK]+[V]	Not applicable
! (exclamation mark)	[BLACK]+[W]	Not applicable
` (grave accent)	[BLACK]+[X]	Not applicable
[(left bracket)	[BLACK]+[Z]	Not applicable
] (right bracket)	[BLACK]+[SP]	Not applicable

Table 4-2 describes how to use the keyboards to do special VT220 terminal function operations. Note that the keyboards do not support key operation COMPOSE CHARACTER, which creates characters that do not exist as standard keys on the VT220 keyboard.

Operation of the delete key depends on how the PROTOCOL OPTS parameter is set in the radio terminal's firmware. The key either sends a delete (DEL, 7F hexadecimal) or a backspace (BS, 08 hexadecimal).

To change from delete mode to backspace mode on the 57-key keyboard, open the firmware by pressing [GOLD]+[BLACK]. Select the following options in this order: SET-UP PARMS (password: CR52401), PROTOCOL OPTS, VT220, DEL TO BS.

To change from delete mode to backspace mode on the 37-key keyboard, open the firmware by pressing [GOLD]+[BLACK]. Select the following options in this order: SET-UP PARMS (press [F12] and then [F11], and then enter password 52401 to access the menu), PROTOCOL OPTS, VT220, DEL TO BS.

Table 4-2
RT1700 Special Function Keys

To Do Operation	57-Key	37-Key
Delete	[BLACK]+[←]	Not applicable
Delete or Backspace	[←]	[←]
Tab	[GOLD]+[9]	[GOLD]+[9]
Return	[ENTER]	[ENTER]
Ctrl	[GOLD]+[8]	[GOLD]+[8]
Shift	[GOLD]+[7]	[SHIFT]
Lock (sets and clears SHIFT LOCK mode)	[BLACK]+[GOLD]	[BLACK]+[GOLD] (lowercase letters)
Space bar	[SP]	[SP]
Compose character	Not supported	Not supported

Editing Keypad

The VT220 terminal's editing keypad has editing keys and cursor control (arrow) keys. Editing keys have functions assigned to them by the application software in use. Refer to your application's software manual for the uses of the editing keypad keys. The cursor control keys in black shift or gold shift mode allow you to scroll through the radio terminal's local display memory.

Editing Keys

Table 4-3 describes how to do VT220 terminal editing operations on the 57-key and 37-key keyboards.

Table 4-3
RT1700 Editing Keys

To Do Editing Operation	Press
Find	[GOLD]+[4]
Insert here	[GOLD]+[5]
Remove	[GOLD]+[6]
Select	[GOLD]+[1]
Prev screen	[GOLD]+[2]
Next screen	[GOLD]+[3]

Cursor Control Keys

The following chart describes how to do VT220 terminal cursor control operations on the 57-key and 37-key keyboards.

To Do Cursor Key	Press
↑	[**Y**]
↓	[**B**]
←	[**A**]
→	[**"**]

In addition to sending VT220 cursor control sequences, the arrow keys at the tops of the keyboards allow you to move the cursor through the radio terminal's display. The keys operate in a local windowing mode, which is enabled with the black shift or gold shift key. This mode provides a "window" into the VT220's screen and allows you to move the radio terminal's display window (Figure 4-3). Each key moves the window in the direction indicated by the arrow.

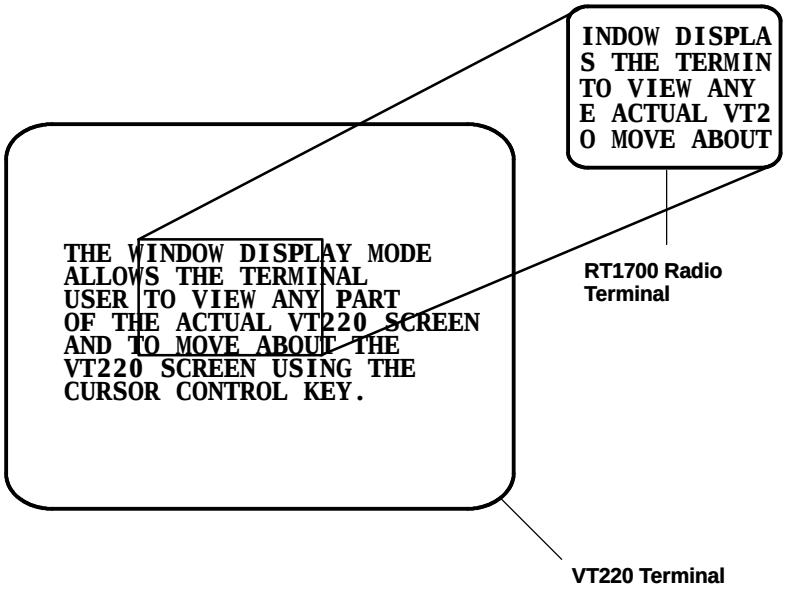


Figure 4-3
RT1700 Windowing Mode

If you try to move the cursor off the display in any direction, the window shifts one or eight lines or columns in the direction of the cursor movement. This lets you move the viewing window around within the larger VT220 terminal screen. The display does not wrap when the window reaches the top or side boundaries of the virtual VT220 screen. A beep tone sounds when you try to move the window beyond a top, bottom, left, or right boundary.

Use the arrow keys in combination with [GOLD] and [BLACK] to move through the radio terminal's display a single space at a time (indicated by "S" on the overlay) or eight spaces at a time (indicated by "W" on the overlay). The following chart shows key movements.

To Move Display	Press
One space right	[GOLD]+[**"**]
One space left	[GOLD]+[**A**]
One space up	[GOLD]+[**Y**]
One space down	[GOLD]+[**B**]
Eight spaces right	[BLACK]+[**"**]
Eight spaces left	[BLACK]+[**A**]
Eight spaces up	[BLACK]+[**Y**]
Eight spaces down	[BLACK]+[**B**]

Auxiliary Keypad

The VT220 terminal's auxiliary keypad consists of numeric keys (which enter numeric data) and programmable function (PF) keys. The PF keys have operations assigned to them by the application software in use. Refer to your application's software manual for the programmed uses of the PF keys.

Table 4-4 describes how to use the radio terminal to do VT220 terminal auxiliary keypad operations.

Table 4-4
RT1700 Auxiliary Keypad

For Auxiliary Operation	57-Key Keyboard	37-Key Keyboard
0–9	[KEYPAD]+[0] – [KEYPAD]+[9]	[KEYPAD]+[0] – [KEYPAD]+[9]
– (hyphen)	[KEYPAD]+[GOLD]+[B]	[KEYPAD]+[GOLD]+[F2]
, (comma)	[KEYPAD]+[GOLD]+[M]	[KEYPAD]+[,]
. (period)	[KEYPAD]+[BLACK]+[U]	[KEYPAD]+[.]
Enter	[KEYPAD]+[ENTER]	[KEYPAD]+[ENTER]
PF1–PF4	[PF1] – [PF4]	[F1] – [F4]

Top-Row Function Keys

On the VT220 terminal's keyboard, function keys [F1] through [F5] are used for hold screen, print screen, set-up, data/talk, and break. The radio terminal supports only the break function, which is [F5] on the radio terminal's keyboard. Table 4-5 shows how to perform function operations.

Function keys [F6] through [F20] are user-defined keys (UDKs) that have operations assigned to them by the application software in use. Refer to your application's software manual for their uses.

Table 4-5
RT1700 Top-Row Function Keys

To Do Function	57-Key Keyboard	37-Key Keyboard
F5–F8	[F5] – [F8]	[F5] – [F8]
F9–F12	[BLACK]+[PF1] – [BLACK]+[PF4]	[F9] – [F12]
F13–F16	[BLACK]+[F5] – [BLACK]+[F8]	Not applicable
F17–F20	[GOLD]+[PF1] – [GOLD]+[PF4]	Not applicable

Control Keys

Both keyboards have control key combinations.

57-Key Keyboard

Table 4-6 lists some combinations on the 57-key keyboard. The control key is [GOLD]+[8].

Table 4-6
RT1700 Control Keys (57-Key Keyboard)

To Do Action	Press
ESC (escape)	[GOLD]+[8]+[3]
FS (file separator)	[GOLD]+[8]+[4]
GS (group separator)	[GOLD]+[8]+[5]
RS (record separator)	[GOLD]+[8]+[6]
US (unit separator)	[GOLD]+[8]+[7]
DEL (delete)	[GOLD]+[8]+[8]

37-Key Keyboard

You can use the control keys on the 37-key keyboard only when the keyboard is in SHIFT LOCK mode. To put the keyboard into SHIFT LOCK mode, press [BLACK]+ [GOLD]. Then press the key sequences listed in Table 4-7.

Table 4-7
RT1700 Control Keys (37-Key Keyboard)

To Do Action	Press
CTRL A – CTRL L	[GOLD]+[8]+[F1] – [GOLD]+[8]+[F12]
CTRL M	[GOLD]+[8]+[SP]
CTRL N	[GOLD]+[8]+[←]
CTRL O – CTRL Q	[GOLD]+[8]+[7] – [GOLD]+[8]+[9]
CTRL R – CTRL T	[GOLD]+[8]+[4] – [GOLD]+[8]+[6]
CTRL U – CTRL W	[GOLD]+[8]+[1] – [GOLD]+[8]+[3]
CTRL X	[GOLD]+[8]+[KEYPAD]
CTRL Y	[GOLD]+[8]+[0]
CTRL Z	[GOLD]+[8]+[.]

Transmission Mode

Use the transmission mode (labeled “mode” on the overlay) to put the radio terminal into line edit (block) mode or character mode. To alternate between modes, press the following keys:

[GOLD]+[7] on the 37-key keyboard
[BLACK]+[Y] on the 57-key keyboard

The modes are described on pages 8-55 and 8-56 in Section 8, “Programming.”

When "lock mode" is disabled through the firmware menus, you can press the mode key to toggle between line edit mode and character mode. When lock mode is enabled, you cannot toggle between line edit (block) mode and character mode. The default setting is "disabled."

Local Edit Mode

If your application software program supports local editing you can use the radio terminal in local edit mode, which is a feature of the VT330/VT340 terminal. Local edit mode is described on page 8-62 in Section 8.

Backlight

Use the backlight to read the radio terminal's display in dim light. To turn the light on, press [GOLD]+[0] (zero) on the 57-key and 37-key keyboards. To turn it off, press [GOLD]+[0] again.

You can use the firmware's setup menus to set the length of time the backlight stays on before the radio terminal's backlight "goes to sleep" to conserve power. Refer to the radio terminal's user's guide for more information about backlighting.

" **NOTE:** *The longer the backlight stays on, the sooner the battery will need to be recharged.*

Section 5

RT5900 Radio Terminal

VT220/ANSI Display Emulation

The RT5900 Mobile Mount Radio Terminal's display shows radio terminal and VT220 prompts, and information you type. Because the VT220 terminal's screen is 80 columns by 24 lines, the radio terminal represents a part of the information on the larger VT220 screen.

" **NOTE:** *RT5900 Series radio terminals have UHF, 900 MHz, or 2.4 GHz radios.*

Host View Size

The host view size is 24 characters high by 80 characters wide.

Screen Size

You can select the number of display lines and characters per line. The options are 40, 60, or 80 characters per line by 8, 10, 12, 16, 21, or 25 lines. The default is 12 lines and 40 characters. To change the screen size, open the firmware and then select the following options in this order: LCD PARMS, SCREEN SIZE.

Screen Modes

The radio terminal has these screen modes: center cursor, corner, page, lazy, screen lock, and locked. The modes present a window onto a standard VT220 terminal's 80-character by 24-line display buffer. You can set the type of mode through the radio terminal's firmware menus.

The screen modes govern which portion of the larger VT220 terminal's screen the radio terminal first presents and how the window moves as the cursor moves.

Center Cursor Mode

Center cursor mode works best for applications that use the entire VT220 data stream's 80-character by 24-line logical display. In this mode, the cursor remains in the center of the radio terminal's window.

As the cursor moves within the window, the radio terminal's display window moves to keep it centered. When the cursor moves off the right, left, top, or bottom edge of the VT220 terminal, the window remains fixed despite the cursor's movement.

Corner Mode

Corner mode begins with the window in the upper left corner of the larger VT220 terminal. It keeps the cursor in the lower right corner of the display. Corner mode works best for applications that use the upper left corner of the logical screen.

As the cursor moves off the right or bottom edge of the radio terminal's display, the window moves to show the cursor. When you use corner mode with the brown-colored key, you can move the cursor a predetermined number of key presses in all four directions.

Page Mode

Page mode provides predefined pages within the larger VT220 terminal. The size of these pages depends on the number of rows and columns selected for display. The radio terminal moves the window by a multiple of the page size. As the cursor moves off the edge of the radio terminal's display, the window changes to the next page.

Lazy Mode

Lazy mode starts the cursor in the upper left corner of the display. The cursor moves across the display in the scrolled direction. When the cursor goes beyond the edge of the display, the data begins to move in the scrolled direction and the cursor remains at the edge of the display. When you try to go beyond an outside boundary, an error tone sounds.

Screen Lock Mode

Screen lock mode allows a specified screen size to be set up and locked. Only the commands issued to the selected screen size are operated on. For example, if the host sends characters to the display, and the number of characters to display is greater than the number of columns specified, the last column(s) on the screen are overwritten.

Locked Mode

If locked mode is selected through the firmware menus, the view window is locked to the upper left-hand corner of the display. The screen does not window around, and only the area that has been selected to be the screen size is visible. Locked mode disables the windowing keys, or only allows you to window around the physical display size selected through the firmware menus.

Display Annunciators

Annunciators show the radio terminal's current status or operation in progress. The following annunciators can appear.

The radio terminal is **transmitting** information to the base station.

C
L

Communications loss. No communication with the host computer has occurred for at least 60 seconds. The radio terminal may be out of radio range, the base station may not have power, or communications from the host computer to the base station may not be properly set up.

A The radio terminal's keyboard is in **brown shift mode**. The key you press while the terminal is in this mode does the operation or types the character printed in brown on the overlay and to the upper left of the key.

" The radio terminal's keyboard is in **gold shift mode**. The key you press while the terminal is in this mode does the function printed in gold on the overlay and to the upper right of the key.

Y The radio terminal's keyboard is in **shift mode**. The letter key you press while the keyboard is in this mode types letters in uppercase.

C The **battery** is charging.

X — **Keyboard action mode (KAM)** has been set. The radio terminal ignores all keystrokes that send characters to the host. This state stays on until KAM has been reset.

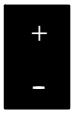
SCAN — **Laser scanner** is in use. This annunciator ensures you are aware of the laser scanner and the cautions you must exercise. Read and obey the caution labels on your laser scanner so that you do not injure your eyes.

B — The radio terminal is in **line edit (block) mode**. The radio terminal is sending, to the host computer, cumulative data when you press a terminating key.

K — The radio terminal is in **keypad mode**.

C — The radio terminal is in **character mode**. The radio terminal is sending, to the host computer, each key as you press it.

e — The radio terminal is in **local edit mode**, which is a feature of the VT330/VT340 terminal.



The **battery** needs to be recharged. When this annunciator appears, you will not be able to operate your radio terminal until you place it on a charger.

Keyboard

The radio terminal has a 47-key keyboard with keys defined to emulate VT220 terminal operation (Figure 5-1). Keys are color-coded according to function to make recognition and key entry easier. The key in the upper left corner of the keyboard turns the radio terminal on and off. To turn the radio terminal off, press the key for about 3 seconds.

Following are the remaining keys and their descriptions.

Key(s)	Description
[A] – [Z]	Send letters a through z or A through Z, depending on how the shift lock is set.
[.]	Sends a period.
[–]	Sends a hyphen.
[SPACE]	Sends one space.
[TAB]	Tabs to next column.
[KEYPD]	Places keyboard into keypad mode.
[SHIFT]	Places keyboard into shift mode.
[0] – [9]	Send numbers 0 through 9 or SS3 p through SS3 y, depending on how the keypad mode is set.
[ENTER]	Sends CR, CR LF, or SS3 M, depending on terminal mode settings.
[←]	Sends a backspace or a delete key, depending on how the firmware is set up.
	Places keyboard into brown shift mode.
	Places keyboard into gold shift mode.

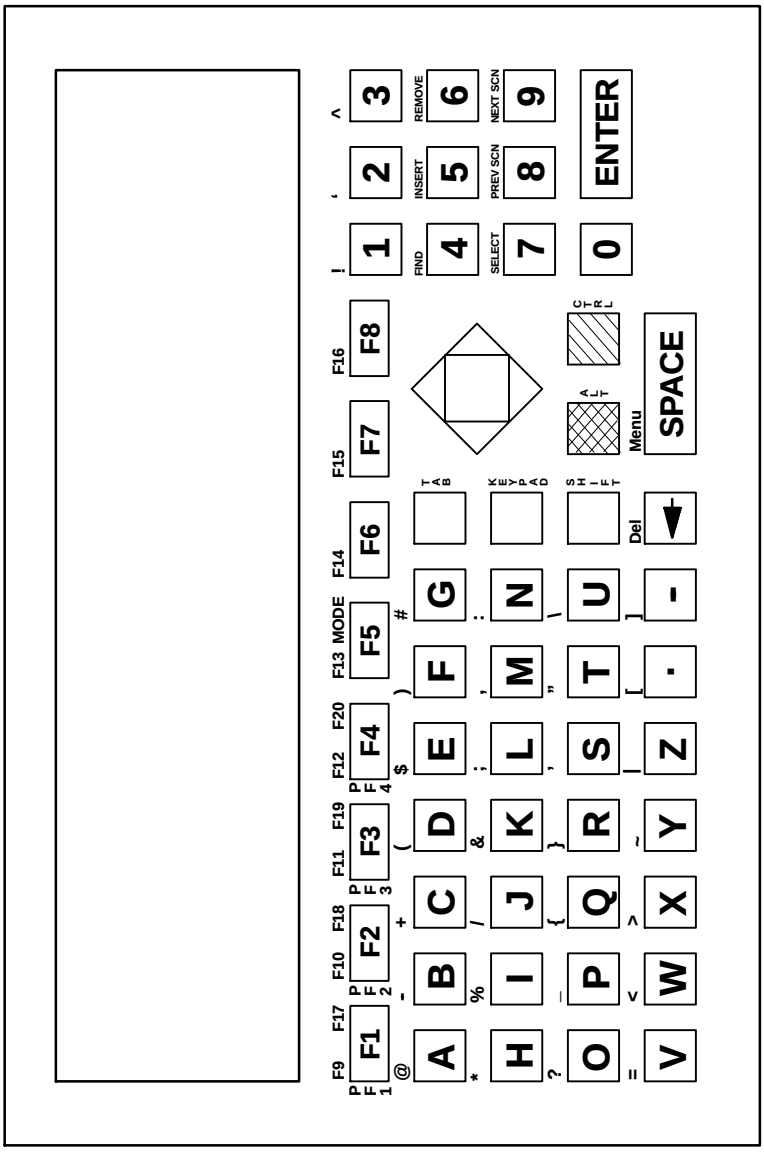


Figure 5-1
RT5900 Keyboard

Overlay

Type the characters and do the operations printed in brown on the overlay when the keyboard is in brown shift [BROWN] mode. Do the operations printed in gold on the overlay when the keyboard is in gold shift [GOLD] mode. Figure 5-1 shows that [BROWN] is to the left and [GOLD] is to the right. Characters printed on the overlay have the same relative relationship; the character or operation above a key and to the left indicates brown shift mode, and the operation above a key and to the right indicates gold shift mode. An annunciator along the right side of the display shows the current mode.

You can also use the cursor control key in the upper right corner of the keyboard in combination with the brown and gold shift modes for local windowing.

The following chart lists radio terminal keys, and their colors.

Key	Color	Letters
[PF1] – [PF8]	Blue	White
[A] – [Z]	Dark gray	Black
[.]	Dark gray	Black
[–]	Dark gray	Black
[TAB]	Blue	None
[KEYPD]	Blue	None
[SHIFT]	Blue	None
[←]	Blue	White
[SPACE]	Light gray	Black
[0] – [9]	Light gray	Black
[ENTER]	Green	White
	Brown	None
	Gold	None

Main Keypad

The VT220 terminal's main keypad has standard keys and function keys. Standard keys type letters, numbers, and symbols. Function keys do special operations.

Standard Keys

Table 5-1 describes how to use the radio terminal to type letters, numbers, and symbols.

Table 5-1
RT5900 Standard Keys

To Type	Press
a–z	[A] – [Z]
A–Z	[A] – [Z] or [SHIFT]+[A] – [SHIFT]+[Z]
0–9	[0] – [9] or [SHIFT]+[0] – [SHIFT]+[9]
@ (at)	[BROWN]+[A]
– (hyphen)	[BROWN]+[B]
+ (plus)	[BROWN]+[C]
((left parenthesis)	[BROWN]+[D]
$ (dollar)	[BROWN]+[E]
) (right parenthesis)	[BROWN]+[F]
# (pound)	[BROWN]+[G]
* (asterisk)	[BROWN]+[H]
% (percent)	[BROWN]+[I]
/ (forward slash)	[BROWN]+[J]
& (ampersand)	[BROWN]+[K]

Table 5-1 (Continued)
RT5900 Standard Keys

To Type	Press
; (semicolon)	[BROWN]+[L]
, (comma)	[BROWN]+[M]
: (colon)	[BROWN]+[N]
? (question mark)	[BROWN]+[O]
_ (underscore)	[BROWN]+[P]
{ (left brace)	[BROWN]+[Q]
} (right brace)	[BROWN]+[R]
' (single quote)	[BROWN]+[S]
" (double quote)	[BROWN]+[T]
\ (backslash)	[BROWN]+[U]
= (equal)	[BROWN]+[V]
< (less than)	[BROWN]+[W]
> (greater than)	[BROWN]+[X]
~ (tilde)	[BROWN]+[Y]
| (vertical bar)	[BROWN]+[Z]
[(left bracket)	[BROWN+[.]
] (right bracket)	[BROWN]+[–]
. (period)	[.]
– (hyphen)	[–]
! (exclamation mark)	[BROWN]+[1]
` (grave accent)	[BROWN]+[2]
^ (circumflex)	[BROWN]+[3]

Special Function Keys

Table 5-2 describes how to use the radio terminal to do special VT220 terminal function operations. Note that the radio terminal does not support key operation COMPOSE CHARACTER, which creates characters that do not exist as standard keys on the VT220 keyboard.

Operation of the delete key depends on how the PROTOCOL OPTS parameter is set in the radio terminal's firmware. The key either sends a delete (DEL, 7F hexadecimal) or a backspace (BS, 08 hexadecimal).

To change from delete mode to backspace mode, open the firmware by pressing [BROWN]+[SPACE]. Then select the following options in this order: SET-UP PARMS (password: CR52401), PROTOCOL OPTS, VT220, DEL TO BS.

Table 5-2
RT5900 Special Function Keys

To Do Operation	Press
Delete	[←]
Tab	[TAB]
Return	[ENTER]
Ctrl	[GOLD]
Lock	Not supported
Shift (uppercase characters)	[SHIFT]
Space bar	[SPACE]
Compose character	Not supported

Editing Keypad

The VT220 terminal's editing keypad has editing keys and cursor control keys. Editing keys have functions assigned to them by the application software in use. Refer to your application's software manual for the uses of the editing keys. You can use the arrow keys to move the cursor and page through the radio terminal's display.

Editing Keys

Table 5-3 describes how to use the radio terminal to do VT220 terminal editing operations.

Table 5-3
RT5900 Editing Keys

To Do Editing Operation	Press
Find	[BROWN]+[4]
Insert here	[BROWN]+[5]
Remove	[BROWN]+[6]
Select	[BROWN]+[1]
Prev screen	[BROWN]+[2]
Next screen	[BROWN]+[3]

Cursor Control Key

The blue cursor control key in the upper right corner of the keyboard allows you to move the cursor and page through the radio terminal's display. The keys operate in a local windowing mode, which is always enabled. The mode provides a "window" into the VT220's screen and allows you to move the radio terminal's display window (Figure 5-2). Each key moves the window in the direction indicated by the arrow.

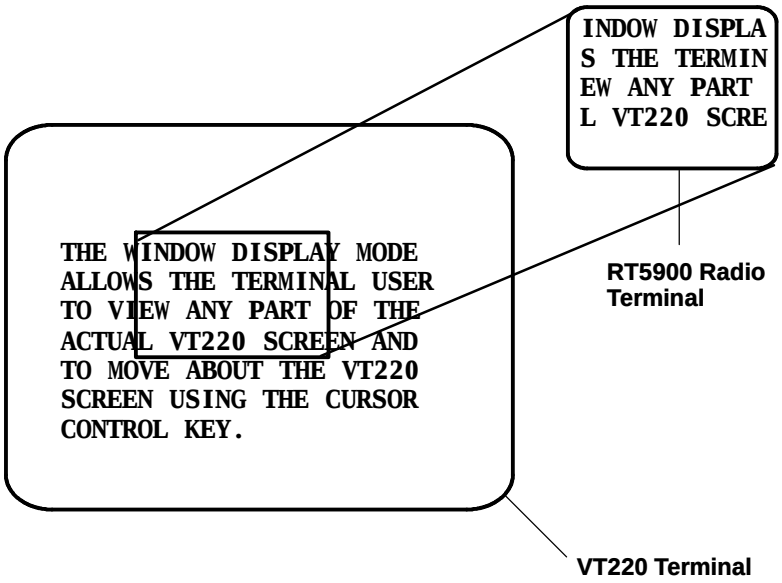


Figure 5-2
RT5900 Windowing Mode

If you try to move the cursor off the display in any direction, the window shifts one or eight lines or columns in the direction of the cursor movement. This lets you move the viewing window around within the larger VT220's screen. The display does not wrap around when the window reaches the top or side boundaries of the virtual VT220 screen. A beep error tone sounds when you try to move the window beyond the top, bottom, left, or right boundary.

The following chart shows how to use the arrow keys in combination with [GOLD] and [BROWN] to move through the radio terminal's display.

To Move Display	Press
One space right	[BROWN]+[**"**]
One space left	[BROWN]+[**A**]
One line up	[BROWN]+[**Y**]
One line down	[BROWN]+[**B**]
Eight spaces right	[GOLD]+[**"**]
Eight spaces left	[GOLD]+[**A**]
Eight lines up	[GOLD]+[**Y**]
Eight lines down	[GOLD]+[**B**]

Auxiliary Keypad

The VT220 terminal's auxiliary keypad consists of numeric keys (which enter numeric data) and programmable function (PF) keys. The PF keys have operations assigned to them by the application software in use. Refer to your application's software manual for the uses of the PF keys.

Table 5-4 describes how to use the radio terminal to do VT220 terminal auxiliary keypad operations.

Table 5-4
RT5900 Auxiliary Keypad

For Auxiliary Operation	Press
0–9	[KEYPD]+[0] – [KEYPD]+[9]
– (hyphen)	[KEYPD]+[–]
, (comma)	[KEYPD]+[M]
. (period)	[KEYPD]+[.]
Enter	[KEYPD]+[ENTER]
PF1–PF4	[F1] – [F4]

Top-Row Function Keys

On the VT220 terminal's keyboard, function keys [F1] through [F5] are used for hold screen, print screen, set-up, data/talk, and break. The radio terminal supports only the break function, which is [F5] on the radio terminal's keyboard.

Function keys [F6] through [F20] are user-defined keys (UDKs) that have operations assigned to them by the application software in use. Refer to your application's software manual for their programmed uses.

Table 5-5 shows how to perform function operations.

Table 5-5
RT5900 Top-Row Function Keys

To Do Function	Press
F5–F8	[F5] – [F8]
F9–F16	[BROWN]+[F1] – [BROWN]+[F8]
F17–F20	[GOLD]+[F1] – [GOLD]+[F4]

Control Keys

Table 5-6 lists some control key combinations. On the radio terminal's keyboard, the control key is [CTRL].

Table 5-6
RT5900 Control Key Combinations

To Do Action	Press
0 (zero)	[CTRL]+[2]
ESC (escape)	[CTRL]+[3]
FS (file separator)	[CTRL]+[4]
GS (group separator)	[CTRL]+[5]
RS (record separator)	[CTRL]+[6]
US (unit separator)	[CTRL]+[7]
DEL (delete)	[CTRL]+[8]

Transmission Mode

Use the transmission mode (labeled “mode” on the overlay) to put the radio terminal into line edit (block) mode or character mode. To alternate between modes, press [GOLD]+[F5]. The modes are described on pages 8-55 and 8-56 in Section 8, “Programming.”

When “lock mode” is disabled through the firmware menus, you can press the mode key to toggle between line edit mode and character mode. When lock mode is enabled, you cannot toggle between line edit (block) mode and character mode. The default setting is “disabled.”

Local Edit Mode

If your application software program supports local editing you can use the radio terminal in local edit mode, which is a feature of the VT330/VT340 terminal. Local edit mode is described on page 8-62 in Section 8.

Section 6

PEN*KEY[R] 6400 Computer

VT220/ANSI Display Emulation

The PEN*KEY 6400 Computer's liquid crystal display (LCD) shows PEN*KEY computer and VT220 prompts, and information you type. Because the VT220 terminal's screen is 80 columns by 24 lines, the PEN*KEY computer represents a part of the information on the larger VT220 screen.

Screen Size

You can select the number of display lines and characters per line. The options are 3, 6, 9, or 18 lines by 10, 13, 16, 20, 26, or 32 characters per line. To set the screen size open the firmware and select the following options in this order: LCD PARMS, SCREEN SIZE.

Screen Modes

The PEN*KEY computer has these screen modes: center cursor, corner, page, lazy, screen lock, and locked. The modes present a window onto a standard VT220 terminal's 80-character by 24-line display buffer. You can set the type of screen mode through the PEN*KEY computer's firmware menus.

The screen modes govern which portion of the larger VT220 terminal's screen the PEN*KEY computer first presents and how the window moves as the cursor moves.

Center Cursor Mode

Center cursor mode works best for applications that use the entire VT220 data stream's 80-character by 24-line logical display. In this mode, the cursor remains in the center of the PEN*KEY computer's window.

As the cursor moves within the window, the PEN*KEY computer's display window moves to keep it centered. When the cursor moves off the right, left, top, or bottom edge of the larger 80x24 display, the window remains fixed despite the cursor's movement.

Corner Mode

Corner mode begins with the window in the upper left corner of the larger VT220 terminal. It keeps the cursor in the lower right corner of the display. Corner mode works best for applications that use the upper left corner of the logical screen.

As the cursor moves off the right or bottom edge of the PEN*KEY computer's display, the window moves to show the cursor. When you use corner mode with the gold-colored key, you can move the cursor a predetermined number of key presses in all four directions.

Page Mode

Page mode provides predefined pages within the larger VT220 terminal. The size of these pages depends on the number of rows and columns selected for display.

The PEN*KEY computer moves the window by a multiple of the page size. As the cursor moves off the edge of the PEN*KEY computer's display, the window changes to the next page.

Lazy Mode

Lazy mode starts the cursor in the upper left corner of the display. The cursor moves across the display in the scrolled direction. When the cursor goes beyond the edge of the display, the data begins to move in the scrolled direction and the cursor remains at the edge of the display. When you try to move the cursor beyond an outside boundary, an error tone sounds.

Screen Lock Mode

Screen lock mode allows a specified screen size to be set up and locked. Only the commands issued to the selected screen size are operated on. For example, if the host sends characters to the display, and the number of characters to display is greater than the number of columns specified, the last column(s) on the screen are overwritten.

Locked Mode

If locked mode is selected through the firmware menus, the view window is locked to the upper left-hand corner of the display. The screen does not window around, and only the area that has been selected to be the screen size is visible. Locked mode disables the windowing keys, or only allows you to window around the physical display size selected through the firmware menus.

Display Annunciators

Annunciators show the PEN*KEY computer's current status or operation in progress. The following annunciators can appear in the computer's display.

The PEN*KEY computer is in **green shift mode**. The key you press while the computer is in this mode does the function or operation printed in green on the overlay.

The PEN*KEY computer is in **gold shift mode**. The key you press while the computer is in this mode sends the character or does the operation printed in gold on the overlay.

The PEN*KEY computer is in **blue shift mode**. The key you press while the computer is in this mode sends the character or does the operation printed in blue on the overlay.

K — The PEN*KEY computer is in **keypad mode**.

X — **Keyboard action mode (KAM)** has been set. The PEN*KEY computer ignores all keystrokes that send characters to the host. This state stays on until KAM has been reset.

Battery capacity. These symbols show the amount of power left in the main battery pack. When all four symbols appear, the battery has more than 75 percent of full capacity. As the battery power decreases to between 50–75 percent capacity, the number of battery icons decreases to three. When the battery pack has between 25–50 percent capacity, two symbols appear. And when the battery pack has less than 25 percent capacity, one symbol appears.

B The PEN*KEY computer is in **line edit (block) mode**. The computer is sending, to the host computer, cumulative data when you press a terminating key.

C The PEN*KEY computer is in **character mode**. The computer is sending, to the host computer, each key as you press it.

e The PEN*KEY computer is in **local edit mode**, which is a feature of the VT330/VT340 terminal.

Keyboards

The PEN*KEY 6400 Computer has either a 41-key keyboard or a standard 51-key keyboard.

51-Key Keyboard

The keys on the 51-key keyboard (Figure 6-1) are color-coded according to function to make recognition and key entry easier.

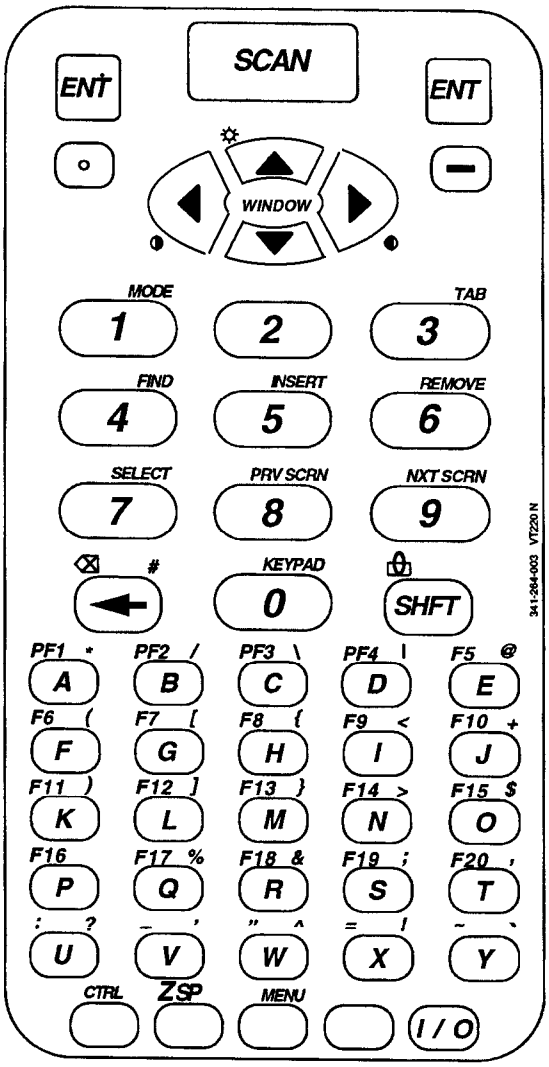


Figure 6-1
PEN*KEY 6400 51-Key Keyboard

Following are the keys and their descriptions.

Key(s)	Description
[SCAN]	The scan key enables an integrated scanner to be operated when this key is pressed.
[ENT]	The two enter keys send CR, CR LF, or SS3 M, depending on PEN*KEY computer mode settings.
[.]	Types a period.
[–]	Types a hyphen.
[0] – [9]	Send numbers 0 through 9 or SS3 p through SS3 y, depending on how the keypad mode is set.
[←]	Sends a backspace or a delete key, depending on how the firmware is set up.
[SHFT]	Places the keyboard into green shift mode.
[A] – [Z]	Send letters a through z or A through Z, depending on how the shift lock is set.
I/O	Suspends and resumes operation.

Four unlabeled keys are in the bottom row of the 51-key keyboard. Following are the keys' functions when they are unshifted (in the primary plane):

- The white key with "CTRL" printed above it is the Control key ([CTRL]) which, in combination with other keys, does control functions.
- The white key with "SP" printed above it is the Space key ([SP)], which types one space.
- The blue key ([BLUE]) places the keyboard into blue shift mode.
- The gold key ([GOLD]) places the keyboard into gold shift mode.

The following chart lists keys and their colors.

Key	Color	Letters
[SCAN]	White	Black
[ENT]	Green	Black
[.]	White	Black
[–]	White	Black
[0] – [9]	White	Black
[←]	White	Black
[SHFT]	Green	Black
[A] – [Z]	White	Black
I/O	White	Black

41-Key Keyboard

The PEN*KEY 6400 Computer's 41-key keyboard (Figure 6-2) has standard numeric and [ENT] keys, plus application-defined function keys. The keys are color-coded according to function to make recognition and key entry easier.

Because a PEN*KEY computer with a 41-key keyboard does not have alphabetic keys in its primary plane, follow these procedures to enter passwords and cold-start the computer:

- To enter the password for the SET-UP PARMS firmware menu press [SHFT]+[BLUE]+[3] (a "C") and then [SHFT]+[BLUE]+ [F8] (an "R"). Then press the correct numbers, which are "52401."
- To initiate the COLD START? firmware menu option, press [BLUE]+[$] to answer "yes."

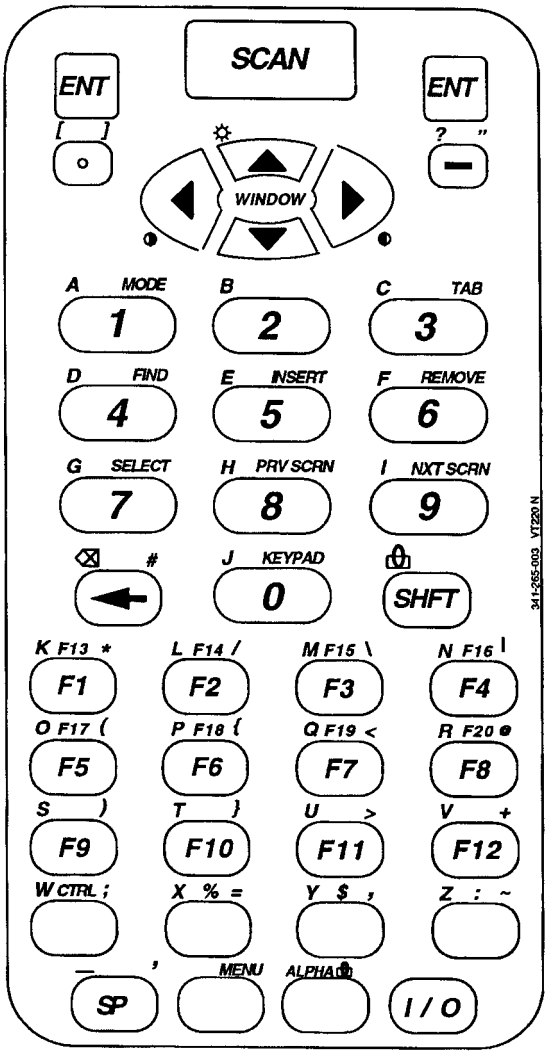


Figure 6-2
PEN*KEY 6400 41-Key Keyboard

Following are the keys and their descriptions.

Key(s)	Description
[SCAN]	The scan key enables an integrated scanner to be operated after this key is pressed.
[ENT]	The two enter keys send CR, CR LF, or SS3 M, depending on PEN*KEY computer mode settings.
[.]	Types a period.
[–]	Types a hyphen.
[0] – [9]	Send numbers 0 through 9 or SS3 p through SS3 y, depending on how the keypad mode is set.
[←]	Sends a backspace or a delete key, depending on how the firmware is set up.
[SHFT]	Places the keyboard into green shift mode.
[F1] – [F12]	Do operations defined by the application.
[SP]	Types one space.
l/O	Suspends and resumes operation.

Six unlabeled keys are in the bottom two rows of the 41-key keyboard. Following are their functions when they are in the primary plane:

- The white key with “CTRL” printed above it is the control key ([CTRL]) which, in combination with other keys, does control functions.
- The white key with “%” printed above it is the percent key ([%]), which types a percent sign.
- The white key with “$” printed above it is the dollar key ([$]), which types a dollar sign.
- The white key with “:” printed above it is the colon key ([:]), which types a colon.
- The blue key ([BLUE]) places the keyboard into blue shift mode.
- The gold key ([GOLD]) places the keyboard into gold shift mode.

The following chart lists keys and their colors.

Key	Color	Letters
[SCAN]	Brown	None
[ENT]	Green	Black
[.]	White	Black
[–]	White	Black
[0] – [9]	White	Black
[←]	White	Black
[SHFT]	Green	Black
[F1] – [F12]	White	Black
[SP]	White	Black
I/O	White	Black

Overlays

The 51-key and 41-key keyboards have overlays designed for VT220 terminal emulation. Type the characters and do the operations printed on the overlay when the keyboard is in blue shift mode ([BLUE]), gold shift mode ([GOLD]), or green shift mode ([SHFT]).

Note that on the 51-key and 41-key keyboards, [BLUE] is to the left and [GOLD] is to the right on the keyboards (Figure 6-1 and Figure 6-2). Characters printed on the overlay have the same relative relationship; the character or operation above a key and to the left (blue lettering) indicates blue shift mode, and the character or operation above a key and to the right (gold lettering) indicates gold shift mode. An annunciator in the display shows the current mode. Characters and operations printed in green on the overlay indicate green shift ([SHFT]) mode.

Main Keypad

The 51-key and 41-key keyboards have standard keys and function keys. Standard keys type letters, numbers, and symbols. Function keys do special operations.

Letters - 51-Key Keyboard

Table 6-1 shows how to type letters on the 51-key keyboard. To put the keyboard into shift lock (caps lock) mode, press [BLUE]+[SHFT]. The keyboard stays in shift lock mode until you press [BLUE]+[SHFT] again to unlock it.

Table 6-1
PEN*KEY 6400 Letters, 51-Key Keyboard

To Type	Press
a–y	A–Y
z	[BLUE]+[SP]
A–Y	[SHFT]+[A] – [SHFT]+[Y]
Z	[SHFT]+[BLUE]+[SP]

Letters - 41-Key Keyboard

You can use one of two methods to type letters on the 41-key keyboard: standard mode or alpha lock mode. When engaged, alpha lock mode switches the alphabetic keys with the function keys. That is, it moves lowercase alphabetic keys from their standard [BLUE] plane to the primary plane. It moves uppercase alphabetic keys from their standard [SHFT]+[BLUE] plane to the [SHFT] plane. Alpha lock provides a faster way to type a series of letters because it reduces the number of key presses.

" **NOTE:** *Alpha lock mode moves only lowercase alphabetic keys to the primary plane.*

Table 6-2 describes how to type letters on the 41-key keyboard in standard mode and alpha lock mode. To engage alpha lock mode press [BLUE]+[GOLD]. Then, to type a series of letters, press the correct key combinations in the table. The keyboard stays in alpha lock mode until you press [BLUE]+[GOLD] again to unlock it.

Table 6-2
PEN*KEY 6400 Letters, 41-Key Keyboard

To Type	Standard Mode	Alpha Lock Mode
a–i	[BLUE]+[1] – [BLUE]+[9]	[1] – [9]
j	[BLUE]+[0]	[0]
k–v	[BLUE]+[F1] – [BLUE]+[F12]	[F1] – [F12]
w	[BLUE]+[CTRL]	[CTRL]
x	[BLUE]+[%]	[%]
y	[BLUE]+[$]	[$]
z	[BLUE]+[:]	[:]
A–I	[SHFT]+[BLUE]+[1] – [SHFT]+[BLUE]+[9]	[SHFT]+[1] – [SHFT]+[9]
J	[SHFT]+[BLUE]+[0]	[SHFT]+[0]
K–V	[SHFT]+[BLUE]+[F1] – [SHFT]+[BLUE]+[F12]	[SHFT]+[F1] – [SHFT]+[F12]
W	[SHFT]+[BLUE]+[CTRL]	[SHFT]+[CTRL]
X	[SHFT]+[BLUE]+[%]	[SHFT]+[%]
Y	[SHFT]+[BLUE]+[$]	[SHFT]+[$]
Z	[SHFT]+[BLUE]+[:]	[SHFT]+[:]

Numbers and Symbols

Table 6-3 describes how to type numbers and symbols on the 51-key and 41-key keyboards.

Table 6-3
PEN*KEY 6400 Numbers and Symbols

To Type	51-Key Keyboard	41-Key Keyboard
[0] – [9]	[0] – [9]	[0] – [9]
– (hyphen)	[–]	[–]
# (pound)	[GOLD]+[←]	[GOLD]+[←]
* (asterisk)	[GOLD]+[A]	[GOLD]+[F1]
/ (forward slash)	[GOLD]+[B]	[GOLD]+[F2]
\ (backslash)	[GOLD]+[C]	[GOLD]+[F3]
| (vertical bar)	[GOLD]+[D]	[GOLD]+[F4]
@ (at)	[GOLD]+[E]	[GOLD]+[F8]
((left parenthesis)	[GOLD]+[F]	[GOLD]+[F5]
[(left bracket)	[GOLD]+[G]	[BLUE]+[.]
{ (left brace)	[GOLD]+[H]	[GOLD]+[F6]
< (less than)	[GOLD]+[I]	[GOLD]+[F7]
+ (plus)	[GOLD]+[J]	[GOLD]+[F12]
) (right parenthesis)	[GOLD]+[K]	[GOLD]+[F9]
] (right bracket)	[GOLD]+[L]	[GOLD]+[.]
} (right brace)	[GOLD]+[M]	[GOLD]+[F10]
> (greater than)	[GOLD]+[N]	[GOLD]+[F11]
$ (dollar)	[GOLD]+[O]	[$]
% (percent)	[GOLD]+[Q]	[%]
& (ampersand)	[GOLD]+[R]	Not applicable
; (semicolon)	[GOLD]+[S]	[GOLD]+[CTRL]
, (comma)	[GOLD]+[T]	[GOLD]+[$]
? (question mark)	[GOLD]+[U]	[BLUE]+[–]

Table 6-3 (Continued)
PEN*KEY 6400 Numbers and Symbols

To Type	51-Key Keyboard	41-Key Keyboard
' (single quote)	[GOLD]+[V]	[GOLD]+[SP]
^ (circumflex)	[GOLD]+[2]	Not applicable
! (exclamation)	[GOLD]+[X]	Not applicable
‘ (grave accent)	[GOLD]+[Y]	Not applicable
: (colon)	[BLUE]+[U]	[:]
_ (underscore)	[BLUE]+[V]	[BLUE]+[SP]
" (double quote)	[BLUE]+[W]	[GOLD]+[–]
= (equal)	[BLUE]+[X]	[GOLD]+[%]
~ (tilde)	[BLUE]+[Y]	[GOLD]+[:]

Special Function Keys

Table 6-4 describes how to use the 51- and 41-key keyboards to do special VT220 terminal function operations. Note that the keyboards do not support key operation COMPOSE CHARACTER, which creates characters that do not exist as standard keys on the VT220 keyboard.

Operation of the delete key depends on how the PROTOCOL OPTS parameter is set in the firmware. The key either sends a delete (DEL, 7F hexadecimal) or a backspace (BS, 08 hexadecimal).

To change from delete mode to backspace mode, open the firmware by pressing [GOLD]+[BLUE]. Select the following options in this order: SET-UP PARMS, PROTOCOL OPTS, VT220, DEL TO BS.

Table 6-4
PEN*KEY 6400 Special Function Keys

To Do Operation	Press
Delete	[BLUE]+[←]
Delete or Backspace	[←]
Forward Tab	[GOLD]+[3]
Return	[ENT]
Ctrl	[CTRL]
Shift	[SHFT]
Lock (sets and clears SHIFT LOCK mode)	[BLUE]+[SHFT]
Space bar	[SP]
Compose character	Not supported

Editing Keypad

The VT220 terminal's editing keypad has editing keys and cursor control (arrow) keys. Editing keys have functions assigned to them by the application software in use. Refer to your application's software manual for the uses of the editing keypad keys. The cursor control keys in blue shift or green shift mode allow you to scroll through the PEN*KEY computer's local display memory.

Editing Keys

Table 6-5 describes how to do VT220 terminal editing operations on the 51-key and 41-key keyboards.

Table 6-5
PEN*KEY 6400 Editing Keys

To Do Editing Operation	Press
Find	[GOLD]+[4]
Insert here	[GOLD]+[5]
Remove	[GOLD]+[6]
Select	[GOLD]+[7]
Prev screen	[GOLD]+[8]
Next screen	[GOLD]+[9]

Cursor Control Keys

The following chart describes how to do VT220 terminal cursor control operations on the 51-key and 41-key keyboards.

To Do Cursor Key	Press 6400 Key
↑	[**Y**]
↓	[**B**]
←	[**A**]
→	[**"**]

In addition to sending VT220 cursor control sequences, the arrow keys at the tops of the keyboards allow you to move the cursor through the PEN*KEY computer's display. The keys operate in a local windowing mode, which is enabled with the blue shift or gold shift key. This mode provides a "window" into the VT220's screen and allows you to move the PEN*KEY computer's display window (Figure 6-3). Each key moves the window in the direction indicated by the arrow.

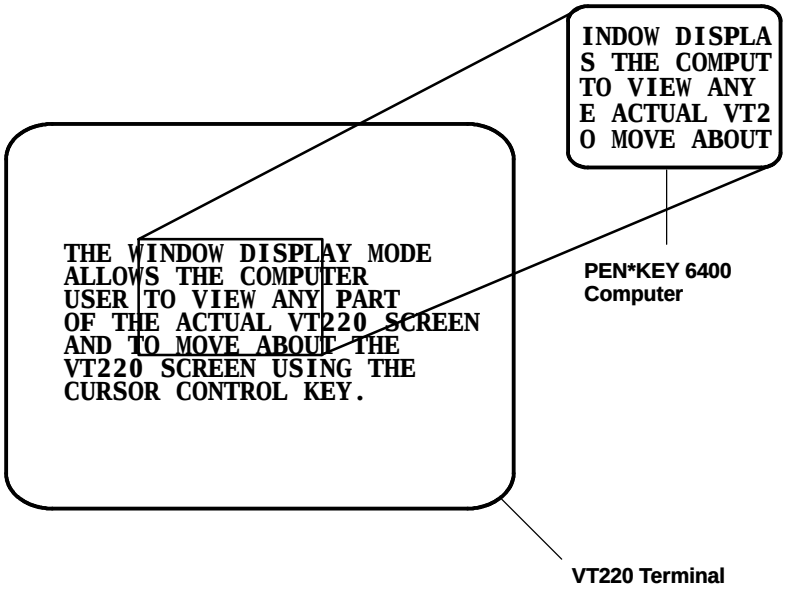


Figure 6-3
PEN*KEY 6400 Windowing Mode

If you try to move the cursor off the display in any direction, the window shifts one or eight lines or columns in the direction of the cursor movement. This lets you move the viewing window around within the larger VT220 terminal screen. The display does not wrap when the window reaches the top or side boundaries of the virtual VT220 screen. A beep tone sounds when you try to move the window beyond a top, bottom, left, or right boundary.

Use the arrow keys in combination with [GOLD] and [BLUE] to move through the PEN*KEY computer's display a single space at a time or eight spaces at a time. The following chart shows key movements.

To Move	Press
One space right	[GOLD]+[**"**]
One space left	[GOLD]+[**A**]
One space up	[GOLD]+[**Y**]
One space down	[GOLD]+[**B**]
Eight spaces right	[BLUE]+[**"**]
Eight spaces left	[BLUE]+[**A**]
Eight spaces up	[BLUE]+[**Y**]
Eight spaces down	[BLUE]+[**B**]

Auxiliary Keypad

The VT220 terminal's auxiliary keypad consists of numeric keys (which enter numeric data) and programmable function (PF) keys. The PF keys have operations assigned to them by the application software in use. Refer to your application's software manual for the programmed uses of the PF keys.

Table 6-6 describes how to use the PEN*KEY computer to do auxiliary keypad operations.

Table 6-6
PEN*KEY 6400 Auxiliary Keypad

For Auxiliary Operation	51-Key Keyboard	41-Key Keyboard
0–9	[GOLD]+[0]+[1] – [GOLD]+[0]+[9]	[GOLD]+[0]+[1] – [GOLD]+[0]+[9]
– (hyphen)	[GOLD]+[0]+[–]	[GOLD]+[0]+[–]

Table 6-6 (Continued)
PEN*KEY 6400 Auxiliary Keypad

For Auxiliary Operation	51-Key Keyboard	41-Key Keyboard
, (comma)	[GOLD]+[0]+ [GOLD]+[T]	[GOLD]+[0]+ [GOLD]+[$]
. (period)	[GOLD]+[0]+[.]	[GOLD]+[0]+[.]
Enter	[GOLD]+[0]+[ENT]	[GOLD]+[0]+[ENT]
PF1–PF4	[BLUE]+[A] – [BLUE]+[D]	[F1] – [F4]

Top-Row Function Keys

On the VT220 terminal's keyboard, function keys [F1] through [F5] are used for hold screen, print screen, set-up, data/talk, and break. The PEN*KEY computer supports only the break function, which is [F5] on the PEN*KEY computer's keyboard.

Function keys [F6] through [F20] are user-defined keys (UDKs) that have operations assigned to them by the application software in use. Refer to your application's software manual for their uses.

51-Key Keyboard

Table 6-7 describes how to do function operations on the 51-key keyboard.

Table 6-7
PEN*KEY 6400 Top-Row Function Keys, 51-Key Keyboard

To Do Function	Press
F5–F20	[BLUE]+[E] – [BLUE]+[T]

41-Key Keyboard

When alpha lock mode is engaged on the 41-key keyboard, it switches the function keys with the alphabetic keys. That is, function keys normally in the primary plane ([F1] through [F12]) move to the [BLUE] plane. Function keys normally in the [SHFT] plane ([F13] through [F20]) move to the [SHFT]+[BLUE] plane.

Table 6-8 describes how to do function operations when the 41-key keyboard is in standard mode or alpha lock mode. To engage alpha lock mode press [BLUE]+[GOLD]. Then press the correct key combinations in the table. The keyboard stays in alpha lock mode until you press [BLUE]+[GOLD] again to unlock it.

Table 6-8
PEN*KEY 6400 Top-Row Function Keys, 41-Key Keyboard

To Do Function	Standard Mode	Alpha Lock Mode
F5–F12	[F5] – [F12]	[BLUE]+[F5] – [BLUE]+[F12]
F13–F20	[SHFT]+[F1] – [SHFT]+[F8]	[SHFT]+[BLUE]+[F1] – [SHFT]+[BLUE]+[F8]

Control Keys

Both keyboards have control key combinations. The control key is the white key with "CTRL" printed above it.

51-Key Keyboard

Table 6-9 lists some combinations on the 51-key keyboard.

Table 6-9
PEN*KEY 6400 Control Keys (51-Key Keyboard)

To Do Action	Press
ESC (escape)	[CTRL]+[3]
FS (file separator)	[CTRL]+[4]
GS (group separator)	[CTRL]+[5]
RS (record separator)	[CTRL]+[6]
US (unit separator)	[CTRL]+[7]
DEL (delete)	[CTRL]+[8]

41-Key Keyboard

To use the control keys on the 41-key keyboard, press the key combinations listed in Table 6-10.

Table 6-10
PEN*KEY 6400 Control Keys (41-Key Keyboard)

To Do	Standard Mode	Alpha Lock Mode
CTRL A– CTRL I	[CTRL]+[BLUE]+[1] – [CTRL]+[BLUE]+[9]	[BLUE]+[CTRL]+[1] – [BLUE]+[CTRL]+[9]
CTRL J– CTRL V	[CTRL]+[BLUE]+[0] – [CTRL]+[BLUE]+[F12]	[BLUE]+[CTRL]+[0] – [BLUE]+[CTRL]+[F12]
CTRL W	[CTRL]+[BLUE]+[CTRL]	[BLUE]+[CTRL]+[CTRL]
CTRL X	[CTRL]+[BLUE]+[%]	[BLUE]+[CTRL]+[%]
CTRL Y	[CTRL]+[BLUE]+[$]	[BLUE]+[CTRL]+[$]
CTRL Z	[CTRL]+[BLUE]+[:]	[BLUE]+[CTRL]+[:]

Transmission Mode

Use the transmission mode (labeled “mode” on the overlay) to put the PEN*KEY computer into line edit (block) mode or character mode. To alternate between modes, press [GOLD]+[1] on both keyboards.

When “lock mode” is disabled through the firmware menus, you can press the mode key to toggle between line edit mode and character mode. When lock mode is enabled, you cannot toggle between line edit (block) mode and character mode. The default setting is “disabled.”

The modes are described on pages 8-55 and 8-56 in Section 8, “Programming.”

Local Edit Mode

If your application software program supports local editing you can use the PEN*KEY computer in local edit mode, which is a feature of the VT330/VT340 terminal. Local edit mode is described on page 8-62 in Section 8.

Backlight

Use the backlight to read the PEN*KEY computer's display in dim light. To turn the light on, press [SHFT]+[**Y**]. To turn it off, press [SHFT]+[**Y**] again.

You can use the firmware's setup menus to set the length of time the backlight stays on before the PEN*KEY computer's backlight "goes to sleep" to conserve power. Refer to the PEN*KEY computer's user's guide for more information about backlighting.

" **NOTE:** *The longer the backlight stays on, the sooner the battery will need to be recharged.*

Section 7

PEN*KEY[R] 6500 Computer

VT220/ANSI Display Emulation

The PEN*KEY 6500 Computer's liquid crystal display (LCD) shows PEN*KEY computer and VT220 prompts, and information you type. Because the VT220 terminal's screen is 80 columns by 24 lines, the PEN*KEY computer represents a part of the information on the larger VT220 screen.

" **NOTE:** *PEN*KEY computers in the PEN*KEY 6500 Series have WLIF radios only.*

Host View Size

The host view size is 24 characters high by 80 characters wide.

Screen Size

You can select the number of display lines and characters per line. The options are 20, 40, or 80 characters per line by 8, 10, 12, 16, 21, or 25 lines. The default is 12 lines and 40 characters. To change the screen size open the firmware and select the following options in this order: LCD PARMS, SCREEN SIZE.

Screen Modes

The PEN*KEY computer has these screen modes: center cursor, corner, page, lazy, screen lock, and locked. The modes present a window onto a standard VT220 terminal's 80-character by 24-line display buffer. You can set the type of screen mode through the PEN*KEY computer's firmware menus.

The screen modes govern which portion of the larger VT220 terminal's screen the PEN*KEY computer first presents and how the window moves as the cursor moves.

Center Cursor Mode

Center cursor mode works best for applications that use the entire VT220 data stream's 80-character by 24-line logical display. In this mode, the cursor remains in the center of the PEN*KEY computer's window.

As the cursor moves within the window, the PEN*KEY computer's display window moves to keep it centered. When the cursor moves off the right, left, top, or bottom edge of the larger 80x24 display, the window remains fixed despite the cursor's movement.

Corner Mode

Corner mode begins with the window in the upper left corner of the larger VT220 terminal. It keeps the cursor in the lower right corner of the display. Corner mode works best for applications that use the upper left corner of the logical screen.

As the cursor moves off the right or bottom edge of the PEN*KEY computer's display, the window moves to show the cursor. When you use corner mode with the gold-colored key, you can move the cursor a predetermined number of key presses in all four directions.

Page Mode

Page mode provides predefined pages within the larger VT220 terminal. The size of these pages depends on the number of rows and columns selected for display. The PEN*KEY computer moves the window by a multiple of the page size. As the cursor moves off the edge of the PEN*KEY computer's display, the window changes to the next page.

Lazy Mode

Lazy mode starts the cursor in the upper left corner of the display. The cursor moves across the display in the scrolled direction. When the cursor goes beyond the edge of the display, the data begins to move in the scrolled direction and the cursor remains at the edge of the display. When you try to go beyond an outside boundary, an error tone sounds.

Screen Lock Mode

Screen lock mode allows a specified screen size to be set up and locked. Only the commands issued to the selected screen size are operated on. For example, if the host sends characters to the display, and the number of characters to display is greater than the number of columns specified, the last column(s) on the screen are overwritten.

Locked Mode

If locked mode is selected through the firmware menus, the view window is locked to the upper left-hand corner of the display. The screen does not window around, and only the area that has been selected to be the screen size is visible. Locked mode disables the windowing keys, or only allows you to window around the physical display size selected through the firmware menus.

Display Annunciators

Annunciators show the PEN*KEY computer's current status or operation in progress. The following annunciators can appear.

▲ The PEN*KEY computer is in **shift mode**. The key you press while the computer is in this mode types letters in uppercase.

◄ The PEN*KEY computer is in **gold shift (Alt) mode**. The key you press while the computer is in this mode does the operation printed in gold on the keyboard.

► The PEN*KEY computer is in **blue shift (Ctrl) mode**. The key you press while the computer is in this mode does the operation printed in blue on the keyboard, or sends a control character.

K The PEN*KEY computer is in **keypad mode**.

X **Keyboard action mode (KAM)** has been set. The PEN*KEY computer ignores all keystrokes that send characters to the host. This state stays on until KAM has been reset.

NL The PEN*KEY computer is in **green shift (number lock) mode**. The key you press while the computer is in this mode types the number or character printed in green on the keyboard.

▲ **CL** The PEN*KEY computer is in **caps (shift) lock**. The key you press while the computer is in this mode types letters in uppercase.

B The PEN*KEY computer is in **line edit (block) mode**. The computer is sending, to the host computer, cumulative data when you press a terminating key.

C The PEN*KEY computer is in **character mode**. The computer is sending, to the host computer, each key as you press it.

e The PEN*KEY computer is in **local edit mode**, which is a feature of the VT330/VT340 terminal.

Keyboard

The PEN*KEY computer has an 81-key external keyboard with keys defined to emulate VT220 terminal operation (Figure 7-1). Note that these keys are not operational: Fn, Setup, SysReq, Pause, Home, End, Ins, ScrLk, PgDn, and PgUp.

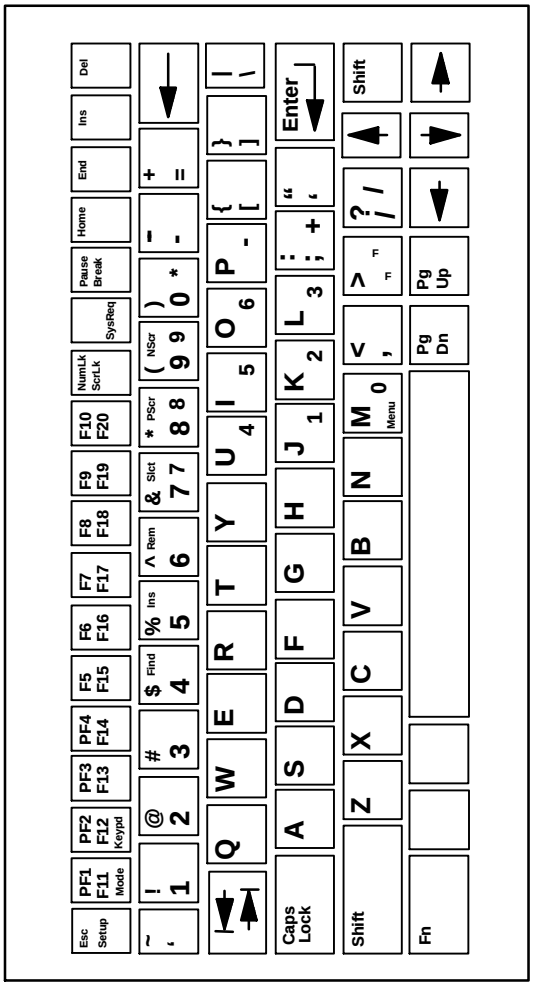


Figure 7-1
PEN*KEY 6500 Keyboard

Shifted Planes

Use the shift keys to type uppercase letters and special characters, and to do special operations. Shift keys are described in the following chart.

Shift Key	Description
[Shift]	Press [Shift] plus a letter to type the letter in uppercase.
[Blue]	The blue-colored (Ctrl) key puts the keyboard into blue shift [Blue] mode. Press [Blue] plus a keyboard key to do an operation printed in blue, or to send a control character.
[Gold]	The gold-colored (Alt) key puts the keyboard into gold shift [Gold] mode. Press [Gold] plus a keyboard key to do an operation printed in gold.
[NumLk]	The green-colored (number lock) key puts the keyboard into [NumLk] mode. Press [NumLk] plus a keyboard key to type a number or character printed in green.

Special characters and functions are color-coded to correspond with the shift keys. For example:

- Press [Blue]+[F1] to do the [F11] function (printed in blue on the key).
- Press [Gold]+[F1] to do the [Mode] function (printed in gold on the key).

When you press [Shift], [Blue], [Gold], or [NumLk], an annunciator in the display indicates the current shift mode.

Main Keypad

A VT220 terminal's main keypad has standard keys and function keys. Standard keys type letters, numbers, and symbols. Function keys do special operations.

Standard Keys

Table 7-1 describes how to use the PEN*KEY computer to type letters, numbers, and symbols.

Table 7-1
PEN*KEY 6500 Standard Keys

To Type	Press
a–z	[A] – [Z]
A–Z	[A] – [Z] or [Shift]+[A] – [Shift]+[Z]
0–9	[0] – [9] or [Shift]+[0] – [Shift]+[9]
~ (tilde)	[Shift]+[‘]
! (exclamation mark)	[Shift]+[1]
@ (at)	[Shift]+[2]
# (pound)	[Shift]+[3]
$ (dollar)	[Shift]+[4]
% (percent)	[Shift]+[5]
^ (circumflex)	[Shift]+[6]
& (ampersand)	[Shift]+[7]
* (asterisk)	[Shift]+[8]
((left parenthesis)	[Shift]+[9]
) (right parenthesis)	[Shift]+[0]
– (hyphen)	[–]
+ (plus)	[Shift]+[=]

Table 7-1 (Continued)
PEN*KEY 6500 Standard Keys

To Type	Press
{ (left brace)	[Shift]+[key
} (right brace)	[Shift]+] key
| (vertical bar)	[Shift]+[\]
: (colon)	[Shift]+[;]
" (double quote)	[Shift]+[']
< (less than)	[Shift]+[,]
> (greater than)	[Shift]+[.]
? (question mark)	[Shift]+[/]
[(left bracket)	[key
] (right bracket)	] key
\ (backslash)	[\]
; (semicolon)	[;]
' (single quote)	[']
, (comma)	[,]
. (period)	[.]
/ (forward slash)	[/]
_ (underscore)	[Shift]+[–]
= (equal)	[=]
` (grave accent)	[`]

Special Function Keys

Table 7-2 describes how to use the PEN*KEY computer to do special VT220 terminal function operations. Note that the PEN*KEY computer does not support key operation COMPOSE CHARACTER, which creates characters that do not exist as standard keys on the VT220 keyboard.

Operation of the delete key [◄—] depends on how the PROTOCOL OPTS parameter is set in the PEN*KEY computer's firmware. The key either sends a delete (DEL, 7F hexadecimal) or a backspace (BS, 08 hexadecimal).

To change from delete mode to backspace mode, open the firmware by pressing [Gold]+[M]. Then select the following options in this order: SET-UP PARMS (password: CR52401), PROTOCOL OPTS, VT220, DEL TO BS.

Table 7-2
PEN*KEY 6500 Special Function Keys

To Do Operation	Press
Delete	◄—
Forward Tab	→|
Reverse Tab	|◄
Return	[Enter]
Ctrl	[Blue]
Lock	[Caps Lock]
Shift (uppercase characters)	[Shift]
Space bar	[Space bar]
Compose character	Not supported

Editing Keypad

The VT220 terminal's editing keypad has editing keys and cursor control keys. Editing keys have functions assigned to them by the application software in use. Refer to your application's software manual for the uses of the editing keys. You can use the arrow keys to move the cursor and page through the PEN*KEY computer's display.

Editing Keys

Table 7-3 describes how to use the PEN*KEY computer to do VT220 terminal editing operations.

Table 7-3
PEN*KEY 6500 Editing Keys

To Do Editing Operation	Press
Find	[Gold]+[4]
Insert here	[Gold]+[5]
Remove	[Gold]+[6]
Select	[Gold]+[7]
Prev screen	[Gold]+[8]
Next screen	[Gold]+[9]

Cursor Control Keys

Use the four cursor control keys (arrows) in the lower right corner of the keyboard to move the cursor and page through the PEN*KEY computer's display. The keys operate in a local windowing mode, which is always enabled. The mode provides a "window" into the VT220's screen and allows you to move the PEN*KEY computer's display window (Figure 7-2). Each key moves the window in the direction indicated by the arrow.

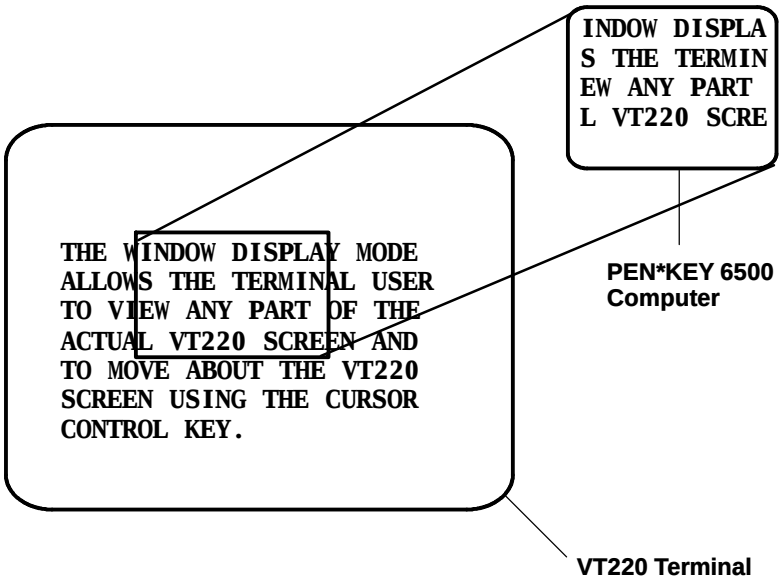


Figure 7-2
PEN*KEY 6500 Windowing Mode

If you try to move the cursor off the display in any direction, the window shifts one or eight lines or columns in the direction of the cursor movement. This lets you move the viewing window around within the larger VT220's screen. The display does not wrap around when the window reaches the top or side boundaries of the virtual VT220 screen. A beep error tone sounds when you try to move the window beyond the top, bottom, left, or right boundary.

The following chart shows how to use the arrow keys in combination with [Blue] and [Gold] to move through the PEN*KEY computer's display.

To Move	Press
One position right	[Blue]+→
One position left	[Blue]+←
One position up	[Blue]+↑
One position down	[Blue]+↓
Eight positions right	[Gold]+→
Eight positions left	[Gold]+←
Eight positions up	[Gold]+↑
Eight positions down	[Gold]+↓

Auxiliary Keypad

The VT220 terminal's auxiliary keypad consists of numeric keys (which enter numeric data) and programmable function (PF) keys. The PF keys have operations assigned to them by the application software in use. Refer to your application's software manual for the uses of the PF keys.

Table 7-4 describes how to use the PEN*KEY computer to do VT220 terminal auxiliary keypad operations.

Table 7-4
PEN*KEY 6500 Auxiliary Keypad

For Auxiliary Operation	Press
0–9	[Gold]+[PF2]+[0] – [Gold]+[PF2]+[9]
– (hyphen)	[Gold]+[PF2]+[–]
, (comma)	[Gold]+[PF2]+[M]
. (period)	[Gold]+[PF2]+[.]
Enter	[Gold]+[PF2]+[ENTER]
PF1–PF4	[PF1] – [PF4]

Top-Row Function Keys

On the VT220 terminal's keyboard, function keys [F1] through [F5] are used for hold screen, print screen, set-up, data/talk, and break. The PEN*KEY computer supports only the break function, which is [Break] on the PEN*KEY computer's keyboard.

Function keys [F6] through [F20] are user-defined keys (UDKs) that have operations assigned to them by the application software in use. Refer to your application's software manual for their programmed uses.

Table 7-5 shows how to perform function operations.

Table 7-5
PEN*KEY 6500 Top-Row Function Keys

To Do Function	Press
F5–F10	[F5] – [F10]
F11–F14	[Blue]+[PF1] – [Blue]+[PF4]
F15–F20	[Blue]+[F5] – [Blue]+[F10]

Control Keys

Table 7-6 lists some control key combinations. On the PEN*KEY computer, the control key is [Blue].

Table 7-6
PEN*KEY 6500 Control Keys

Code Name	Keys	Action
SOH	[Blue]+[A]	Start of heading
STX	[Blue]+[B]	Start of text
ETX	[Blue]+[C]	Interrupt program
EOT	[Blue]+[D]	End of transmission
ENQ	[Blue]+[E]	Enquiry

Table 7-6 (Continued)
PEN*KEY 6500 Control Keys

Code Name	Keys	Action
ACK	[Blue]+[F]	Acknowledge
BEL	[Blue]+[G]	Sound beeper
BS	[Blue]+[H]	Same as Backspace key
HT	[Blue]+[I]	Same as Tab key
LF	[Blue]+[J]	Same as Line Feed key
VT	[Blue]+[K]	Vertical tab
FF	[Blue]+[L]	Top of page (on printer)
CR	[Blue]+[M]	Same as Return key
SO	[Blue]+[N]	Change typeface
SI	[Blue]+[O]	Undo effect of CTRL N
DLE	[Blue]+[P]	Data link escape
DC1, X-ON	[Blue]+[Q]	Undo effect of CTRL S
DC2	[Blue]+[R]	Device control 2
DC3, X-OFF	[Blue]+[S]	Make computer stop typing
DC4	[Blue]+[T]	Device control 4
NAK	[Blue]+[U]	Negative acknowledgment
SYN	[Blue]+[V]	Synchronous table
ETB	[Blue]+[W]	End transmission block
CAN	[Blue]+[X]	Cancel
EM	[Blue]+[Y]	End of medium
SUB	[Blue]+[Z]	End of file mark
ESC	[ESC]	Escape
FS	[Blue]+[1]	File separator
GS	[Blue]+[2]	Group separator
RS	[Blue]+[3]	Record separator
US	[Blue]+[4]	Unit separator
DEL	[Del]	Delete

Transmission Mode

Use the transmission mode (labeled “Mode” on the keyboard) to put the PEN*KEY computer into line edit (block) mode or character mode. To alternate between modes, press [Gold]+[PF1]. The modes are described on pages 8-55 and 8-56 in Section 8, “Programming.”

When “lock mode” is disabled through the firmware menus, you can press the mode key to toggle between line edit mode and character mode. When lock mode is enabled, you cannot toggle between line edit (block) mode and character mode. The default setting is “disabled.”

Local Edit Mode

If your application software program supports local editing you can use the PEN*KEY computer in local edit mode, which is a feature of the VT330/VT340 terminal. Local edit mode is described on page 8-62 in Section 8.

Section 8

Programming

Overview

This section describes programming for the wireless stations. This section contains the following information:

- Received codes that the wireless stations support. Received codes include C0 and C1 control characters, character sets, and terminal modes.
- The transmitted codes generated by the wireless stations' keys and sent to the host computer.
- The capability of the wireless stations to emulate VT220 terminal top-row function, main keypad, editing, and auxiliary keys.
- VT330/VT340 terminal applications supported by the wireless stations. Applications include working in local editing and interactive modes, and creating text forms.

Character Encoding

The implementation of VT220/ANSI terminal emulation supports both 7-bit and 8-bit communications environments. The implementation consists of an 8-bit asynchronous character encoding scheme and a 7-bit code extension technique so that the wireless station is compatible with ANSI and ISO standards. All 8-bit codes can be referenced by using two-byte ESCape sequences in accordance with ANSI standard X3.41 –– 1974.

The document commonly referred to when ANSI is mentioned is ANSI X3.64 –– 1979, *Additional Controls for Use With American National Standard for Information Interchange*. The ANSI X3.64 standard controls character imaging devices like the VT220. ANSI and ISO determine the current standards for character encoding in the communications industry.

Character Sets

The wireless station processes most characters it receives from the host computer based on characters whose codes and functions are defined and standardized by ANSI. The types are 7-bit and 8-bit character codes.

Multinational Character Set

The DEC multinational character set consists of C0, GL, C1, and GR codes.

C0 and GL Codes

The left half of the multinational character set consists of control characters (C0 codes) and graphic characters (GL codes). Control characters are 7-bit compatible, nondisplayable single-byte characters that perform specific functions during communications and text processing. C0 codes range from 00 to 1F hexadecimal, and include 7F hexadecimal (DEL). They can be used in a 7-bit or an 8-bit environment.

Graphic characters are 7-bit compatible, displayable characters that represent various alphanumeric characters, punctuation marks, and symbols that appear in the wireless station's display. GL codes range from 21 to 7E hexadecimal. They can be used in a 7-bit or an 8-bit environment. The space character (20 hexadecimal) may be a graphic character or a control character, depending on the context.

Table 8-1 shows the C0 and and GL codes recognized by the wireless station. Ignored codes are parsed (removed) from the data stream with no action taken by the wireless station. Codes that the wireless station ignores are also indicated in the table. Table 8-2 describes the action taken by the wireless station when it receives a C0 code.

Table 8-1
C0 Control and Graphic Characters

row	column	0		1		2		3		4		5		6		7	
	b8 bits b7 b6 b5 b4 b3 b2 b1	0 0 0 0		0 0 0 1		0 0 1 0		0 0 1 1		0 1 0 0		0 1 0 1		0 1 1 0		0 1 1 1	
0	0 0 0 0	NUL	0 00	DLE	16 10	SP	32 20	0	48 30	@	64 40	P	80 50	‘	96 60	p	112 70
1	0 0 0 1	SOH	1 01	DC1 (XON)	17 11	!	33 21	1	49 31	A	65 41	Q	81 51	a	97 61	q	113 71
2	0 0 1 0	STX	2 02	DC2	18 12	I	34 22	2	50 32	B	66 42	R	82 52	b	98 62	r	114 72
3	0 0 1 1	ETX	3 03	DC3 (XOFF)	19 13	#	35 23	3	51 33	C	67 43	S	83 53	c	99 63	s	115 73
4	0 1 0 0	EOT	4 04	DC4	20 14	$	36 24	4	52 34	D	68 44	T	84 54	d	100 64	t	116 74
5	0 1 0 1	ENQ	5 05	NAK	21 15	%	37 25	5	53 35	E	69 45	U	85 55	e	101 65	u	117 75
6	0 1 1 0	ACK	6 06	SYN	22 16	&	38 26	6	54 36	F	70 46	V	86 56	f	102 66	v	118 76
7	0 1 1 1	BEL	7 07	ETB	23 17	’	39 27	7	55 37	G	71 47	W	87 57	g	103 67	w	119 77
8	1 0 0 0	BS	8 08	CAN	24 18	(	40 28	8	56 38	H	72 48	X	88 58	h	104 68	x	120 78
9	1 0 0 1	HT	9 09	EM	25 19	)	41 29	9	57 39	I	73 49	Y	89 59	i	105 69	y	121 79
A	1 0 1 0	LF	10 0A	SUB	26 1A	*	42 2A	:	58 3A	J	74 4A	Z	90 5A	j	106 6A	z	122 7A
B	1 0 1 1	VT	11 0B	ESC	27 1B	+	43 2B	;	59 3B	K	75 4B	[	91 5B	k	107 6B	{	123 7B
C	1 1 0 0	FF	12 0C	FS	28 1C	,	44 2C	<	60 3C	L	76 4C	\	92 5C	l	108 6C	|	124 7C
D	1 1 0 1	CR	13 0D	GS	29 1D	-	45 2D	=	61 3D	M	77 4D	]	93 5D	m	109 6D	}	125 7D
E	1 1 1 0	SO	14 0E	RS	30 1E	.	46 2E	>	62 3E	N	78 4E	^	94 5E	n	110 6E	~	126 7E
F	1 1 1 1	SI	15 0F	US	31 1F	/	47 2F	?	63 3F	O	79 4F	_	95 5F	o	111 6F	DEL	127 7F

C0 Codes — **GL Codes (ASCII Graphics Character Set)**

Legend:

ENQ	5 05	decimal hexadecimal **code recognized by the wireless station**
NUL	0 00	decimal hexadecimal **code ignored by the wireless station**

Table 8-2
C0 Control Characters and Wireless Station Action

Mnemonic	Hex	Name	Wireless Station Action
NUL	00	Null	Ignores this code.
SOH	01	Start of heading	Ignores this code.
STX	02	Start of text	Ignores this code.
ETX	03	End of text	Ignores this code.
EOT	04	End of transmission	Ignores this code.
ENQ	05	Enquiry	Generates an answerback message. You set the number of characters in the message (0–30) through the wireless station's firmware.
ACK	06	Acknowledge	Ignores this code.
BEL	07	Bell	Generates bell tone if bell is enabled.
BS	08	Backspace	Moves cursor one column to the left. If cursor is in Column 1, takes no action.
HT	09	Horizontal tab	Moves cursor to predetermined tab stop. Moves cursor to right margin if there are no tab stops.
LF	0A	Line feed	Causes a line feed or new line operation, depending on how the LNM received code is set.
VT	0B	Vertical tab	Processes as LF (line feed).
FF	0C	Form feed	Processes as LF (line feed).
CR	0D	Carriage return	Moves cursor to Column 1 of the current row.
SO (LS1)	0E	Shift out (Lock shift G1)	Invokes G1 character set into GL.
SI (LS0)	0F	Shift in (Lock shift G0)	Invokes G0 character set into GL.
DLE	10	Data link escape	Ignores this code.

Table 8-2 (Continued)
C0 Control Characters and Wireless Station Action

Mnemonic	Hex	Name	Wireless Station Action
DC1 (XON)	11	Device control 1	Clears DC3 if XOFF support is enabled, which causes the wireless station to continue sending characters (keyboard unlocks).
DC2	12	Device control 2	Ignores this code.
DC3 (XOFF)	13	Device control 3	If XOFF support is enabled, causes the wireless station to stop sending characters until it receives a DC1 control character.
DC4	14	Device control 4	Ignores this code.
NAK	15	Negative acknowledgment	Ignores this code.
SYN	16	Synchronous table	Ignores this code.
ETB	17	End transmission block	Ignores this code.
CAN	18	Cancel	Terminates and cancels any sequence in progress.
EM	19	End of medium	Ignores this code.
SUB	1A	Substitute	Terminates and cancels the escape or control sequence, or terminates the device control string and displays reverse question mark.
ESC	1B	Escape	Processes as escape sequence introducer. Terminates any escape, control, or device control sequence in process.
FS	1C	File separator	Ignores this code.
GS	1D	Group separator	Ignores this code.
RS	1E	Record separator	If guarded area transfer mode (GATM) is reset, the record separator is processed as a protected field entry.
US	1F	Unit separator	Ignores this code.
DEL	7F	Delete	Ignores this code; cannot be used as a fill character.

C1 and GR Codes

The right half of the DEC multinational character set consists of eight-bit control codes (C1 codes) and supplemental graphic characters (GR codes). C1 codes are nondisplayable codes that perform additional functions beyond those possible with the C0 codes. C1 codes range from 80 to 9F hexadecimal.

The supplemental graphic characters set (GR codes) range from A0 hexadecimal to FF hexadecimal. The set has alphabetic characters with accents and diacritical marks that appear in the major Western European alphabets. It also has other symbols not included in the ASCII graphics set.

Table 8-3 shows the C1 control characters and GR codes recognized by the wireless station. Ignored codes are parsed (removed) from the data stream with no action taken by the wireless station. Codes that the wireless station ignores are also indicated in the table. Note that some letters that are normally in uppercase are converted into lowercase. The hexadecimal values for the converted letters are:

C0, C1, C2, C8, CA, CB, CC, CD, CE, CF, D9, DA, and DB. (These values may be supported correctly in later versions.)

Table 8-4 describes the action taken by the wireless station when it receives a C1 control code.

Table 8-3
C1 Control Characters

8		9		10		11		12		13		14		15		column	row
1 0 0 0		1 0 0 1		1 0 1 0		1 0 1 1		1 1 0 0		1 1 0 1		1 1 1 0		1 1 1 1		b8 bits b7 b6 b5 b4 b3 b2 b1	
	128 80	DCS	144 90	NBSP	160 A0	°	176 B0	à	192 C0	Ð	208 D0	à	224 E0	ð	240 F0	0 0 0 0	0
	129 81	PU1	145 91	¡	161 A1	±	177 B1	á	193 C1	Ñ	209 D1	á	225 E1	ñ	241 F1	0 0 0 1	1
	130 82	PU2	146 92	¢	162 A2	²	178 B2	â	194 C2	Ò	210 D2	â	226 E2	ò	242 F2	0 0 1 0	2
	131 83	STS	147 93	£	163 A3	³	179 B3	Ã	195 C3	Ó	211 D3	ã	227 E3	ó	243 F3	0 0 1 1	3
IND	132 84	CCH	148 94	¤	164 A4	‘	180 B4	Ä	196 C4	Ô	212 D4	ä	228 E4	ô	244 F4	0 1 0 0	4
NEL	133 85	MW	149 95	¥	165 A5	µ	181 B5	Å	197 C5	Õ	213 D5	å	229 E5	õ	245 F5	0 1 0 1	5
SSA	134 86	SPA	150 96	¦	166 A6	¶	182 B6	Æ	198 C6	Ö	214 D6	æ	230 E6	ö	246 F6	0 1 1 0	6
ESA	135 87	EPA	151 97	§	167 A7	·	183 B7	Ç	199 C7	X	215 D7	ç	231 E7	÷	247 F7	0 1 1 1	7
HTS	136 88		152 98	¨	168 A8	¸	184 B8	è	200 C8	Ø	216 D8	è	232 E8	ø	248 F8	1 0 0 0	8
HTJ	137 89		153 99	©	169 A9	¹	185 B9	É	201 C9	ù	217 D9	é	233 E9	ù	249 F9	1 0 0 1	9
VTS	138 8A		154 9A	ª	170 AA	º	186 BA	ê	202 CA	ú	218 DA	ê	234 EA	ú	250 FA	1 0 1 0	A
PLD	139 8B	CSI	155 9B	«	171 AB	»	187 BB	ë	203 CB	û	219 DB	ë	235 EB	û	251 FB	1 0 1 1	B
PLU	140 8C	ST	156 9C	¬	172 AC	¼	188 BC	ì	204 CC	Ü	220 DC	ì	236 EC	ü	252 FC	1 1 0 0	C
RI	141 8D	OSC	157 9D	—	173 AD	½	189 BD	í	205 CD	Ý	221 DD	í	237 ED	ý	253 FD	1 1 0 1	D
SS2	142 8E	PM	158 9E	®	174 AE	¾	190 BE	î	206 CE	Þ	222 DE	î	238 EE	þ	254 FE	1 1 1 0	E
SS3	143 8F	APC	159 9F	—	175 AF	¿	191 BF	ï	207 CF	ß	223 DF	ï	239 EF	ÿ	255 FF	1 1 1 1	F

C1 Codes — GR Codes (DEC Supplemental Graphics)

Legend:

IND | 132 | 84 — decimal / hexadecimal — **code recognized by the wireless station**

HTJ | 137 | 89 — decimal / hexadecimal — **code ignored by the wireless station**

code not yet standardized by ANSI and ignored by the wireless station

Table 8-4
C1 Control Characters and Wireless Station Action

Mnemonic	Hex	Name	Wireless Station Action
	80		Ignores this code.
	81		Ignores this code.
	82		Ignores this code.
	83		Ignores this code.
IND	84	Index	Moves cursor down one line in same column. If cursor is at bottom margin, display performs a scroll up.
NEL	85	Next line	Moves cursor to first position on next line. If cursor is at bottom margin, display performs a scroll up.
SSA	86	Start of selected area	Selects which characters on the current page the wireless station can send to the host.
ESA	87	End of selected area	Ends the selected area that is sent to the host when forms are created for VT330/VT340 terminal emulation.
HTS	88	Horizontal tab set	Sets one horizontal tab stop at the column where the cursor is.
HTJ	89	Horizontal tab with justify	Ignores this code.
VTS	8A	Vertical tabulation set	Ignores this code.
PLD	8B	Partial line down	Ignores this code.
PLU	8C	Partial line up	Ignores this code.
RI	8D	Reverse index	Moves cursor up one line in same column. If cursor is at top margin, display performs a scroll down.
SS2	8E	Single shift 2	Temporarily invokes G2 character set into GL for the next graphic character. G2 is designated by a select character set (SCS) sequence.

Table 8-4 (Continued)
C1 Control Characters and Wireless Station Action

Mnemonic	Hex	Name	Wireless Station Action
SS3	8F	Single shift 3	Temporarily invokes G3 character set into GL for the next graphic character. G3 is designated by a select character set (SCS) sequence.
DCS	90	Device control string	Processes as opening delimiter of a device control string for device control use.
PU1	91	Private use 1	Ignores this code.
PU2	92	Private use 2	Ignores this code.
STS	93	Set transmit state	Ignores this code.
CCH	94	Cancel character	Ignores this code.
MW	95	Message waiting	Ignores this code.
SPA	96	Start of protected area	Starts the protected area in page memory that cannot be edited when forms are created from the host.
EPA	97	End of protected area	Ends the protected area in page memory that cannot be edited when forms are created from the host.
	98		Ignores this code.
	99		Ignores this code.
	9A		Ignores this code.
CSI	9B	Control sequence introducer	Processes as control sequence introducer.
ST	9C	String terminator	Processes as the closing delimiter of a string opened by DCS. Also, processes the code as the end of a line of extended command characters.
OSC	9D	Operating system command	Ignores this code.
PM	9E	Privacy message	Ignores this code.
APC	9F	Application program command	Processes the code as the start of a line of extended command characters.

Display Controls Mode

The wireless station does not support the VT220 terminal display controls mode, which displays control codes as graphic characters for debugging.

Dynamically Redefinable Character Set

The wireless station does not support the dynamically redefinable character set (DRCS), which is a 94-character set you can create on the VT220 terminal and down-line load into the terminal DRCS buffer.

Special Graphics Character Set

The wireless station supports most of the DEC special graphics character set. The set contains ASCII C0 codes and most of the GL codes. It also has special symbols and short line segments. You would normally use these characters to create a limited range of drawings while working in text mode.

Table 8-5 shows special graphics characters recognized by the wireless station. Ignored codes are parsed (removed) from the data stream with no action taken by the wireless station. Codes the wireless station ignores and does not support are also indicated in the table.

Table 8-5
Special Graphics Character Set

row	column	0		1		2		3		4		5		6		7	
	b8 bits b7 b6 b5 b4 b3 b2 b1	0 0 0 0		0 0 0 1		0 0 1 0		0 0 1 1		0 1 0 0		0 1 0 1		0 1 1 0		0 1 1 1	
0	0 0 0 0	NUL	00	DLE	10	SP	20	0	30	@	40	P	50		60		70
1	0 0 0 1	SOH	01	DC1 (XON)	11	!	21	1	31	A	41	Q	51		61	- SCAN 5	71
2	0 0 1 0	STX	02	DC2	12	"	22	2	32	B	42	R	52		62		72
3	0 0 1 1	ETX	03	DC3 (XOFF)	13	#	23	3	33	C	43	S	53		63		73
4	0 1 0 0	EOT	04	DC4	14	$	24	4	34	D	44	T	54		64	⊢	74
5	0 1 0 1	ENQ	05	NAK	15	%	25	5	35	E	45	U	55		65	┤	75
6	0 1 1 0	ACK	06	SYN	16	&	26	6	36	F	46	V	56		66	⊥	76
7	0 1 1 1	BEL	07	ETB	17	'	27	7	37	G	47	W	57		67	T	77
8	1 0 0 0	BS	08	CAN	18	(	28	8	38	H	48	X	58		68	│	78
9	1 0 0 1	HT	09	EM	19	)	29	9	39	I	49	Y	59		69		79
A	1 0 1 0	LF	0A	SUB	1A	*	2A	:	3A	J	4A	Z	5A	⌋	6A		7A
B	1 0 1 1	VT	0B	ESC	1B	+	2B	;	3B	K	4B	[	5B	⌉	6B		7B
C	1 1 0 0	FF	0C	FS	1C	,	2C	<	3C	L	4C	\	5C	⌈	6C		7C
D	1 1 0 1	CR	0D	GS	1D	-	2D	=	3D	M	4D	]	5D	⌊	6D		7D
E	1 1 1 0	SO	0E	RS	1E	.	2E	>	3E	N	4E	^	5E	+	6E		7E
F	1 1 1 1	SI	0F	US	1F	/	2F	?	3F	O	4F		5F		6F		7F

C0 Codes
(ASCII Nondisplayable Control Character Set)

GL Codes
(DEC Special Graphics Character Set)

Legend:

ENQ 05 — **code recognized by the wireless station**

NUL 00 — **code ignored by the wireless station**

5F — **code not supported and character displayed may change without notice**

National Replacement Character Sets

The wireless station supports the 7-bit national replacement character (NRC) sets for European languages. A Greek NRC set is also available. The NRC sets are similar to the 7-bit ASCII set, except for a few characters. You designate the character sets as hard using escape sequence formats (page 8-15).

Table 8-6 lists the characters in each NRC set that are different from the ASCII set. The wireless station does not support the character "¾" (40 hexadecimal) in the Dutch NRC set. Table 8-7 shows characters in the Greek NRC set.

Table 8-6
National Replacement Character Set

Character Set	Hexadecimal											
	23	**40**	**5B**	**5C**	**5D**	**5E**	**5F**	**60**	**7B**	**7C**	**7D**	**7E**
ASCII	#	@	[	\	]	^	_	‘	{	|	}	~
British	£	@	[	\	]	^	_	‘	{	|	}	~
Dutch	£		ÿ	½	|	^	_	‘	¨	*f*	¼	’
Finnish	#	@	Ä	Ö	Å	Ü	_	é	ä	ö	å	ü
French	£	à	_	ç	§	^	_	‘	é	ù	è	¨
French Canadian	#	à	â	ç	ê	î	_	ô	é	ù	è	û
German	#	§	Ä	Ö	Ü	^	_	‘	ä	ö	ü	ß
Italian	£	§	_	ç	é	^	_	ù	à	ò	è	ì
Norwegian/Danish	#	@	Æ	Ø	Å	^	_	‘	æ	ø	å	~
Portuguese	#	@	Ã	Ç	Õ	^	_	‘	ã	ç	õ	~
Spanish	£	§	¡	Ñ	¿	^	_	‘	‘	_	ñ	ç
Swedish	#	É	Ä	Ö	Å	Ü	_	é	ä	ö	å	ü
Swiss	ù	à	é	ç	ê	î	è	ô	ä	ö	ü	û

Table 8-7
Greek National Replacement Character Set

row	column	0		1		2		3		4		5		6		7	
	b8 bits b7 b6 b5 b4 b3 b2 b1	0 0 0		0 0 1		0 1 0		0 1 1		1 0 0		1 0 1		1 1 0		1 1 1	
0	0 0 0 0		00		10		20	•	30	ΐ	40	Π	50	ΰ	60	π	70
1	0 0 0 1		01		11	‘	21	±	31	A	41	P	51	α	61	ρ	71
2	0 0 1 0		02		12	’	22	2	32	B	42		52	β	62	ς	72
3	0 0 1 1		03		13	£	23	΄	33	Γ	43	Σ	53	γ	63	σ	73
4	0 1 0 0		04		14		24	΄	34	Δ	44	T	54	δ	64	τ	74
5	0 1 0 1		05		15		25	¨	35	E	45	Y	55	ε	65	υ	75
6	0 1 1 0		06		16	¦	26	Α	36	Z	46	Φ	56	ζ	66	φ	76
7	0 1 1 1		07		17	§	27	·	37	H	47	X	57	η	67	χ	77
8	1 0 0 0		08		18	¨	28	Έ	38	Θ	48	Ψ	58	θ	68	ψ	78
9	1 0 0 1		09		19	©	29	Η	39	I	49	Ω	59	ι	69	ω	79
A	1 0 1 0		0A		1A		2A	Ί	3A	K	4A	Ϊ	5A	κ	6A	ϊ	7A
B	1 0 1 1		0B		1B	«	2B	»	3B	Λ	4B	Ύ	5B	λ	6B	ύ	7B
C	1 1 0 0		0C		1C	¬	2C	Ο	3C	M	4C	ά	5C	μ	6C	ό	7C
D	1 1 0 1		0D		1D	SHY	2D	½	3D	N	4D	έ	5D	ν	6D	ύ	7D
E	1 1 1 0		0E		1E		2E	Υ	3E	Ξ	4E	ή	5E	ξ	6E	ώ	7E
F	1 1 1 1		0F		1F	—	2F	Ω	3F	O	4F	ί	5F	ο	6F		7F

Legend:

£ 23 **code recognized by the wireless station**

20 **code ignored by the wireless station**

Character Set Selection

The wireless station supports hard character sets. It does not support designating soft (down-line loadable) character sets.

Designating Hard Character Sets

Designate hard character sets using the escape sequence format in Table 8-8.

Table 8-8
Hard Character Set Escape Sequences

Escape Sequence			Designated As
Supplemental and special graphics sets:			
1B hexadecimal ESC	28 hexadecimal (	(Final)	G0
1B hexadecimal ESC	29 hexadecimal)	(Final)	G1
1B hexadecimal ESC	2A hexadecimal *	(Final)	G2
1B hexadecimal ESC	2B hexadecimal +	(Final)	G3
NRC sets:			
1B hexadecimal ESC	2D hexadecimal -	(Final)	G1
1B hexadecimal ESC	2E hexadecimal .	(Final)	G2
1B hexadecimal ESC	2F hexadecimal /	(Final)	G3

The final character in the escape sequence represents the character set you want to designate. For the wireless station, the final characters are indicated in Table 8-9.

Table 8-9
Hard Character Set Final Characters

Character Set		Final Character
ASCII		B (42 hexadecimal)
Special graphics		0 (30 hexadecimal)
National replacement	British	A (41 hexadecimal)
	Dutch	4 (34 hexadecimal)
	Finnish*	5 (35 hexadecimal) or C (43 hexadecimal)
	French	R (52 hexadecimal)
	French Canadian*	9 (39 hexadecimal) or Q (51 hexadecimal)
	German	K (4B hexadecimal)
	Italian	Y (59 hexadecimal)
	Norwegian/Danish*	‘ (60 hexadecimal) or E (45 hexadecimal)
	Portuguese	% (25 hexadecimal)
	Spanish	Z (5A hexadecimal)
	Swedish*	7 (37 hexadecimal) or H (48 hexadecimal)
	Swiss	= (3D hexadecimal)
	Greek	6 (36 hexadecimal) (This is a private extension.)

* Digital recommends using the first code shown.

Locking Shifts

The wireless station applies the locking shift (LS) control functions in Table 8-10. Locking shifts LS1R, LS2, LS2R, LS3, and LS3R are available in VT300 mode only.

Table 8-10
Locking Shifts

Control Name	Code	Function
LS0 (Locking shift 0)	SI (0F hexadecimal)	Map G0 into GL (default).
LS1 (Locking shift 1)	SO (0E hexadecimal)	Map G1 into GL.
LS1R (Locking shift 1, right)	ESC ~ (1B, 7E hexadecimals)	Map G1 into GR.
LS2 (Locking shift 2)	ESC n (1B, 6E hexadecimals)	Map G2 into GL.
LS2R (Locking shift 2, right)	ESC } (1B, 7D hexadecimals)	Map G2 into GR.
LS3 (Locking shift 3)	ESC o (1B, 6F hexadecimals)	Map G3 into GL.
LS3R (Locking shift 3, right)	ESC | (1B, 7C hexadecimals)	Map G3 into GR.

Received Codes

Received codes are codes the wireless station receives from an application or host computer. The following pages describe received codes, and the action taken by the wireless station when it receives the codes from an application or host.

Select C1 Controls

Select C1 controls (code extension announcers) control the representation of C1 control codes returned to the application. The wireless station supports select 7-bit C1 control transmission (Table 8-11), which converts all C1 codes returned to the application to their equivalent 7-bit code extensions.

The wireless station also supports select 8-bit C1 control transmission, which returns C1 codes to the application without converting them to their equivalent 7-bit code extensions.

" **NOTE:** *The wireless station does not support DECSCL sequences.*

Table 8-11
Select C1 Controls

Transmission	Sequence	Wireless Station Action
Select 7-bit C1 Control (S7C1T)	ESC sp F	Converts all C1 codes returned to the application to their equivalent 7-bit code extensions.
Select 8-bit C1 Control (S8C1T)	ESC sp G	Returns C1 codes to the application without converting them to their equivalent 7-bit code extensions.

Terminal Modes

A mode is one of several operating states used by the wireless station. Table 8-12 lists selectable terminal modes and the action taken by the wireless station in set mode and reset mode.

Table 8-12
Selectable Terminal Modes

Mode (Mnemonic)	Set Mode / Reset Mode	Sequence*	Wireless Station Action
Keyboard action (KAM)	Locked	CSI 2 h	Locks the keyboard for all following keystrokes.
	Unlocked	CSI 2 l	Unlocks the keyboard.
Insert/ Replace (IRM)	Insert	CSI 4 h	Selects insert mode. New display characters move old display characters to the right. Characters moved past the right margin are lost. Text moved into a protected character field is lost. If erasure mode (ERM) is reset, text moved into a protected character field is lost.
	Replace	CSI 4 l	Selects replace mode. New display characters replace old display characters at the cursor position. The old character is erased.
Send/Receive (SRM))	Off	CSI 1 2 h	Disables local echo. When the wireless station sends characters to the host, the host must echo them back to the display.
	On	CSI 1 2 l	Enables local echo. When the wireless station sends characters, they are automatically sent to the display.

* The last character of each reset mode sequence is lowercase L (6C hexadecimal).

Table 8-12 (Continued)
Selectable Terminal Modes

Mode (Mnemonic)	Set Mode / Reset Mode	Sequence*	Wireless Station Action
Line feed/ New line (LNM)	New line	CSI 2 0 h	Causes a received LF, FF, or VT code to move the cursor to the first column of the next line. "Return" sends both a CR and an LF code.
	Line feed	CSI 2 0 l	Causes a received LF, FF, or VT code to move cursor to the next line in the current column. "Return" sends a CR code only.
Cursor key (DECCKM)	Application	CSI ? 1 h	Causes cursor keys to send application control functions.
	Cursor	CSI ? l l	Causes cursor keys to send ANSI cursor control sequences.
ANSI/VT52 (DECANM)	(None)	(None)	Not applicable.
	VT52	CSI ? 2 l	Ignores this code.
Column (DECCOLM)	132 column	CSI ? 3 h	Ignores this code.
	80 column	CSI ? 3 l	Selects 80 columns per line.
Scrolling (DECSCLM)	Smooth	CSI ? 4 h	Ignores this code.
	Jump	CSI ? 4 l	Lets the wireless station add lines to the display as fast as possible.

* The last character of each reset mode sequence is lowercase L (6C hexadecimal).

Table 8-12 (Continued)
Selectable Terminal Modes

Mode (Mnemonic)	Set Mode / Reset Mode	Sequence*	Wireless Station Action
Screen (DECSCNM)	Reverse	CSI ? 5 h	Ignores this code.
	Normal	CSI ? 5 l	Selects normal (light characters on a dark background).
Origin (DECOM)	Origin	CSI ? 6 h	Ignores this code.
	Absolute	CSI ? 6 l	Ignores this code.
Auto wrap (DECAWM)	On	CSI ? 7 h	Graphic display characters received when the cursor is at right margin appear on the next line. The display scrolls up if cursor is at end of the scrolling region.
	Off	CSI ? 7 l	Graphic display characters received when cursor is at right margin replace previously displayed characters.
Auto repeat (DECARM)	On	CSI ? 8 h	Ignores this code.
	Off	CSI ? 8 l	Ignores this code.
Print form feed (DECPFF)	On	CSI ? 18 h	Selects form feed (FF) as print termination character. The wireless station sends this character to the printer after each print screen operation.
	Off	CSI ? 18 l	Selects no termination character. The wireless station does not send an FF to the printer after each print screen operation.

* The last character of each reset mode sequence is lowercase L (6C hexadecimal).

Table 8-12 (Continued)
Selectable Terminal Modes

Mode (Mnemonic)	Set Mode / Reset Mode	Sequence*	Wireless Station Action
Print extent (DECPEX)	Full screen	CSI ? 19 h	Selects full screen to print during a print screen operation.
	Scrolling region	CSI ? 19 l	Selects scrolling region to print during a print screen operation.
Text cursor enable (DECTCEM)	Visible	CSI ? 25 h	Makes the cursor visible.
	Not visible	CSI ? 25 l	Makes the cursor not visible.
Keypad (DECKPAM/ DECPNM)	Application	ESC =	Keypad keys send application control functions.
	Numeric	ESC >	Keypad keys send characters that match the numeric, comma, period, and minus sign keys on main keypad. PF1–PF4 send control functions.
Character set (DECNRCM)	National	CSI ? 42 h	Ignores this code.
	Multinational	CSI ? 42 l	Ignores this code.
Back arrow key mode (DECBKM)	Backspace	CSI ? 6 7 h	The arrow key moves cursor back one space and deletes the character. It sends a BS character to the host.
	Delete	CSI ? 6 7 l	The arrow key deletes the character at the cursor position. It sends a DEL character to the host.

* The last character of each reset mode sequence is lowercase L (6C hexadecimal).

Cursor Positioning

The cursor indicates the position where the next character appears. The wireless station supports all cursor positioning sequences (Table 8-13).

" **NOTE:** *Pn is a variable, ASCII-coded, numeric parameter.*

Table 8-13
Cursor Positioning

Name (Mnemonic)	Sequence	Wireless Station Action
Cursor up (CUU)	CSI Pn A	Moves cursor up Pn lines in the same column. Cursor stops at top margin.
Cursor down (CUD)	CSI Pn B	Moves cursor down Pn lines in the same column. Cursor stops at bottom margin.
Cursor forward (CUF)	CSI Pn C	Moves cursor right Pn columns. Cursor stops at right margin.
Cursor backward (CUB)	CSI Pn D	Moves cursor left Pn columns. Cursor stops at left margin.
Cursor position (CUP)	CSI Pl ; Pc H	Moves cursor to Line P1, Column Pc.
Horizontal and vertical positions (HVP)	CSI Pl ; Pc f	Moves cursor to Line P1, Column Pc.
Index (IND)	ESC D	This is an 8-bit control character (84 hexadecimal) that can be expressed as an escape sequence for a 7-bit environment. IND moves the cursor down one line in the same column. If cursor is at bottom margin, display scrolls up.

Table 8-13 (Continued)
Cursor Positioning

Name (Mnemonic)	Sequence	Wireless Station Action
Reverse index (RI)	ESC M	This is an 8-bit control character (8D hexadecimal) that can be expressed as an escape sequence for a 7-bit environment. RI moves the cursor up one line in the same column. If the cursor is at top margin, the display scrolls down.
Next line (NEL)	ESC E	This is an 8-bit control character (85 hexadecimal) that can be expressed as an escape sequence for a 7-bit environment. NEL moves the cursor to the first position on the next line. If the cursor is at bottom margin, the display scrolls up.
Save cursor (DECSC)	ESC 7	Saves the following into memory: cursor position, graphic rendition, character set shift state, state of wrap flag, state of origin mode, state of selective erase.
Restore cursor (DECRC)	ESC 8	Restores the states described for DECSC. If none of these characteristics were saved the cursor moves to home position, origin mode is reset, no character attributes are assigned, and the default character set mapping is established.

Tab Stops

Tab stops are selected based on the vertical column of the display. When the wireless station receives a horizontal tab code (HT, 09 hexadecimal), the cursor tabs to the next tab stop. If no tab stops exist, the cursor tabs to the right margin.

The wireless station supports both tab stop sequences (Table 8-14). The wireless station supports "global" line tab stops only. It does not allow tab set and clear on every character on every line as for a VT220.

Table 8-14
Tab Stops

Name (Mnemonic)	Sequence	Wireless Station Action
Horizontal tab set (HTS)	ESC H	Sets a tab stop at the current column. HTS is an 8-bit control character (88 hexadecimal) that can also be expressed as an escape sequence when coding for a 7-bit environment.
Tabulation clear (TBC)	CSI g	Clears a horizontal tab stop at cursor position.
	CSI 0 g	Clears a horizontal tab stop at cursor position.
	CSI 3 g	Clears all horizontal tab stops.

Character Rendition and Attributes

Character rendition and attributes affect how a character is displayed, without changing the character. Select graphic rendition sequences change character rendition. The select character attribute sequence designates characters as erasable or non-erasable.

Select Graphic Rendition (SGR)

Table 8-15 lists select graphic rendition sequences and the action taken by the wireless station.

Table 8-15
Select Graphic Rendition

Graphic Rendition	Sequence and Ps (Single Parameter)	Wireless Station Action
All attributes off	CSI 0 m	Turns all attributes off.
Display bold	CSI 1 m	Translates bold to reverse video.
Display underscored	CSI 4 m	Displays underscored.
Display blinking	CSI 5 m	Ignores this code.
Display negative (reverse) image	CSI 7 m	Displays negative (reverse) image.
Display normal intensity	CSI 2 2 m	Displays normal intensity.
Display not underlined	CSI 2 4 m	Displays not underlined.
Display not blinking	CSI 2 5 m	Ignores this code.
Display positive image	CSI 2 7 m	Displays positive image.

Select Character Attributes (DECSCA)

The wireless station ignores select character attributes (Table 8-16).

Table 8-16
Select Character Attributes

Character Attribute	Sequence and Ps	Wireless Station Action
All attributes off	CSI 0 **I** q	Ignores this code.
Designate characters as non-erasable by DECSEL/ DECSED	CSI 1 **I** q	Ignores this code.
Designate character as erasable by DECSEL/DECSED	CSI 2 **I** q	Ignores this code.

Line Attributes

Line attributes affect an entire display line. The cursor selects the line affected by the attribute. It stays in the same character position when the attribute changes, unless the attribute would move the cursor past the right margin. In this case, the cursor stops at the right margin. When scrolling, the attribute moves with the line.

Double-Height Line (DECDHL)

Double-height line sequences make the line with the cursor the top or bottom half of a double-height, double-width line. The wireless station ignores these sequences (Table 8-17).

Table 8-17
Double-Height Line

Line Attribute	Half	Sequence	Wireless Station Action
Double-height, double-width	Top	ESC # 3	Ignores this code.
	Bottom	ESC # 4	Ignores this code.

Single-Width Line (DECSWL)

The wireless station supports the single-width line (Table 8-18).

Table 8-18
Single-Width Line

Line Attribute	Sequence	Wireless Station Action
Single-width, single-height	ESC # 5	Makes the line with the cursor single-width, single-height. This is the line attribute for all new lines on the display.

Double-Width Line (DECDWL)

Double-width line makes the line with the cursor double-width, single-height. The wireless station ignores this sequence (Table 8-19).

Table 8-19
Double-Width Line

Line Attribute	Sequence	Wireless Station Action
Double-width, single-height	ESC # 6	Ignores this code.

Erasure Mode

Erasure mode (ERM) determines whether erasing functions (ECH, erase character; EL, erase in line; and ED, erase in display) can edit protected characters. Table 8-20 lists erasure mode sequences.

" **NOTE:** *In edit mode (DECEDM), ERM affects editing functions IL, DL, ICH, and DCH.*

Table 8-20
Erasure Mode

Mode	Sequence	Comments
Set	CSI 6 h	Erasing functions ECH, EL, and ED can affect all protected and unprotected characters.
Reset	CSI 6 l	Erasing functions ECH, EL, and ED can affect only unprotected characters.

Table 8-21 lists the erasing and editing functions that ERM affects. ERM also affects the independent style of character protection.

Table 8-21
Control Functions Affected by Character Protection

Always Affected	Affected if Edit Mode (DECEDM) is Set
Erase character (ECH)	Insert character (ICH)
Erase in line (EL)	Insert line (IL)
Erase in display (ED)	Delete character (DCH) Delete line (DL)

Editing

Editing sequences insert and delete characters and lines of characters at the cursor position. The position does not change when lines are inserted or deleted. The wireless station supports all editing sequences (Table 8-22).

" **NOTE:** *Pn is a variable, ASCII-coded, numeric parameter.*

Table 8-22
Editing

Name (Mnemonic)	Sequence	Wireless Station Action
Insert line (IL)	CSI Pn L	Inserts Pn lines at the cursor. If fewer than Pn lines remain from the current line to the end of the scrolling region, the number of lines inserted is the lesser number. Lines within the scrolling region at and below the cursor move down. Lines moved past bottom margin are lost. The cursor is reset to Column 1. Sequence is ignored when cursor is outside the scrolling region. In edit mode (DECEDM), if erasure mode (ERM) is reset, lines that move down into a line with a protected character field are lost.

Table 8-22 (Continued)
Editing

Name (Mnemonic)	Sequence	Wireless Station Action
Delete line (DL)	CSI Pn M	Deletes Pn lines, starting at the line with the cursor. If fewer than Pn lines remain from the current line to the end of the scrolling region, the number of lines deleted is the lesser number. As lines are deleted, the lines within the scrolling region and below the cursor move up, and blank lines are added at the bottom of the scrolling region. The cursor is reset to Column 1. Sequence is ignored when cursor is outside the scrolling region. In edit mode (DECEDM), if erasure mode (ERM) is reset, DL cannot delete lines that have protected characters. As lines are deleted, the area moved up is bounded by the bottom of the scrolling region, or by the next line with a protected character field.
Insert characters (ICH)	CSI Pn @	Inserts Pn blank characters at the cursor position, with the character attributes set to normal. The cursor does not move and remains at the beginning of the inserted blank characters. A parameter of 0 or 1 inserts one blank character. Data on the line is shifted forward as in character insertion. In edit mode (DECEDM), if erasure mode (ERM) is reset, text moved into a protected character field is lost.
Delete character (DCH)	CSI Pn P	Deletes Pn characters, starting with the character at the cursor position. When a character is deleted, all characters to the right of the cursor move to the left. This creates a space character at the right margin for each character deleted. Character attributes move with the characters. Spaces created at the end of the line have all of their character attributes off. In edit mode (DECEDM), if erasure mode (ERM) is reset, DCH cannot delete protected characters.

Erasing

Erasing deletes characters in the wireless station's display without affecting other characters. Erased characters are lost. Cursor positioning does not change when characters or lines are erased. Table 8-23 lists erasing sequences and the action taken by the wireless station.

Table 8-23
Erasing

Name (Mnemonic)	Sequence	Wireless Station Action
Erase character (ECH)	CSI Pn X	Erases characters at the cursor position and the next Pn-1 character. A parameter of 0 or 1 erases a single character. Character attributes are set to normal. No reformatting of data on the line occurs. The cursor remains in the same position. If erasure mode (ERM) is reset, ECH cannot erase protected characters.
Erase in line (EL)	CSI K	Erases from the cursor to the end of the line, including the cursor position. Line attribute is not affected. If erasure mode (ERM) is reset, EL cannot erase protected characters.
	CSI 0 K	Same as CSI K.
	CSI l K	Erases from beginning of the line to the cursor, including the cursor position. Line attribute is not affected.
	CSI 2 K	Erases the complete line.

Table 8-23 (Continued)
Erasing

Name (Mnemonic)	Sequence	Wireless Station Action
Erase in display (ED)	CSI J	Erases from cursor to the end of display, including the cursor position. Line attribute is single-height, single-width for all completely erased lines. If erasure mode (ERM) is set, ED cannot erase protected character positions.
	CSI 0 J	Same as CSI J.
	CSI 1 J	Erases from the beginning of the display to the cursor, including the cursor position. Line attribute becomes single-height, single-width for all completely erased lines.
	CSI 2 J	Erases complete display. All lines are erased and changed to single-width. The cursor does not move.
Selective erase in line (DECSEL)	CSI ? K CSI ? 0 K CSI ? 1 K CSI ? 2 K	Ignores these codes.
Selective erase in display (DECSED)	CSI ? J CSI ? 0 J CSI ? 1 J CSI ? 2 J	Ignores these codes.

Scrolling Margins (Top and Bottom)

The scrolling region is the area of the wireless station's display that can receive new characters by scrolling old characters off the display. The area is defined by the top and bottom display margins (Table 8-24). The smallest scrolling region allowed is two lines. The number of the top margin must be at least one less than the number of the bottom margin.

Table 8-24
Scrolling Margins (Top and Bottom)

Name (Mnemonic)	Sequence	Wireless Station Action
Set top and bottom margins (DECSTBM)	CSI Pt ; Pb r	Sets top and bottom scrolling margins. The value of Pt must be less than Pb. Moves the cursor to Column 1, Line 1 of the page.

Printing

Select print operations with control sequences (Table 8-25). When characters are printed on the screen, printer tab stops are ignored. Print characters are spaced with the SP character. The wireless station sends a carriage return and line feed, vertical tab, or form feed after the last printable character on a line (not a space character).

" **NOTE:** *The wireless station ignores printer port DSR exchanges.*

Table 8-25
Printing

Name	Sequence	Wireless Station Action
Auto print mode	CSI ? 5 i (turn on) CSI ? 4 i (turn off)	Ignores these codes.
Printer controller	CSI 5 i	Turns on printer controller mode. Wireless station sends received characters to the printer without displaying them on the screen. All characters and character sequences except NUL, XON, XOFF, CSI 5 i, and CSI 4 i are sent to the printer. Wireless station does not insert or delete spaces, provide line delimiters, or select the correct printer character set. Keyboard activity is still directed to the host.
	CSI 4 i	Turns off printer controller mode.
Print cursor line	CSI ? l i	Prints the data on the display line with the cursor. Cursor position does not change. Print-cursor-line sequence is complete when the line prints. No CR/LF is attached to the line.
Print screen	CSI i	Prints the screen display (full screen or scrolling region, depending on the print extent DECPEX selection). Printer form feed mode (DECPFF) selects either a form feed (FF) or nothing as the print terminator. Print screen sequence is complete when the screen prints.
	CSI 0 i	Same as above.

User-Defined Keys (DECUDK)

The wireless station has 20 user-defined keys (UDKs). You can define the codes of 15 of these keys. The keys are:

- F6 through F14
- F15 (Help)
- F16 (Do)
- F17 through F20

Use UDKs to store and recall text and commands that you often use with applications. You should refer to your application's software manual for the commands you can store in user-defined keys.

If you use dual sessions, you can define UDKs for each session. However, you can only save one set of UDK definitions. For each session you can use a total of 256 characters to define UDKs.

Using UDKs

To enter definitions for the 15 UDKs, you program the definitions with DECUDK device control strings. To use a UDK after you have defined it, the wireless station must be in shift lock mode (*not* shift mode, such as gold shift or black shift). For example, if you defined the F6 key, you can use it by pressing the shift lock key for the wireless station and then the key sequence for the F6 key. The following chart shows key combinations.

Wireless Station	Keys
RT3210	[SFT]+[FUNC]+[F]
RT1100	[BLACK]+[GOLD]+[BLACK]+[F]
RT1700	[BLACK]+[GOLD]+[F6]
RT5900	[SHIFT]+[F6]
PEN*KEY® 6400	[BLUE]+[SHFT]
PEN*KEY 6500	[Caps Lock]

" **NOTE:** *The host system can also define the function keys.*

UDK Memory Space

There are 256 bytes of memory space available for the 15 UDKs. Space is supplied on a first come, first serve basis. When the 256 bytes are full you cannot define any more keys until you clear some of the memory space. Three ways that you can clear space are:

- Redefine one or more UDKs by using a DECUDK control string.
- Clear one or more UDKs by using a DECUDK control string.
- Clear all UDKs with a wireless station power-up or hard terminal reset (RIS) operation.

" **NOTE:** *All UDK key definitions are lost when wireless station power is lost.*

Programming UDKs

Use the following device control string format to down-line load definitions for UDKs.

DCS	**Pc ; Pl**	**|**	**Ky1/St1;...Kyn/Stn**	**ST**
Device control string introducer	Clear and lock parameters	Final character	Key definition string	String terminator

Each string component is described on the following pages.

DCS indicates the beginning of a device control string. DCS is an 8-bit C1 character (90 hexadecimal). You can use ESC P (1B and 50 hexadecimals) for a 7-bit environment.

Pc is the clear parameter that selects how to clear key definitions. The following chart summarizes Pc values and meanings.

Pc	Meaning
0 (default) or none	Clear all keys before loading new values.
1	Clear one key at a time, before loading a new value.

When Pc is 1, the wireless station only clears the keys you are loading. By using a Pc value of 1, you can redefine some keys without redefining them all.

" **NOTE:** *There are 256 bytes of memory for all UDKs. A key definition can only use the number of bytes available when that key is loaded.*

If Pc is 1, a key load may fail because no memory space is available. The reason for this is, with Pc set to 1, keys are cleared and loaded sequentially. If the new definition for a key is larger than the old one you may exceed the 256-byte limit.

For example, suppose F6 contains 120 bytes, F7 contains 110 bytes, and F8 contains 20 bytes. You try to load F8 with 40 bytes, F6 with 1 byte, and F7 with 1 byte, in that order. This works if all keys are cleared first (Pc is 0), but not if keys are cleared one at a time (Pc is 1). When you try to load F8 with 40 bytes, the load fails because only 26 bytes are free at that time. (256 maximum – 120 in F6 – 110 in F7 = 26.)

Pl is the lock parameter. Pl determines whether the key definitions are locked or unlocked after you load them. The following chart summarizes Pl values and meanings.

Pl	Meaning
0	Lock the keys. If you want to load new values into the keys, you must unlock the keys through the wireless station's VT220 firmware menus.
1 (default) or none	Do not lock the keys. The keys are unlocked and can be redefined with another DECUDK string.

" **NOTE:** *If Pl is 1 and the keys are already locked, nothing happens.*

" **NOTE:** *The wireless station ignores UDK DSR exchanges.*

The wireless station uses a special lock to allow or prevent the programming of UDKs. You can turn on this lock through the wireless station's VT220 firmware menus or from the host (with a DECUDK device control string). The lock affects all programmable keys. When using the lock follow these guidelines:

- Unlock the keys to define them. The keys must be unlocked before you can define them. You can only unlock the keys through the wireless station's VT220 firmware menus. If a key is locked and an application tries to redefine the key with a DECUDK sequence, the wireless station ignores the sequence.
- Lock the keys to prevent redefinition. You can lock the keys through the wireless station's VT220 firmware menus or from the host (with a DECUDK sequence). New key definitions are unlocked by default.

The **vertical bar** (|, 7C hexadecimal) is the final character. It identifies this control string as a DECUDK.

Ky1/St1;...**Kyn/Stn** are the key definition strings. You include these strings between the final character (|) and the string terminator (ST). Each string consists of a key selector number (Kyn) and a string parameter (Stn), separated by a slash (/, 2F hexadecimal). A semicolon (3B hexadecimal) separates different strings.

The key selector number (Kyn) indicates which key you are defining. Following is a list of definable keys and their identifying values.

Key	Value
F6	17
F7	18
F8	19
F9	20
F10	21
F11	23
F12	24
F13	25
F14	26
Help	28
Do	29
F17	31
F18	32
F19	33
F20	34

String parameters (Stn) are the encoded definition of the keys. String parameters consist of hex pairs in the following ranges:

- 30 through 39 hexadecimal (0 through 9)
- 41 through 46 hexadecimal (A through F)
- 61 through 66 hexadecimal (a through f)

When you combine these hexadecimal values they represent an 8-bit quantity. This method lets you use any of the 256 character codes in the key string. You can enter key definition strings in any order.

The default for Stn is "empty." The key is undefined.

ST is the string terminator. ST (9C hexadecimal) is a C1 8-bit character. You can use ESC \ (1B and 5C hexadecimals) for a 7-bit environment.

Loading UDKs

Following are some guidelines for loading UDKs.

- Clear UDK memory space before loading new definitions. Use a DECUDK string to clear keys without locking them. Then you can use another DECUDK string to redefine the keys and lock them.
- If you redefine a key, the old definition is lost. This may clear some space if the new definition uses fewer bytes than the old one.
- There are two ways to lock UDKs, but only one way to unlock them. To lock UDKs, you can use either the wireless station's VT220 firmware menus or a DECUDK control string. To unlock UDKs, you must use the wireless station's firmware menus.
- The default value for each key definition is empty. When you clear UDKs, they are empty.
- An invalid hex pair in a DECUDK string is ignored.

Examples of Device Control Strings

This sequence clears UDKs:

DCS 0 ; 1 | ST

This sequence locks UDKs:

DCS 1 ; 0 | ST

Suppose you want to define the F20 key to be PRINT without clearing or locking any other keys. The first part of the sequence would look like this:

DCS 1 ; 1 | 3 4 /

where 34 is the code for the F20 key.

After the slash character (2F hexadecimal) you would include the definition. The rest of the sequence after the slash character would be,

5 0 5 2 4 9 4 E 5 4 ST

where the hex encoding for PRINT is:

50 = P
52 = R
49 = I
4E = N
54 = T

The ST character (9C hexadecimal) marks the end of the control string. The complete string is:

DCS 1 ; 1 | 34 / 50 52 49 4E 54 ST

Down-Line Loadable Character Set

The wireless station does not support the ability to create and down-line load a character set of up to 94 characters (Table 8-26). This character set is also called a dynamically redefinable character set (DRCS).

Table 8-26
Down-Line Loadable Character Set

Function	Wireless Station Action
Down-line load DRCS characters	Ignores this function.
Clear a down-line loaded character set	Ignores this function.

Reports

The wireless station sends reports in response to host computer requests. Reports provide identification (type of terminal). Two categories of reports are available: primary and secondary device attributes, and device status reports.

Device Attributes (DA)

Table 8-27 shows the action taken by the wireless station when it receives primary and secondary device attribute exchanges. During a primary exchange, the host asks for the wireless station's service class code. The wireless station responds with "I am a service class 2 terminal." During a secondary exchange the wireless station responds with "I am a VT220 (identification code of 1) family terminal."

Table 8-27
Device Attributes

Communication	DA Exchange	Sequence	Meaning
Host to VT220 (request)	Primary	CSI c *or* CSI 0 c	"What is your service code and what are your attributes?"
	Secondary	CSI > c *or* CSI > 0 c	"What type of terminal are you, what is your firmware version, what hardware options do you have installed?"
VT220 to host (response)	Primary	CSI ? Pv;…Pvc	CSI ? 62 c (I am a VT220).
	Secondary	CSI > l; Py; Po c	CSI > 1 c (I am a VT220).

Device Status Reports (DSR)

Table 8-28 shows the action taken by the wireless station when it receives device status report exchanges, when the host computer asks for the general operating status of the wireless station or printer, or both. If the wireless station is in printer controller mode, the printer receives the DSR request but cannot answer.

Table 8-28
Device Status Reports

DSR Exchange	Communication	Sequence	Wireless Station Action
VT220	Host to VT220 (Request for terminal status)	CSI 5 n	Ignores this code.
	VT220 to host (DA response)	CSI 0 n *or* CSI 3 n	Ignores these codes.
	Host to VT220 (Request for cursor position)	CSI 6 n	"Please report your cursor position using a CPR (not DSR) control sequence."
	VT220 to host (CPR response)	CSI Pv; Ph R	"My cursor is positioned at _____ (Pv); _____ (Ph)." (Pv=row, Ph=column)
Printer port	Host to VT220 (Request for printer status)	CSI ? 15 n	Ignores this code.
	VT220 to host	CSI ? 13 n CSI ? 10 n CSI ? 11 n	Ignores these codes.
User-defined keys	Host to VT220 (Request for UDK status)	CSI ? 25 n	Ignores this code.
	VT220 to host	CSI ? 20 n CSI ? 21 n	Ignores these codes.
Keyboard language	Host to VT220 (Request for keyboard language)	CSI ? 26 n	Ignores this code.
	VT220 to host	CSI ? 27; Pn n	Ignores this code.

Identification

The identification sequence is not recommended. The wireless station supports the identification sequence (Table 8-29).

Table 8-29
Identification

Name (Mnemonic)	Sequence	Wireless Station Action
Identification (DECID)	ESC Z	Ignores this code.

Terminal Reset

Terminal reset escape sequences cause either a soft terminal reset or a hard terminal reset. Table 8-30 shows the action taken by the wireless station when it receives terminal reset sequences.

Table 8-30
Terminal Reset

Name (Mnemonic)	Sequence	Wireless Station Action
Soft terminal reset (DECSTR)	CSI ! p	Ignores this code.
Hard terminal reset (RIS)	ESC c	Performs a communications line disconnect. Clears the display. Returns the cursor to the upper-left corner of the display. Sets the SGR state to normal. Sets all character sets to the default.

Tests and Adjustments

The wireless station has adjustment patterns you can invoke from the host computer with escape sequences. Adjustment sequences send uppercase E's to the wireless station's display. Adjustment procedures are usually done only by qualified technicians. For more information, contact the Customer Response Center at the phone numbers listed in the introduction to this programmer's reference guide.

Table 8-31 shows the action taken by the wireless station when it receives test and adjustment sequences.

Table 8-31
Tests and Adjustments

Name (Mnemonic)	Sequence	Wireless Station Action
Tests (DECTST)	CSI 4 ; Ps ; ..... ; Ps y	Ignores this code.
Adjustments (DECALN)	ESC # 8	Fills display with uppercase E's.

VT52 Mode Escape Sequence

The wireless station does not support VT52 mode, which allows the VT220 to operate with DEC software written for VT52 terminals.

Define Area Qualification

The define area qualification (DAQ) command indicates that the active position is the first character position of a qualified area. The end of a qualified area is indicated by the beginning of the following qualified area. The qualifications of the area are specified according to the parameter(s). Table 8-32 lists qualification sequences.

Table 8-32
Define Area Qualification

Qualification	Sequence and Ps (Single Parameter)	Wireless Station Action
Accept all input	CSI 0 o	Accepts all input.
Accept no input (protected) and do not transmit (guarded)	CSI 1 o	Accepts no input.
Accept graphics	CSI 2 o	Accepts graphics.
Accept numerics	CSI 3 o	Accepts numerics.
Accept alphabetics	CSI 4 o	Accepts alphabetics.
Right justify in area	CSI 5 o	Right justifies area.
Zero fill in area	CSI 6 o	Fills area with zeroes.
Horizontal tab stop at start of area	CSI 7 o	Places a horizontal tab stop at the start of the area.
Accept no input (protected), but select for transmission (unguarded)	CSI 8 o	Accepts no input.
Space fill in area	CSI 9 o	Fills area with spaces.
Invisible	CSI 1 0 o	Makes passwords invisible.

Private Sequences

Private sequences enable or disable the autosend (Table 8-33).

Table 8-33
Private Sequence

Mode	Sequence*	Wireless Station Action
Set	ESC [= 3 l	Enables autosend. Transmits the screen when the last field is filled. If you are on the last defined field and get data from the bar code reader or RS-232 port, the display will also be automatically sent even if the field not filled.
Reset	ESC [= 3 h	Disables autosend. Only transmits when a terminating key is pressed.

* The last character of the set mode sequence is lowercase L (6C hexadecimal).

Proprietary Sequences

Line Edit and Character Modes

Two proprietary escape sequences enable the host to put the wireless station into line edit (block) mode or character mode (Table 8-34). Note that the wireless station enters character mode when it is cold-started.

Table 8-34
Line Edit and Character Mode Sequences

Mode	Sequence*
Line edit	CSI = 1 l
Character	CSI = 1 h

* The last character of the line edit mode sequence is lowercase L (6C hexadecimal).

Norcompress

The norcompress function (Table 8-35) handles the norrc command, where "a" is the number of iterations that "b" occurs in the datastream.

Table 8-35
Norcompress

Name	Sequence
Norcompress	CSI a;bz

VT330/VT340 Applications

VT330/VT340 terminal applications supported by the wireless station include setting the right margin, using control functions, and creating text forms.

Right Margin

The wireless station's display contains 2 to 80 columns. To ensure that the cursor will not go beyond Column Pn, use the following sequence to set the number of columns (Pn is a number from 2 to 80):

CSI Pn $ ¦

Control Functions

In editing mode you can use the erasure, deletion, and insertion control functions. The character protection field lets you design text forms that cannot be changed or overwritten. In edit mode, character protection also depends on the setting of erasure mode (ERM):

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

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

Text Forms

When using C1 control characters SPA, EPA, SSA, and ESA to create forms on the host, the rows and columns to which the cursor moves must be in sequential order. The following example shows some sequences that create a text form.

Sequence	Description
ESC [1; 1 H	Home cursor.
ESC [2 J	Clear screen.
ESC [? 10 h	Start local editing mode.
ESC V	Start protected area.
ESC [1 ; 2 H	Move cursor to Row 1, Column 2.
ESC [1; 17 H	Move cursor to Row 1, Column 17.
"Manufacturing"	Display literal.
"Receiving"	Display literal.
ESC [2; 1 H	Move cursor to Row 2, Column 1.
"LIP:"	Display literal.
ESC [1 D	Move cursor back one position.
ESC W	End protected area.
ESC [l C	Move cursor forward one position.
ESC F	Start selected area.
ESC [2; 15 H	Move cursor to Row 2, Column 15.
ESC G	End selected area.
ESC V	Start protected area.
ESC [3; 1 H	Move cursor to Row 3, Column 1.
"Item:"	Display literal.
ESC [1 D	Move cursor back one position.
ESC W	End protected area.
ESC [1 C	Move cursor forward one position.
ESC F	Start selected area.
ESC [3; 16 H	Move cursor to Row 3, Column 16.
ESC G	End selected area.
ESC V	Start protected area.
ESC [4; 1 H	Move cursor to Row 4, Column 1.
"Lot:"	Display literal.
ESC [1 D	Move cursor back one position.

(Continued)

Sequence	Description
ESC W	End protected area.
ESC [1 C	Move cursor forward one position.
ESC F	Start selected area.
ESC [4; 9 H	Move cursor to Row 4, Column 9.
ESC G	End selected area.
ESC V	Start protected area.
ESC [5; 1 H	Move cursor to Row 5, Column 1.
"Qty:"	Display literal.
ESC [1 D	Move cursor back one position.
ESC W	End protected area.
ESC [1 C	Move cursor forward one position.
ESC F	Start selected area.
ESC [5; 13 H	Move cursor to Row 5, Column 13.
ESC G	End selected area.
ESC V	Start protected area.
ESC [24; 80 H	Move cursor to Row 24, Column 80.
ESC W	End protected area.
ESC [26 $ |	Set the number of columns to 26.
ESC [1; 8 r	Set top at 1, bottom at 8 rows.
ESC [3 g	Clear tab stops.
ESC [2; 5 H	Move cursor to Row 2, Column 5.

If this information is entered on the form:

111111111	for "LIP:"
2222222222	for "Item:"
3333	for "Lot:"
44444444	for "Qty:"

The data stream will be sent to the host as indicated in the following chart. (If guarded area transfer mode (GATM) is reset, then the record separator is processed as a protected field entry.)

Sequence	Description
RS	Protected field Line 1.
RS	First protected field Line 2.
111111111	Selected field Line 2.
RS	Second protected field Line 2.
RS	First protected field Line 3.
2222222222	Selected field Line 3.
RS	Second protected field Line 3.
RS	First protected field Line 4.
3333	Selected field Line 4.
RS	Second protected field Line 4.
RS	First protected field Line 5.
44444444	Selected field Line 5.
RS	Second protected field Line 5.
RS	Protected field Line 6.
RS	Protected field Line 7.
RS	Protected field Line 8.

Transmitted Keyboard Codes

Transmitted codes are codes generated by the wireless station's keys and sent to the host computer or software application in use. The following pages describe the capability of the wireless stations to emulate codes generated by the VT220 terminal keyboard's main keypad, editing keypad, auxiliary keypad, and top-row function keys.

Codes are sent via line edit (block) mode or optimized character mode selected through the keyboard function labeled MODE on the overlay.

Line Edit Mode

Line edit (block) mode is a synchronous condition where the wireless station temporarily stores or "buffers" keys you press. It sends the cumulative data to the host computer when you press one of the following terminating keys:

[ENTER]
[F6] through [F20], [PF1] through [PF4]
[CTRL]+[A] through [CTRL]+[Z]
Forward tab
DEL (7F hexadecimal)
Backspace

The following also apply to line edit mode:

- When you press [PF1], the following key will also be transmitted directly to the host computer.
- When scanning, the wireless station automatically enters line edit mode for each individual scan. When it completes scanning, it returns to the mode it was set at before it started scanning.
- For codes generated by the cursor control key, see page 8-58.
- For codes generated by the keypad keys, see page 8-59.

Character Mode

Character mode (the default) is a condition where the wireless station sends, to the host computer, each key as you press it. You should place the wireless station into character mode during these situations:

- When the wireless station should immediately send information to the host computer. This operation is called “type ahead.”
- When the wireless station’s keyboard sends a character to the display as well as to the host. This operation is called “local echo.” If local echo is disabled, the host receives the character from the wireless station and then sends the return response.

To alternate between line edit and character modes, press the correct sequence of keys from the chart below. An annunciator in the wireless station’s display indicates the current mode.

Series	Key Sequences
RT1100 and RT1700	[BLACK]+[Y]
RT5900	[GOLD]+[F5]
PEN*KEY 6400	[GOLD]+[1]
PEN*KEY 6500	[GOLD]+[PF1]

Transmitted Keyboard Keys

The following pages describe codes generated by main keypad keys, editing keys, auxiliary keys, and top-row function keys.

Main Keypad

The wireless station emulates all of the standard and most of the special function keys on the VT220 main keypad. The standard keys generate letters, numbers, and symbols, either alone or in combination with other keys. The function keys generate special function codes.

Table 8-36 lists the codes generated by the special function keys.

Table 8-36
Special Function Keys and Codes Generated

VT220 Key	Code
Delete	DEL (7F hexadecimal).
Tab	HT (09 hexadecimal).
Return	CR (0D hexadecimal) or CR (0D hexadecimal) LF (0A hexadecimal).
Ctrl	Does not send a code when used alone; always used in combination with another key to send a control code.
Shift	Does not send a code when used alone; sends uppercase characters when used with other standard keys.
Lock	None.
Space bar	SP (20 hexadecimal).
Compose character	None.

Editing Keypad

The wireless station has editing keys and cursor control keys. Editing keys have functions assigned to them by the application software in use. Refer to your VT220 application software manual for the uses of the editing keys.

Editing Keys

Table 8-37 lists the codes generated by the editing keys.

Table 8-37
Editing Keys and Codes Generated

VT220 Key	Code
Find	CSI 1 ~
Insert here	CSI 2 ~
Remove	CSI 3 ~
Select	CSI 4 ~
Prev screen	CSI 5 ~
Next screen	CSI 6 ~

Cursor Control Key

Table 8-38 lists codes generated by the wireless stations' cursor control keys.

Table 8-38
Cursor Control Key and Codes Generated

Wireless Station Key	Cursor Key Mode Reset (Normal)	Cursor Key Mode Set (Application)
Up arrow	CSI A	SS3 A
Down arrow	CSI B	SS3 B
Right arrow	CSI C	SS3 C
Left arrow	CSI D	SS3 D

Sending Host Cursor Keys

In keyboard unshifted and shifted modes, the cursor control key sends a host cursor key to the host computer. The cursor control key emulates the arrow keys of a VT220 terminal in either their normal arrow key mode or application mode, depending on the state set by the programmer. See "Keyboard Codes" discussed later in this section.

To Send to Host	Press Wireless Station Key(s)
Host cursor right key	[**"**]
Host cursor left key	[**A**]
Host cursor up key	[**Y**]
Host cursor down key	[**B**]
Host cursor right key	[SFT]+[**"**]
Host cursor left key	[SFT]+[**A**]
Host cursor up key	[SFT]+[**Y**]
Host cursor down key	[SFT]+[**B**]

Auxiliary Keypad

Auxiliary keys enter numeric data. The application software in use can also assign functions to these keys; refer to your VT220 application software manual for their uses. Table 8-39 shows codes generated by the auxiliary keys in keypad application mode.

Table 8-39
Auxiliary Keys and Codes Generated

VT220 Key	Keypad Mode
0	SS3 p
1	SS3 q
2	SS3 r
3	SS3 s
4	SS3 t
5	SS3 u
6	SS3 v
7	SS3 w
8	SS3 x
9	SS3 y
- (hyphen)	SS3 m
, (comma)	SS3 l
. (period)	SS3 n
Enter	SS3 M
PF1	SS3 P
PF2	SS3 Q
PF3	SS3 R
PF4	SS3 S

Top-Row Function Keys

Function keys [F1] through [F4] on the wireless station's keyboard have been assigned the VT220 [PF1] through [PF4] definitions. On the VT220 terminal's keyboard, function keys [F1] through [F5] are used for hold screen, print screen, set-up, data/talk, and break. The wireless station supports only the break function, which is [F5] on the wireless station's keyboard.

Wireless stations emulate the remaining VT220 terminal top-row function keys ([F6] through [F20]), which have functions assigned to them by the application software in use. Refer to your VT220 application software manual for the uses of these keys. Table 8-40 lists function keys.

Table 8-40
Top-Row Function Keys and Codes Generated

VT220 Key	Code
F5	None
F6	CSI 1 7 ~
F7	CSI 1 8 ~
F8	CSI 1 9 ~
F9	CSI 2 0 ~
F10	CSI 2 1 ~
F11	CSI 2 3 ~
F12	CSI 2 4 ~
F13	CSI 2 5 ~
F14	CSI 2 6 ~
F15	CSI 2 8 ~
F16	CSI 2 9 ~
F17	CSI 3 1 ~
F18	CSI 3 2 ~
F19	CSI 3 3 ~
F20	CSI 3 4 ~

Local Edit Mode

If your application software program supports local editing, the wireless station can be programmed to operate in local edit mode. Local edit mode is a feature of the VT330/VT340 terminal. Use the mode to send characters to page memory instead of to the host. The wireless station sends a block of edited text to the host after you press a terminating key. Wireless station terminating keys in local edit mode are:

[ENTER]
[F1] through [F20]

Edit Mode and Interactive Mode

The edit mode control function (DECEDM) selects edit mode or interactive mode. The function determines when the wireless station sends data to the host. Table 8-41 describes the modes.

Table 8-41
Local Edit Modes

Mode	Sequence*	Wireless Station Action
Set	CSI ? 1 0 h	Selects edit mode. (Turns on the annunciator in the display.) The wireless station stores all typed characters in page memory for local editing. After the data is edited, it can be sent in a block to the host.
Reset	CSI ? 1 0 l	Selects interactive mode. (Turns off the annunciator in the display.) The wireless station immediately sends typed characters to the host.

* The last character in the reset mode sequence is lowercase L (6C hexadecimal).

Local Editing Setup

To use the wireless station in local edit mode, the local editing features must be set up for the application software as described in Table 8-42.

Table 8-42
Local Editing Setup

Feature	Setting	Description
Edit mode	Edit	Edited text is stored in memory until you press a terminating key, which sends the text to the host.
Edit key execution mode		Not supported.
Transmit execution mode	Immediate	The wireless station sends data to the host immediately after you press a terminating key.
Local editing application keys	Suffix transmit	When you press [F1] through [F20], the wireless station sends that function to the host after sending a block of data.
Line transmit mode	Disabled	The wireless station sends a full page of data to the host after you press a terminating key.
Transfer termination mode	Enabled	After you press a terminating key, the wireless station sends the scrolling region, which is the area inside the scrolling margins.
VT131 transfer mode		Not supported.
Space compression	Disabled	The wireless station sends a space character for each unused character position.
End of line characters		On the wireless station, no characters indicate the end of a line in a data block.
End of block characters		On the wireless station, no characters indicate the end of a data block.

Selecting Characters to Send

Three control functions allow you to define which characters the wireless station can send to the host. Table 8-43 shows how the control functions select which characters the wireless station sends.

Table 8-43
Selecting Character Fields for Transmission

Fields Selected	Guarded Area Transfer Mode	Selected Area Transfer Mode	Multiple Area Transfer Mode
All fields	Set	Set	Unavailable
Unprotected fields only	Reset	Set	Unavailable
Selected fields only	Set	Reset	Set
Selected field with cursor only	Set	Reset	Reset
Unprotected and selected fields	Reset	Reset	Set
Selected field with cursor only	Reset	Reset	Reset

Guarded Area Transfer Mode (GATM)

The guarded area transfer mode control function selects whether the wireless station sends all characters or only unprotected characters to the host. When GATM is unprotected (reset), the wireless station sends a record separator (RS, 1E hexadecimal) to the host in place of a protected field. Table 8-44 lists guarded area transfer modes.

Table 8-44
Guarded Area Transfer Modes

Mode	Sequence*	Wireless Station Action
Set (All)	CSI 1 h	Selects all characters. During block transmission, the wireless station can send all protected and unprotected characters to the host.
Reset (Unprotected)	CSI 1 l	Selects unprotected characters. During a block transmission, the wireless station can send only unprotected characters to the host.

* The last character of the reset mode sequence is lowercase L (6C hexadecimal).

Selected Area Transfer Mode (SATM)

The selected area transfer mode control function determines whether the wireless station can send all characters or only selected characters to the host. Selected characters are characters defined as eligible to send to the host. Table 8-45 lists selected area transfer modes.

Table 8-45
Selected Area Transfer Modes

Mode	Sequence*	Wireless Station Action
Set (All)	CSI 1 7 h	Selects all characters. The wireless station can send selected and unselected characters on the current page to the host.
Reset (Unprotected)	CSI 1 7 l	Selects only selected characters. The wireless station can only send selected characters on the current page to the host.

* The last character of the reset mode sequence is lowercase L (6C hexadecimal).

Multiple Area Transfer Mode (MATM)

The multiple area transfer mode control function determines what selected character areas the wireless station can send to the host. MATM work only when SATM is reset. Table 8-46 describes multiple area transfer modes.

Table 8-46
Multiple Area Transfer Modes

Mode	Sequence*	Wireless Station Action
Set (All)	CSI 1 5 h	The wireless station can send all selected areas on the page to the host.
Reset (Unprotected)	CSI 1 5 l	Selects one area. The wireless station can send only the selected area with the cursor. If the cursor is not in a selected field, the cursor moves to the next selected field.

* The last character of the reset mode sequence is lowercase L (6C hexadecimal).

Defining Selected Areas

Start selected area (SSA) and end selected area (ESA) control functions select which characters on the current page the wireless station can send to the host. SSA and ESA are 8-bit C-1 control characters that can also be coded as 7-bit escape sequences. The following conditions apply to SSA and ESA:

- They work only when SATM is reset.
- If the wireless station receives ESA before SSA, it ignores ESA.

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

Table 8-47 describes SSA and ESA.

Table 8-47
Start Selected Area and End Selected Area

Name (Mnemonic)	8-Bit	7-Bit Equivalent	Wireless Station Action
Start selected area (SSA)	SSA (86 hex.)	ESC F (1B, 46 hex.)	Marks the cursor position as the first of a string of character positions the wireless station can send to the host.
End selected area (ESA)	ESA (87 hex.)	ESC G (1B, 47 hex.)	Defines the cursor position as the last of a string of character fields the wireless station can send to the host.

Local Edit Mode Keys

Keys with special functions in local edit mode are described in Table 8-48.

Table 8-48
Local Edit Mode Keys

Key(s)	Function
Find	Advances cursor to the top margin, Column 1.
Tab	Advances cursor to the next tab stop. If in protected area, it advances to the next selectable field. If tab stop is selected, it advances to the next selectable field.
Insert here	Default mode is "insert." The key toggles between insert and overstrike. If in insert mode, all following characters in the field are shifted right one position. If the field is full the last character is deleted.
Remove	If in protected area, wireless station beeps and the cursor advances to the first position of the next selectable field. If no selectable field is found, it advances to the bottom margin (the default is Row 24, Column 80). If in unprotected field, the field is cleared and the cursor is positioned to the beginning of the selectable field.
Prev screen	Ignores this key.
Next screen	Ignores this key.
Select	Ignores this key.
Backspace	Moves cursor one position to the left until it reaches the left margin.
Delete	Deletes the previous selectable character.
A–Z, 0–9, Auxiliary keypad	If one of these keys is pressed while in a protected area, the wireless station beeps, advances the cursor to the next selectable field, and enters the characters. If no other selectable field is found, the cursor advances to the bottom margin.

Table 8-48 (Continued)
Local Edit Mode Keys

Key(s)		Function
Backtab		Cursor moves back to the first occurrence of the following: " Previous tab stop. " Beginning of the current unprotected field. " Beginning of the previous unprotected field. " Beginning of scrolling region. (Also called top margin.)
Cursor	[**Y**]	Cursor moves up one line until it reaches the top margin. The wireless station beeps when the cursor reaches the top margin.
	[**B**]	Cursor moves down one line until it reaches the bottom margin. The wireless station beeps when the cursor reaches the bottom margin.
	[**"**]	Cursor moves right one character position until it reaches the right margin. The wireless station beeps when the cursor reaches the right margin.
	[**A**]	Cursor moves left one character position until it reaches the left margin. The wireless station beeps when the cursor reaches the left margin.

Scanning in Local Edit Mode

When scanning is enabled, data from the scanner is placed into the field where the cursor is located. If the cursor is not in an input field, the data from the scanner is placed into the next input field. If the data from the scanner fills the first input field, the remaining characters are placed into the next input field.

When the bar code does not fill the input field, the cursor stays where it ended. If autotab scanning is enabled, the cursor is placed at the beginning of the next input field. If not next input field is found, extra data will be lost.

Set Transmit Termination Character (DECTTC)

The wireless station supports the set transmit termination character (DECTTC) control function. Use the control function to select a character to indicate the end of a block transmission. You do not need to use an end-of-block character. The wireless station sends the end-of-block character to the host at the end of each block transmission.

The control sequence is:

CSI Ps |

Ps is the end-of-block character in the following chart.

Ps	End-of-Block Character	Wireless Station Action
0 (default)	No character (DECTTC disabled)	
1	FF (0C hexadecimal)	Form feed
2	ETX (03 hexadecimal)	End of text
3	EOT (04 hexadecimal)	End of transmission
4	CR (0D hexadecimal)	Carriage return
5	DC3 (13 hexadecimal)	XOFF

Use an extended form of DECTTC to select a string of characters to indicate the end of a block. The extended form uses decimal codes to represent characters. You can use the extended form to send a control function at the end of a block transmission, instead of a single character. You can send a control sequence of up to six characters (Pn1 through Pn6) at the end of a block.

The control sequence is:

CSI ? Pn1 ; ... **Pn6** |

Pn1 through Pn6 are decimal codes for characters you can define as end-of-block. For example, the decimal code for ESC is 27 (1B hexadecimal). A code outside the range of 0 to 254 is ignored. The tables on pages 8-4 and 8-8 contain decimal codes for characters.

For example, to send the default code of the PF1 key on the wireless station's numeric keypad at the end of a block transmission, use the following procedure.

1. The PF1 key sends this default code:

   ESC O P

2. Translate each character in the sequence to decimal code.

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

3. Insert the decimal codes into the extended DECTTC sequence:

   CSI ? 27 ; 79 ; 80 |

Section 9

Extended Commands

Overview

Extended commands govern abilities unique to wireless stations. You can use extended commands to print, scan bar codes, and send communications over the wireless station's RS-232 port. You can also use extended commands to set wireless station parameters from the host computer. The host computer sends the commands to the wireless station. The following chart lists the extended commands.

Name	Characters
Transmit and Receive On RS-232 Port	#F
Transmit Only On RS-232 Port	#P
Receive Only On RS-232 Port	#G
Set Parameters	#H
Return Version	#V
Tone	#T
Scan Bar Code Parameters	#S

To use extended commands, you must enable the extended command feature for the wireless station's firmware. The following chart describes how to access the firmware's main menu.

Series	Main Menu
RT1100 and RT1700	[GOLD]+[BLACK]
RT5900	[BROWN]+[SPACE]
PEN*KEY® 6400	[GOLD]+[BLUE]
PEN*KEY 6500	[GOLD]+[M]

To enable extended commands, select the following options in this order: SET-UP PARMS, PROTOCOL OPTS, EXTENDED CMDS, ENABLED.

Transmit and Receive On RS-232 Port (#F)

Use the Transmit and Receive On RS-232 Port extended command to transmit and receive data on the wireless station's RS-232 port. The command uses "#F" characters to request communication on the port.

When constructing a Transmit and Receive command, the data to be sent should be placed at Line 2, Column 1. The data must be less than 1840 bytes in length (after "=yy" compression). The last character must be a "#" (pound sign). The wireless station sends the data to the RS-232 port until it detects a "#" character. Due to possible system fragmentation of a data stream, the "#" in Line 1, Column 2 should be the last character placed on the screen. This will assure that all data is present before the extended command is parsed (removed).

Control character sequences for mnemonics APC (application program command) and ST (string terminator) can also start and end data. The last data character must be a “#” (pound sign). The wireless station sends the data to the RS-232 port until it detects a “#” character and the string terminator sequence.

The output stream appears in ASCII character format. For bytes that are not displayable ASCII characters, you may insert the characters “=yy,” where “yy” is the hexadecimal representation of the output byte.

Table 9-1 lists columns in which characters must appear.

Table 9-1
Transmit and Receive Characters

Line 1, Columns 2–24

Column	Character *	Description
2	#	Extended command.
3	F	Transmit and Receive On RS-232 Port command.
4		Speed (bits per second).
	1	1200.
	2	2400.
	3	4800.
	4	9600.
	5	19200
	6	38400
5		Data parity.
	N	None.
	0 (zero)	None.
	(Space)	None.
	E	Even.
	O	Odd.
6		Number of data bits.
	7	Seven.
	8	Eight.
7		Number of stop bits.
	1	One.
	2	Two.

* Some wireless stations do not support some characters. Refer to the wireless station's user guide for supported characters and options.

Table 9-1 (Continued)
Transmit and Receive Characters

Line 1, Columns 2–24

Column	Character *	Description
8		CTS flow control.
	0	Disable.
	1	Enable.
9		DTR flow control.
	0	Disable. (To avoid improper operation of the RT3210 Radio Terminal and the remote display, DTR flow control should be set to Disable when a remote display is in use.)
	1	Enable.
10		XON/XOFF flow control.
	0	Disable.
	1	Enable.
11–12		Flow control timeout value.
	XX	Number of seconds.
13–14		Maximum characters to receive.
	dd (or) Xd…dX	"dd" is a decimal digit from 00–99. Default is 99. "X" is an uppercase literal. "d…d" is any number of decimal digits from 0–2000 inclusive. Default is 99.
15–16		Delimiter character.
	AA	Hexadecimal ASCII code that marks the end of data to be received. Range is 00–7E. Default 00 implies no start character.

* Some wireless stations do not support some characters. Refer to the wireless station's user guide for supported characters and options.

Table 9-1 (Continued)
Transmit and Receive Characters

Line 1, Columns 2–24

Column	Character *	Description
17–18		Number of delimiter characters.
	XX	Number of characters accepted before sending return code to host. Range is 00–99. Default of 00 implies no start character.
19–20		Start character.
	AA	Hexadecimal ASCII code. Range is 00–99. Default of 00 implies no start character.
21		Return start character to host.
	F	Return character.
	(Space)	Do not return character.
22		Flag parity errors.
	P	Flag.
	(Space)	Do not flag.
23–24		Receive timeout length.
	XX	Number of seconds the wireless station waits for input from the RS-232 port before it sends a timeout error. Uses a default of 5 seconds when field is filled with spaces.

* Some wireless stations do not support some characters. Refer to the wireless station's user guide for supported characters and options.

Flow Control

Transmit supports three types of flow control: CTS, DSR (RT5900 Series only), and DTR. Use CTS and DSR flow control lines to show XON/XOFF conditions from the output device. Also use them to prevent output when the wireless station has no output device. The DTR of the output device should connect to either the DSR or CTS lines. On the wireless station, DTR is normally low and is raised to indicate that the wireless station is prepared for an RS-232 data exchange.

XON/XOFF is the same XON/XOFF flow control supported by most devices. The timeout value tells the wireless station how long to wait for the flow control handshake before returning a one byte error value.

Return Codes for Transmit and Receive

The Transmit and Receive return code is the status sent to the host computer. The wireless station returns data and the extended command's status to the host computer in the following format:

\\X\CC\DATA<CR> or **\\x\cccc\DATA<CR>**

"X" is the return code listed in the following chart.

"CC" or "CCCC" is the character count of the data returned. "CC" is 00–99. "CCCC" is 100–2000.

"DATA" is the RS-232 data received from the RS-232 device attached to the wireless station (if any data was received). The wireless station simulates the [Enter] key to return the code to the host.

Code	Description	Column
0	Good status, transaction complete.	(None)
1	Not enough memory. Or, incorrect setting for speed, number of data bits, number of stop bits, or flow control timeout.	4, 6, 7, 11–12
2	No delimiter (#) on data stream.	(None)
3	Timeout while using CTS flow control.	(None)
4	Timeout while using DTR flow control.	(None)
5	Timeout while using XON/XOFF flow control.	(None)
6	Improper return field.	(None)
7	Hexadecimal value is outside the range of 00–0F.	15–16, 19–20
8	Reserved.	(None)
9	Incorrect setting for maximum characters to receive.	13–14
A	Incorrect setting for delimiter character.	15–16
B	Incorrect setting for number of delimiter characters.	17–18
C	Incorrect setting for CTS flow control, DTR flow control, or XON/OFF flow control.	8, 9, 10
D	Incorrect setting for start character.	19–20
E	Incorrect setting for data parity.	5, 22
f/F *	Timeout.	(None)
p/P *	Data parity or framing error.	(None)
R	Syntax error from RD5500 Remote Display (not the expected character; no character error was detected).	(None)
o/O *	Overrun of UART receive register.	(None)

* An uppercase letter indicates an error from the RS-232 device. A lowercase letter indicates an error from the RD5500 Remote Display.

Examples of Transmit and Receive

Extended command characters can be started by an APC sequence and ended by an ST sequence, or started by a space and ended by a "#" character.

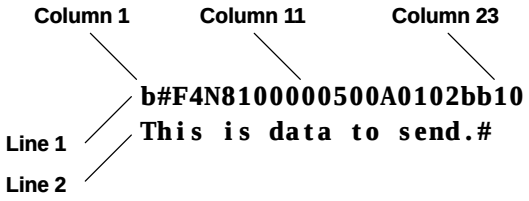
APC and ST Sequences

When control character sequences for APC and ST start and end data, all the data is on Line 1. A "#" character is before the sequence for ST at the end of the line. Control character sequences are not displayed, which results in a faster transmission rate. Also, the cursor position is not lost.

The following example shows data started and ended by control character sequences. Sequences are prefixed by the notation " ^ " which represents "control."

Space and "#" Character

The following example shows a space as the start of the data and a "#" character as the end. The data is on two lines. A "b" indicates a space.



Following is an example of data transmitted and received on the wireless station's RS-232 port. A space and "#" character start and end the data.

Column	Character	Description
1	(Space)	This column typically contains a space.
2	#	Extended command.
3	F	Transmit and Receive command.
4	4	9600 baud.
5	N	No parity.
6	8	Eight data bits.
7	1	One stop bit.
8	0	No CTS flow control.
9	0	No DTR flow control.
10	0	No XON/OFF flow control.
11–12	00	No flow control timeout value.
13–14	50	Receive a maximum of 50 characters.
15–16	0A	Delimiter character is 0A hexadecimal (line feed).
17–18	01	Data will be sent to host after one delimiter character has been received.
19–20	02	Start character is 02 hexadecimal (STX).
21	(Space)	Start character will not be returned.
22	(Space)	Do not flag parity errors.
23–24	10	Receive timeout length is 10 seconds.

Transmit Only On RS-232 Port (#P)

The Transmit Only On RS-232 Port extended command lets the wireless station send information to a slaved RS-232 device, such as a printer or bar code printer. The command uses the RS-232 communications port to send data to the device. The wireless station checks data from the host computer for a transmit sequence, then sends the requested data. The host computer signals the wireless station for a transmit command by inserting the characters "#P" into the display at Line 1, Columns 2 and 3. Characteristics of the transmission immediately follow the #P command.

When constructing a Transmit Only command, the data to be sent should be placed at Line 2, Column 1. The data must be less than 1840 bytes in length (after "=yy" compression). The last character must be "#." The wireless station sends the data to the RS-232 port until it detects a "#" character. Due to possible system fragmentation of a data stream, the "#" in Line 1, Column 2 should be the last character placed on the screen. This will assure that all data is present before the extended command is parsed (removed).

Control characters sequences for mnemonics APC (application program command) and ST (string terminator) can also start and end data. The last data character must be a "#" (pound sign). The wireless station sends the data to the RS-232 port until it detects a "#" character and the string terminator sequence.

The output stream takes the form of ASCII characters. For nondisplayable ASCII characters, you may insert the characters "=yy," where "yy" is the hexadecimal representation of the output byte.

Table 9-2 lists columns in which characters must appear.

Table 9-2
Transmit Only Characters

Line 1, Columns 2–12

Column	Character *	Description
2	#	Extended command.
3	P	Transmit Only On RS-232 Port command.
4		Speed (bits per second).
	1	1200.
	2	2400.
	3	4800.
	4	9600.
	5	19200.
	6	38400.
5		Data parity.
	N	None.
	0 (zero)	None.
	(Space)	None.
	O	Even.
	E	Odd.
6		Number of data bits.
	7	Seven.
	8	Eight.
7		Number of stop bits.
	1	One.
	2	Two.
8		CTS flow control.
	0	Disable.
	1	Enable.

* Some wireless stations do not support some characters. Refer to the wireless station's user guide for supported characters and options.

Table 9-2 (Continued)
Transmit Only Characters

Line 1, Columns 2–12

Column	Character *	Description
9		DTR flow control.
	0	Disable.
	1	Enable.
		To avoid improper operation of the RT3210 Radio Terminal and the remote display, DTR flow control should be set to Disable when a remote display is in use.
10		XON/XOFF flow control.
	0	Disable.
	1	Enable.
11–12		Flow control timeout value.
	XX	Number of seconds.

* Some wireless stations do not support some characters. Refer to the wireless station's user guide for supported characters and options.

Flow Control

Transmit Only supports three types of flow control: CTS, DSR (RT5900 Series only), and DTR. Use CTS and DSR flow control lines to show XON/XOFF conditions from the output device. Also use them to prevent output when the wireless station has no output device. The DTR of the output device should connect to either the DSR or CTS lines.

XON/XOFF is the same XON/XOFF flow control supported by most devices. The timeout value tells the wireless station how long to wait for the flow control handshake before returning a one byte error value.

For the wireless station, DTR is normally low and is raised to indicate the wireless station is prepared for an RS-232 data exchange.

Return Codes for Transmit Only

The Transmit Only return code is the status sent to the host computer. The wireless station returns the extended command's status to the host computer in the following format:

\\X<CR>

where "X" is the return code listed in the following chart. The wireless station simulates the [Enter] key to return the code to the host.

Code	Description	Column
0	Good status, transaction complete.	(None)
1	Not enough memory. Or, incorrect setting for speed, number of data bits, number of stop bits, or flow control timeout.	4, 6, 7, 11–12
2	No delimiter (#) on data stream.	(None)
3	Timeout while using CTS flow control.	(None)
4	Timeout while using DTR flow control.	(None)
5	Timeout while using XON/XOFF flow control.	(None)
6	Improper return field.	(None)
C	Incorrect setting for CTS flow control, DTR flow control, or XON/OFF flow control.	8, 9, 10
E	Incorrect setting for data parity.	5
f *	Timeout; no acknowledgment was received from the RD5500 Remote Display.	(None)
p/P *	Data parity or framing error.	(None)
R	Syntax error from RD5500 Remote Display (not the expected character; no character error was detected).	(None)
o/O *	Overrun of UART receive register.	(None)

* An uppercase letter indicates an error from the RS-232 device. A lowercase letter indicates an error from the RD5500 Remote Display.

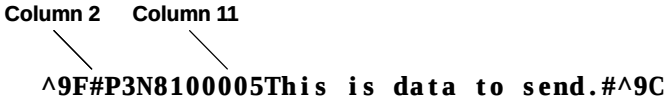
Examples of Transmit Only

Extended command characters can be started by an APC sequence and ended by an ST sequence, or started by a space and ended by a "#" character.

APC and ST Sequences

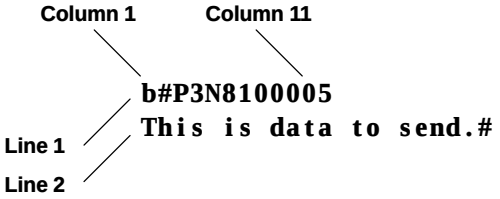
When control character sequences for APC and ST mark data, all of the data is on Line 1. A "#" character is before the sequence for ST at the end of the line. Control character sequences are not displayed, which results in a faster transmission rate. Also, the cursor position is not lost.

The following example shows data started and ended by control character sequences. Sequences are prefixed by the notation " ^ " which represents "control."



Space and "#" Character

The following example shows a space as the start of the data and a "#" character as the end. The data is on two lines. A "b" indicates a space.



Following is an example of data transmitted on the wireless station's RS-232 port. A space and "#" character start and end the data.

Column	Character	Description
1	(Space)	This column typically contains a space.
2	#	Extended command.
3	P	Transmit Only command.
4	3	4800 baud.
5	N	No data parity.
6	8	Eight data bits.
7	1	One stop bit.
8	0	No CTS flow control.
9	0	No DTR flow control.
10	0	No XON/XOFF flow control.
11–12	05	Flow control timeout is 5 seconds.

Receive Only On RS-232 Port (#G)

The Receive Only On RS-232 Port extended command provides a way to use the RS-232 port on the wireless station to collect data. A scale is one example of a use for this command. The host computer sends "#G" characters to alert the wireless station for activity on the port. Table 9-3 lists columns in which characters must appear.

Table 9-3
Receive Only Characters

Line 1, Columns 2–24

Column	Character *	Description
2	#	Extended command.
3	G	Receive Only On RS-232 Port command.

* Some wireless stations do not support some characters. Refer to the wireless station's user guide for supported characters and options.

Table 9-3 (Continued)
Receive Only Characters

Line 1, Columns 2–24

Column	Character *	Description
4		Speed (bits per second).
	1	1200.
	2	2400.
	3	4800.
	4	9600.
	5	19200
	6	38400
5		Data parity.
	N	None.
	0 (zero)	None.
	(Space)	None.
	O	Odd.
	E	Even.
6		Number of data bits.
	7	Seven.
	8	Eight.
7		Number of stop bits.
	1	One.
	2	Two.
8	(Space)	Reserved (ignored by wireless station).
9	(Space)	Reserved (ignored by wireless station).
10	(Space)	Reserved (ignored by wireless station).
11–12	(Spaces)	Reserved (ignored by wireless station).

* Some wireless stations do not support some characters. Refer to the wireless station's user guide for supported characters and options.

Table 9-3 (Continued)
Receive Only Characters

Line 1, Columns 2–24

Column	Character *	Description
13–14		Maximum characters to receive.
	dd (or) Xd…dX	"dd" is a decimal digit from 00–99. Default is 99. "X" is an uppercase literal. "d…d" is any number of decimal digits from 0–2000 inclusive. Default is 99.
15–16		Delimiter character.
	AA	Hexadecimal ASCII code which marks the end of valid data to be received. Range is 00–7E. Default is 00.
17–18		Number of delimiter characters.
	XX	Delimiter characters received before transmitting return code to host. Range is 00–99. Default is 00.
19–20		Start character.
	AA	Hexadecimal ASCII code for start character. Range is 00–99. Default of 00 implies no start character.
21		Return start character to host.
	F (Space)	Return character. Do not return character.
22		Flag parity errors.
	P (Space)	Flag. Do not flag.
23–24		Receive timeout length.
	XX	Number of seconds the wireless station waits for input from the RS-232 port before it sends a timeout error. Uses a default of 5 seconds when this field is filled with spaces.

* Some wireless stations do not support some characters. Refer to the wireless station's user guide for supported characters and options.

Return Codes for Receive Only

The Receive Only return code is the status sent to the host computer. The wireless station returns data and the extended command's status to the host computer in the following format:

\\X\CC\DATA<CR> or **\\X\CCCC\DATA<CR>**

"X" is the return code listed in the following chart.

"CC" or "CCCC" is the character count of the received data. "CC" is 00–99. "CCCC" is 100–2000.

"DATA" is the RS-232 data received from the RS-232 device attached to the wireless station (if any data was received). The wireless station simulates the [Enter] key to return the code to the host.

Code	Description	Column
0	Good status, transaction complete.	(None)
1	Not enough memory. Or, incorrect setting for speed, number of data bits, or number of stop bits.	4, 6, 7
2	No delimiter (#) on data stream.	(None)
6	Improper return field.	(None)
7	Hexadecimal value is outside the range of 00–0F.	15–16, 19–20
8	Reserved.	(None)
9	Incorrect setting for maximum characters to receive.	13–14
A	Incorrect setting for delimiter character.	15–16
B	Incorrect setting for number of delimiter characters.	17–18
D	Incorrect setting for start character.	19–20
E	Incorrect setting for data parity.	5, 22
f/F *	Timeout.	(None)
p/P *	Data parity or framing error.	(None)
R	Syntax error from RD5500 Remote Display (not the expected character; no character error was detected).	(None)
o/O *	Overrun of UART receive register.	(None)

* An uppercase letter indicates an error from the RS-232 device. A lowercase letter indicates an error from the RD5500 Remote Display.

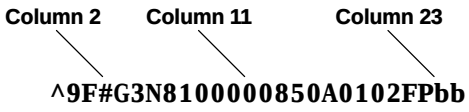
Examples of Receive Only

Receive Only extended command characters can be started by an APC sequence or by a space.

APC Sequence

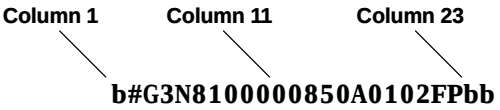
When the control character sequence for APC starts data, all of the data is on Line 1. The control character sequence is not displayed, which results in a faster transmission rate. Also, the cursor position is not lost.

The following example shows data marked by the control character sequence for APC. The sequence is prefixed by the notation " ^ " which represents "control."



Space

The following example shows a space as the start of the data. A "b" indicates a space.



Following is an example of data received on the wireless station's RS-232 port. A space starts the data.

Column	Character	Description
1	(Space)	This column typically contains a space.
2	#	Extended command.
3	G	Receive Only command.
4	3	4800 baud.
5	N	No data parity.
6	8	Eight data bits.
7	1	One stop bit.
8	(Space)	Reserved.
9	(Space)	Reserved.
10	(Space)	Reserved.
11–12	(Spaces)	Reserved.
13–14	50	Receive a maximum of 50 characters.
15–16	0A	Delimiter character is 0A hexadecimal (line feed).
17–18	01	Data will be sent to host after one delimiter character has been received.
19–20	02	Start character is 02 hexadecimal (STX).
21	F	Start character will be returned to host.
22	P	Parity errors will be flagged
23–24	10	Receive timeout length is 5 seconds.

Set Parameters (#H)

Use the Set Parameters extended command to set firmware parameters that you would otherwise set at the wireless station. The parameters are part of the wireless station's firmware.

Set most of the parameters once per wireless station. Set them when you install a radio data network, or when you add wireless stations to the network. Unless the wireless station fails (perhaps a dead battery) or a user does something destructive (like a RAM test), you probably won't need to set them again.

Table 9-4 lists columns in which characters must appear.

Table 9-4
Set Parameters Characters

Line 1, Columns 2–36

Column	Character *	Description
2	#	Extended command.
3	H	Set Parameters command.
4–6		Backlight timer.
	(Spaces)	No change from current setting.
	000	On continuously.
	001–255	Seconds to remain on.
7–9		Sleep timer delay for RT3210. (Ignored by other wireless stations.)
	(Spaces)	No change from current setting.
	000	Off.
	001–255	Seconds of activity before sleep.
10		Cursor mode.
	(Space)	No change from current setting.
	1	Underline (default).
	2	Underline blink.
	3	Block.
	4	Block blink
11	(Space)	Reserved.

* Some wireless stations do not support some characters. Refer to the wireless station's user guide for supported characters and options.

Table 9-4 (Continued)
Set Parameters Characters

Line 1, Columns 2–36

Column	Character *	Description
12		Remote display for RT3210.
	(Space)	No change from current setting.
	0	Not attached.
	1	Attached.
13–15		Beeper volume.
	(Spaces)	No change from current setting.
	000–255	Volume range in increments of 5. The larger the number, the louder the volume.
16–18		Beeper frequency.
	(Spaces)	No change from current setting.
	000–030	Frequency range. The larger the number, the higher the frequency.
19–21		Beeper length.
	(Spaces)	No change from current setting.
	001–010	Duration in seconds. The larger the number, the longer the beep and the slower the keyboard response time.
22		Delete key mapping.
	(Space)	No change from current setting.
	1	Delete key is backspace (08 hexadecimal).
	0	Delete key is delete (7F hexadecimal).

* Some wireless stations do not support some characters. Refer to the wireless station's user guide for supported characters and options.

Table 9-4 (Continued)
Set Parameters Characters

Line 1, Columns 2–36

Column	Character *	Description
23		Carriage return expansion mapping.
	(Space)	No change from current setting.
	1	CR/LF.
	0	CR.
24		Local host echo.
	(Space)	No change from current setting.
	1	Local echo.
	0	Host echo.
25–27		Screen size.
	(Spaces)	No change from current setting.
	000–255	Number of rows per display screen.
28–30		Screen size.
	(Spaces)	No change from current setting.
	000–255	Number of columns per display screen.
31–33		Alternate screen size.
	(Spaces)	No change from current setting.
	000–255	Number of rows per display screen.
34–36		Alternate screen size.
	(Spaces)	No change from current setting.
	000–255	Number of columns per display screen.

* Some wireless stations do not support some characters. Refer to the wireless station's user guide for supported characters and options.

Return Codes for Set Parameters

The Set Parameters return code is the status sent to the host computer. The wireless station returns data and the extended command's status to the host computer in the following format:

\\X<CR>

where "X" is the return code listed in the following chart. The wireless station simulates the [Enter] key to return the code to the host.

Code	Description	Column
0	Good status, transaction complete.	(None)
1	Incorrect setting for backlight timer.	4–6
2	Reserved.	(None)
3	Incorrect setting for cursor mode.	10
4	Reserved.	(None)
5	Reserved.	(None)
6	Reserved.	(None)
7	Reserved.	(None)
8	Incorrect setting for beeper volume.	13–15
9	Incorrect setting for beeper frequency.	16–18
A	Incorrect setting for beeper length.	19–21
B	Incorrect setting for delete key mapped to "backspace delete."	22
C	Incorrect setting for carriage return expansion mapped to "CR/LF."	23
D	Incorrect setting for local host echo.	24
E	Incorrect setting for number of screen rows or alternate screen rows.	25–27 31–33
F	Incorrect setting for number of screen columns or alternate screen columns.	28–30 34–36

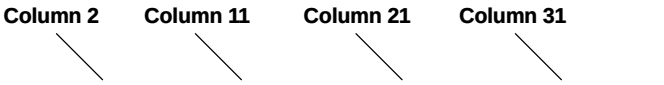
Examples of Set Parameters

Set Parameters extended command characters can be started by an APC sequence or by a space.

APC Sequence

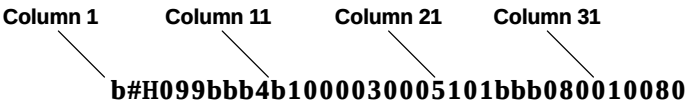
When the control character sequence for APC starts data, all of the data is on Line 1. The control character sequence is not displayed, which results in a faster transmission rate. Also, the cursor position is not lost.

The following example shows data started by the control character sequence for APC. The sequence is prefixed by the notation " ^ " which represents "control."



Space

The following example shows a space at the start of the data. A "b" indicates a space.



Following is an example of data for Set Parameters. A space starts the data.

Column	Character	Description
1	(Space)	This column typically contains a space.
2	#	Extended command.
3	H	Set Parameters command.
4–6	099	Backlight stays on for 99 seconds.
7–9	(Spaces)	No change from current setting.
10	4	Cursor is in block blink mode.
11	(Space)	Reserved.
12	1	A remote display is in use.
13–15	000	Beep is inaudible.
16–18	030	Beeper frequency is 030.
19–21	005	Beeper length is 5 seconds.
22	1	Delete key deletes current character.
23	0	Carriage return.
24	1	Local echo
25–27	(Spaces)	No change from current setting.
28–30	080	Screen is 80 columns wide.
31–33	010	Ten rows per screen.
34–36	080	Alternate screen is 80 columns wide.

Return Version (#V)

The Return Version extended command returns the current firmware name and version to the host computer. Table 9-5 lists columns in which characters must appear.

Table 9-5
Return Version Characters

Line 1, Columns 2–3

Column	Character	Description
2	#	Extended command.
3	V	Return Version command.

Return Code for Return Version

The return code is the status sent to the host computer; the code indicates if the extended command was successful. The wireless station returns data and the extended command's status to the host computer in the following format:

\\0\<Firmware> <Version><CR>

"0" is the return code listed in the following chart.

"<Firmware>" is the name of the wireless station's firmware.

"<Version>" is the current firmware version.

Code	Description
0	Good status, transaction complete.

Example of Return Version

The following example shows data started by the control character sequence for APC. The sequence is prefixed by the notation " ^ " which represents "control."

Column 2

^9F#V^9C

Tone (#T)

The Tone extended command causes the wireless station to make a tone of a specified volume, frequency, and length (Table 9-6).

Table 9-6
Tone Options

Line 1, Columns 2–12

Column	Character	Description
2	#	Extended command.
3	T	Tone command.
4–6		Tone volume.
	(Spaces	No change from current setting.
	000–255	Volume range. The larger the number, the louder the volume.
7–9		Tone frequency.
	(Spaces)	No change from current setting.
	000–030	Frequency range. The larger the number, the higher the frequency.
10–12		Tone length.
	(Spaces)	No change from current setting.
	001–010	Duration in seconds. The larger the number, the longer the beep and the slower the keyboard response time.

The return code is the status sent to the host computer; the code indicates if the extended command was successful. The wireless station returns data and the extended command's status to the host computer in the following format:

\\X<CR>

"X" is the return code listed in the following chart.

Code	Description	Column
0	Good status, transaction complete.	(None)
8	Incorrect setting for volume.	4–6
9	Incorrect setting for frequency.	7–9
A	Incorrect setting for length.	10–12

Scan Bar Code Parameters (#S)

The Scan Bar Code Parameters extended command allows host systems to have the same capabilities as wireless stations using the Native data stream to set bar code parameters and scan.

By inserting characters "#S" in the display buffer at Line 1, Columns 2 and 3, the host computer tells the wireless station to expect a Bar Code Scanner extended command. Appropriate descriptive characteristics should follow the "#S" characters. The wireless station returns a code that indicates if the command was successful. Then it simulates the [Enter] key to return a value to the host computer.

Due to possible system fragmentation of a data stream, the "#" in Line 1, Column 2 should be the last character placed on the screen. This will assure that all data is present before the extended command is parsed (removed).

Table 9-7 lists columns in which characters must appear. Tables on the following pages list characters for each type of bar code.

" **NOTE:** *The PEN*KEY 6500 Computer supports only the laser bar code scanner.*

Table 9-7
Scan Bar Code Parameters

Line 1, Columns 2–3

Column	Character	Description
2	#	Extended command.
3	S	Scan Bar Code Parameters command.

Control Byte 1

The dots in Table 9-8 indicate the Control Byte 1 options the characters support. (The RT1100, RT1700, RT5900, and the PEN*KEY 6400 Computer's internal engine do not support CCD 20/20. The PEN*KEY 6400 Computer's internal engine does not support HP Wand Select.)

Table 9-8
Control Byte 1 Characters

Line 1, Column 4

Control Byte 1 Character	Options				
	CCD 20/20 Select	**HP Wand Select**	**Redundancy**	**Laser**	**No Redundancy**
0				•	•
1			•	•	
2			•		
3			•	•	
4		•			•
5		•	•	•	
6		•	•		
7		•	•	•	
8	•				•
9	•		•	•	
A	•		•		
B	•		•	•	
C	•	•			•
D	•	•	•	•	
E	•	•	•		
F	Disable scanner.				
(Space)	No change from current setting.				

Control Byte 2

The dots in Table 9-9 indicate the Control Byte 2 options the characters support.

Table 9-9
Control Byte 2 Characters

Line 1, Column 5 Control Byte 2 Character	Scan Termination Character	Modulo 10 Check Digit
0	None	
1		•
2		
3		•
4	[Enter] key	
5		•
6		
7		•
8	[Tab] key	
9		•
A		
B		•
C		
D		•
E		
F		•

Control Byte 3

The dots in Table 9-10 indicate the Control Byte 3 options the characters support.

Table 9-10
Control Byte 3 Characters

Line 1, Column 6

Control Byte 3 Character	Options			
	Enable Stream Scanning	**Reserved**	**Return Bar Code Type**	**Bar Code Concatenated**
0				
1				•
2			•	
3			•	•
4		•		
5		•		•
6		•	•	
7		•	•	•
8	•			
9	•			•
A	•		•	
B	•		•	•
C	•	•		
D	•	•		•
E	•	•	•	
F	•	•	•	•
(Space)	No change from current setting.			

Bar Code Length

Bar Code Length sets the minimum and maximum character lengths for all types of bar codes scanned (Table 9-11). Setting the minimum and maximum values to their optimum can increase scanning performance. If the wireless station scans bar codes that are outside the minimum and maximum value, the wireless station ignores the bar code.

Table 9-11
Bar Code Length

Line 1, Columns 7–10

Column	Character	Description
7–8	XX (Spaces)	Bar code length. Maximum length is 99. No change from current setting.
9–10	XX (Spaces)	Bar code length. Minimum length is 00. No change from current setting.

UPC

Use the UPC command to select the combinations listed in Table 9-12. (The PEN*KEY 6400 Computer's internal engine does not support UPC-E Number System 1.)

Table 9-12
UPC Bar Code Characters

	Options				
Character	**UPC-E # System 1**	**Expand UPC-E to UPC-A**	**UPC-E # System 0**	**Add-Ons**	**UPC-A**
0	Disables all.				
1				•	•
2			•		•
3			•	•	•
4		•			•
5		•		•	•
6		•	•		•
7		•	•	•	•
8	•				•
9	•			•	•
10	•		•		•
11	•		•	•	•
12	•	•			•
13	•	•		•	•
14	•	•	•		•
15	•	•	•	•	•
(Space)	No change from current setting.				

EAN Algorithms

Use EAN Algorithms to select combinations of EAN options (Table 9-13).

Table 9-13
EAN Algorithms

Line 1, Column 12

Character	Description
0	EAN disabled.
1	EAN-8 and EAN-13 with add-ons enabled.
2	EAN-8 and EAN-13 enabled.
(Space)	No change from current setting.

Code 39

Code 39 (Table 9-14) sets the scanner to read simple Code 39 bar codes that do not include extended or encoded sequences. Extended Code 39 is a superset of Code 39 and scans all regular Code 39 bar codes. You cannot select both Code 39 and Extended Code 39. Encoded Code 39 combines key presses with normal bar code data.

Encoded Code 39 sequences are described on page 9-45.

Table 9-14
Code 39 Algorithms Characters

Line 1, Column 13

Character	Description
0	Code 39 disabled.
1	Encoded Code 39 enabled.
2	Extended Code 39 enabled.
3	Code 39 enabled.
(Space)	No change from current setting.

Plessey

If the Plessey bar code scanning algorithm is enabled, set its check digits (Table 9-15) according to your requirements. See the manufacturer's bar code specifications for more information on check digits.

Table 9-15
Plessey Characters

Line 1, Column 14

Character	Description
0	Plessey disabled.
1	Plessey enabled.
(Space)	No change from current setting.

The dots in Table 9-17 on the next page indicate the Plessey check digits the characters support. (The PEN*KEY 6400 Computer's internal engine does not support Plessey alpha characters.)

Codabar

The Codabar options (Codabar and ABC Codabar, Table 9-16) are mutually exclusive coding algorithms and cannot be selected at the same time. (The PEN*KEY 6400 Computer's internal engine does not support ABC Codabar.)

Table 9-16
Codabar Characters

Line 1, Column 16

Character	Description
0	Codabar disabled.
1	Codabar enabled.
2	ABC Codabar enabled.
(Space)	No change from current setting.

Table 9-17
Plessey Check Digit Characters

Line 1, Column 15

Character	Plessey Check Digit				
	Keep 2nd Digit Check	**Do Not Validate 1st Check Digit**	**Keep 1st Check Digit**	**Mod 10 1st Check Digit**	**Mod 11 1st Check Digit**
0					•
1				•	
2			•		•
3			•	•	
4		•			•
5		•		•	
6		•	•		•
7		•	•	•	
8			•		•
9			•	•	
A	•		•		•
B	•		•	•	
C		•	•		•
D		•	•	•	
E	•	•	•		•
F	•	•	•	•	
(Space)	No change from current setting.				

Code 11

Table 9-18 lists Code 11 characters. (The PEN*KEY 6400 Computer's internal engine does not support Code 11.)

Table 9-18
Code 11 Characters

Line 1, Column 17

Character	Description
0	Code 11 disabled.
1	Code 11 enabled.
(Space)	No change from current setting.

Code 93

Both Code 93 and Code 128 options can be enabled for scanning. (The PEN*KEY 6400 Computer's internal engine does not support Code 93.)

Table 9-19
Code 93 Characters

Line 1, Column 18

Character	Description
0	Code 93 disabled.
1	Code 93 enabled.
(Space)	No change from current setting.

Code 128

Table 9-20 lists Code 128 characters.

Table 9-20
Code 128 Characters

Line 1, Column 19

Character	Description
0	Code 128 disabled.
1	Code 128 enabled.
(Space)	No change from current setting.

Straight or Computer Identics 2of5

If the Straight or Computer Identics bar code is enabled, select the maximum and minimum lengths and the 1st and 2nd fixed bar code lengths according to your requirements (Table 9-21). (The PEN*KEY 6400 Computer's internal engine does not support Straight or Computer Identics 2of5.)

Table 9-21
2of5 Characters

Line 1, Columns 20–28

Column	Characters	Description
20	0	Straight and Computer Identics 2of5 disabled.
	1	Computer Identics 2of5 enabled.
	2	Straight 2of5 enabled.
	(Space)	No change from current setting.
21–22	XX	Maximum length Straight or Computer Identics 2of5. See the manufacturer's bar code specifications for further information.
	(Spaces)	No change from current setting.
23–24	XX	Minimum length Straight or Computer Identics 2of5. See the manufacturer's bar code specifications for further information.
	(Spaces)	No change from current setting.
25–26	XX	1st fixed bar code length for Straight or Computer Identics 2of5. See the manufacturer's bar code specifications for further information.
	(Spaces)	No change from current setting.
27–28	XX	2nd fixed bar code length for Straight or Computer Identics 2of5. See the manufacturer's bar code specifications for further information.
	(Spaces)	No change from current setting.

Interleaved 2of5

If Interleaved 2of5 is enabled, select the maximum and minimum lengths and the 1st and 2nd fixed bar code lengths according to your requirements (Table 9-22).

Table 9-22
Interleaved 2of5 Characters

Line 1, Columns 29–37

Column	Character	Description
29	0	Interleaved 2of5 disabled.
	1	Interleaved 2of5 enabled.
	(Space)	No change from current setting.
30–31	XX	Maximum length Interleaved 2of5. See the manufacturer's bar code specifications for further information.
	(Spaces)	No change from current setting.
32–33	XX	Minimum length Interleaved 2of5. See the manufacturer's bar code specifications for further information.
	(Spaces)	No change from current setting.
34–35	XX	1st fixed length for Interleaved 2of5 Bar Code. See the manufacturer's bar code specifications for further information.
	(Spaces)	No change from current setting.
36–37	XX	2nd fixed length for Interleaved 2of5 Bar Code. See the manufacturer's bar code specifications for further information.
	(Spaces)	No change from current setting.

Return Codes for Scan Bar Code Parameters

The Scan Bar Code Parameters return code is the status sent to the host computer; the code indicates if the extended command was successful. The wireless station returns data and the extended command's status to the host computer in the following format:

\\X<CR>

where "X" is the return code listed in the following chart. The wireless station simulates the [Enter] key to return a value to the host computer. If a hexadecimal number is entered wrong, the return code defaults to "0."

Code	Description
0	Good status, transaction complete.
1	Bad status, transaction incomplete.

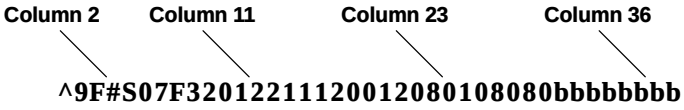
Examples of Scan Bar Code Parameters

Scan Bar Code Parameters extended command characters can be started by an APC sequence or by a space.

APC Sequence

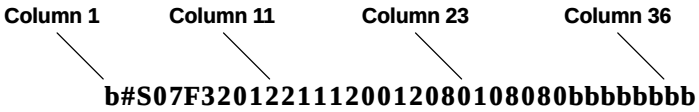
When the control character sequence for APC starts data, all of the data is on Line 1. The control character sequence is not displayed, which results in a faster transmission rate. Also, the cursor position is not lost.

The following example shows data started by the control character sequence for APC. Sequences are prefixed by the notation " ^ " which represents "control."



Space

The following example shows a space as the start of the data. A "b" indicates a space.



The following example shows data for Scan Bar Code Parameters. A space starts the data.

Column	Character	Description
1	(Space)	This column typically contains a space.
2	#	Extended command.
3	S	Scan Bar Code Parameter command.
4	0	No Control Byte 1 options are returned.
5	7	[ENTER] key terminates all scans, 12-volt laser is enabled, Modulo 10 Check Digit.
6	F	Barcode type is returned and concatenated.
7–8	32	Maximum length is 32 characters.
9–10	01	Minimum length is 1 character.
11	2	Decode UPC System 0.
12	2	EAN is enabled.
13	1	Encoded code 39 is enabled.
14	1	Plessey is enabled.
15	1	Mod 10 first digit is checked.
16	2	ABC Codabar is enabled.
17	0	Code 11 is disabled.
18	0	Code 93 is disabled.
19	1	Code 128 is enabled.
20	2	Straight 2of5 is enabled.
21–22	08	Straight 2of5 maximum length is 8.
23–24	01	Straight 2of5 minimum length is 1.
25–26	08	Straight 2of5 1st fixed length is 8.
27–28	08	Straight 2of5 2nd fixed length is 8.
29	0	Interleaved 2of5 is disabled.
30–31	(Spaces)	No change from current setting.
32–33	(Spaces)	No change from current setting.
34–35	(Spaces)	No change from current setting.
36–37	(Spaces)	No change from current setting.

Encoded Code 39

Encoded Code 39 combines key presses with normal bar code data. All regular Code 39 bar codes can be scanned when using Encoded Code 39. "Encoded" refers to special character sequences contained within a standard Code 39 bar code that the wireless station scanning program converts into key presses. This feature allows bar codes to contain commonly-used key press sequences that accompany scanning.

An example is a bar code with a forward tab character encoded at the end of it. When the wireless station operator scans the bar code, the wireless station fills in bar code data and automatically performs a forward tab. This moves the cursor to the next field. The operator does not need to press a key between scans.

Table 9-23 lists escape characters and key press sequences for Encoded Code 39. The "(t)" in the table indicates a terminating key. Any bar code data following this key code is ignored. The "t" sequences, therefore, should be located only at the end of the bar code.

If you attempt to use an invalid sequence (termed "invalid" in the table) the wireless station will beep and the data stream will be flushed.

Table 9-23
Key Press Sequences for Encoded Code 39

Sequence	Key
$space	Find (t)
$–	Insert here (t)
$.	Remove (t)
$0	Keypad 0 (t)
$1	Keypad 1 (t)
$2	Keypad 2 (t)
$3	Keypad 3 (t)
$4	Keypad 4 (t)
$5	Keypad 5 (t)
$6	Keypad 6 (t)
$7	Keypad 7 (t)
$8	Keypad 8 (t)
$9	Keypad 9 (t)
$A	New line (t)
$B	Delete (t)
$C	Forward tab (t)
$D	Forward tab (t)
$E	Invalid
$F	Invalid
$G	Invalid
$H	Backspace (t)
$I	Invalid
$J	Invalid
$K	Invalid
$L	Invalid
$M	Enter (t)
$N	Invalid
$O	Invalid

Table 9-23 (Continued)
Key Press Sequences for Encoded Code 39

Sequence	Key
$P	Invalid
$Q	PF1 (t)
$R	PF2 (t)
$S	PF3 (t)
$T	PF4 (t)
$U	F5 (t)
$V	F6 (t)
$W	F7 (t)
$X	F8 (t)
$Y	F9 (t)
$Z	F10 (t)
%space	Select (t)
%–	Previous screen (t)
%.	Next screen (t)
%0	Enter (t)
%1	00 hexadecimal (t)
%2	01 hexadecimal (t)
%3	02 hexadecimal (t)
%4	03 hexadecimal (t)
%5	04 hexadecimal (t)
%6	05 hexadecimal (t)
%7	06 hexadecimal (t)
%8	07 hexadecimal (t)
%9	08 hexadecimal (t)
%A	Invalid
%B	F11 (t)
%C	F12 (t)

Table 9-23 (Continued)
Key Press Sequences for Encoded Code 39

Sequence	Key
%D	Invalid
%E	Invalid
%F	; (semicolon)
%G	< (less than)
%H	= (equal)
%I	> (greater than)
%J	? (question mark)
%K	[(left brace)
%L	\ (backslash)
%M	] (right brace)
%N	^ (circumflex)
%O	_ (underscore)
%P	{ (left brace)
%Q	| (vertical bar)
%R	} (right brace)
%S	~ (tilde)
%T	Keyboard delete (t)
%U	Invalid
%V	@ (at)
%W	**i** (grave accent)
%X	Invalid
%Y	Invalid
%Z	F13 (t)

Table 9-23 (Continued)
Key Press Sequences for Encoded Code 39

Sequence	Key
+space	09 hexadecimal (t)
+–	0A hexadecimal (t)
+.	0B hexadecimal (t)
+0	0C hexadecimal (t)
+1	0D hexadecimal (t)
+2	0E hexadecimal (t)
+3	0F hexadecimal (t)
+4	10 hexadecimal (t)
+5	11 hexadecimal (t)
+6	12 hexadecimal (t)
+7	13 hexadecimal (t)
+8	14 hexadecimal (t)
+9	15 hexadecimal (t)
+A	a
+B	b
+C	c
+D	d
+E	e
+F	f
+G	g
+H	h
+I	i
+J	j
+K	k
+L	l
+M	m
+N	n

Table 9-23 (Continued)
Key Press Sequences for Encoded Code 39

Sequence	Key
+O	o
+P	p
+Q	q
+R	r
+S	s
+T	t
+U	u
+V	v
+W	w
+X	x
+Y	y
+Z	z
/space	16 hexadecimal (t)
/–	17 hexadecimal (t)
/.	18 hexadecimal (t)
/0	19 hexadecimal (t)
/1	1A hexadecimal (t)
/2	1B hexadecimal (t)
/3	1C hexadecimal (t)
/4	1D hexadecimal (t)
/5	1E hexadecimal (t)
/6	1F hexadecimal (t)
/7	Invalid
/8	Invalid
/9	Invalid
/A	! (exclamation mark)

Table 9-23 (Continued)
Key Press Sequences for Encoded Code 39

Sequence	Key
/B	” (double quote)
/C	# (pound)
/D	$ (dollar)
/E	% (percent)
/F	& (ampersand)
/G	’ (single quote)
/H	((left parenthesis)
/I	) (right parenthesis)
/J	* (asterisk)
/K	+ (plus)
/L	, (comma)
/M	– (hyphen)
/N	F14 (t)
/O	/ (forward slash)
/P	F15 (t)
/Q	F16 (t)
/R	F17 (t)
/S	F18 (t)
/T	F19 (t)
/U	F20 (t)
/V	Invalid
/W	Invalid
/X	Invalid
/Y	Invalid
/Z	: (colon)

Terminating Keys

Terminating keys are the non-printable ASCII sequences and action keys. When the wireless station encounters them in a bar code, an action is taken, and the wireless station sends the data in the buffer to the host computer. Terminating keys should appear only at the end of the bar code. If they are located in the middle of a bar code, they are executed normally, but the data following them in the bar code is ignored. Terminating keys cause a wireless station-to-base station transmission. The wireless station ignores data in the bar code buffer following these keys once a transmission takes place.

For example, the wireless station interprets this sequence:

123$V456

as

123F6

The wireless station will not send "456" to the host computer, because it follows terminating key F6.

ASCII sequences can be used any time before a terminating key. For example, the wireless station interprets

+H+E+L+L+O$M

as

hello<Enter>

Escape Characters

The four escape characters in Table 9-23 yield a VT220 data stream key press equivalent when followed by another character. The escape characters are:

$ (dollar sign)
% (percent)
+ (plus)
/ (forward slash)

For example:

- If a bar code contains the sequence "%U" somewhere within it, the wireless station converts this sequence to an [ENTER] key and processes it as soon as encountered in the scanning buffer.
- "+B" is converted to the lower case "b."
- "%B" is converted to an F11 key press.

" **NOTE:** *If you want the Encoded Code 39 option but the bar codes to be scanned already contain the "$," "%," "+," or "/," character, then each place where these characters occur must be expanded to a special "/" sequence:*

- *Every bar code where the "$" is maintained must be expanded to a "/D" sequence.*
- *Percent signs (%) must be expanded to "/E".*
- *Forward slashes (/) must be expanded to the letter "/O".*
- *Plus signs (+) must be expanded to "/K".*

Concatenation

When Encoded Code 39 is enabled, all bar codes are concatenated. This allows several separate bar code scans to be strung together into one input field. This feature is especially useful when using separate Encoded Code 39 bar codes to replace operator key presses.

Appendix A

Bar Code Scanning

Overview

This appendix contains reference data pertaining to enabling bar code algorithms and interpreting bar code data. Collecting and decoding bar code data are built-in features of wireless stations. The wireless station is programmed to support a variety of bar code scanning devices and decode all major bar code types.

Specific bar code algorithms are enabled either by scanner orders from the host computer, or by the terminal operator using the wireless station's firmware menus. Once a wireless station correctly decodes a bar code, the data is encoded with descriptive data about the decoded symbol.

The wireless station employs unique ASCII command codes to enable certain types of bar code algorithms and to format bar code data for return to the host computer. You can improve response time for your network by knowing the bar codes you use and limiting the wireless station to only those codes.

How to Enable Algorithms

To maximize wireless terminal and network performance, it is recommended that you enable only the bar code types required by your network and host application software. The more bar code algorithms enabled in the wireless station, the slower the response time. Likewise, the more types of bar codes the host application receives, the slower throughput time on processing bar code data.

How the Host Gets Bar Codes

The wireless station encodes descriptive data along with bar code data returned to the host computer. This encoded data indicates the type of bar code scanned and, in some instances, the length of the bar code data. Also included in the format may be check digits, start and stop digits, system digits, add-on digits, and flags.

Bar code data streams always begin with the bar code type followed by the bar code data. Table A-1 details the bar code types and the format of the bar code data string. Refer to the wireless station's user guide for the bar code types that the wireless station supports.

Table A-1
Bar Code Data String Formats

Type Code	Data Bar Code Type	Data Format *	Data Length **
0	UPC short	ndddddc	8
1	EAN short	fnddddc	8
2	UPC long	nddddddddddc	12
3	EAN long	fnddddddddddc	13
4	UPC short add-on 2	ndddddcaa	10
5	EAN short add-on 2	fnddddcaa	10
6	UPC long add-on 2	nddddddddddcaa	14
7	EAN long add-on 2	fnddddddddddcaa	15
8	UPC short add-on 5	ndddddcaaaaa	13
9	EAN short add-on 5	fnddddcaaaaa	13
:	UPC long add-on 5	nddddddddddcaaaaa	17
;	EAN long add-on 5	fnddddddddddcaaaaa	18
<	Interleaved 2 of 5	d.....d	1 to 31
=	Straight 2 of 5 ***	d.....d	1 to 31
Z	Computer Identics 2 of 5 ***	d.....d	1 to 31
>	Plessey	d.....dc	2 to 31
@	CODABAR	sd....ds	3 to 31
A	ABC CODABAR ***	sd....ds	6 to 31
P	Code 39	d.....d	1 to 31
Q	Extended Code 39	d.....d	1 to 31
R	Code 93 ***	d.....d	1 to 31
J	Code 128	d.....d	1 to 31

* Bar code data definitions:

n = Number system digits
d = Bar code digits
c = Check digits
f = EAN flag 1 characters
a = Add-on code digits
s = Start and stop digits

** If MOD 10 or MOD11 check digits are enabled, the digit falls at the end of a bar code data string. Each check digit enabled extends the length of the bar code data string by 1 character.

*** Not supported by PEN*KEY® 6400 Computer's internal engine.

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