Intermec
Technologies Corporation

3270 Terminal Emulation

PROGRAMMER'S REFERENCE GUIDE

P/N 977-047-040
Revision C
July 1998

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CONTENTS

TABLES

Section 1
Introduction

Purpose of This Guide

This programmer's reference guide describes the wireless network implementation of Systems Network Architecture and Synchronous Data Link Control (SNA/SDLC). INTERMEC® wireless terminal emulation stations emulate IBM products that communicate through the 3270 data stream.

The 3270 data stream governs the data flow between the host computer and wireless terminal emulation stations (called "wireless stations" throughout the rest of this guide). It specifies what data can be displayed on the wireless station and how it must be positioned. It also defines the types of data a wireless terminal emulation station can collect for each input field.

▶ NOTE: *The term "wireless terminal emulation stations" (or simply "wireless stations") refers to RT3210, RT1100, RT1700, and RT5900 Radio Terminals, and PEN*KEY® 6400 and 6500 Computers.*

The purpose of this programmer's guide is to define the differences between implementation of the data stream by IBM and adaptation of the 3270 data stream for the wireless stations. This guide contains descriptions of:

- How the wireless stations' keyboards and overlays emulate the IBM 3278 Model 2 terminal.
- 3270 display data stream commands and orders supported by the wireless stations.
- Extended commands for wireless stations.

Two types of 3270 products are available: those for an IBM midrange host computer (such as System/36, System/38, and AS/400) and those for personal computers serving as host. This programmer's guide describes products for IBM midrange host computers.

Intended Audience

This programmer's guide is prepared assuming you are already familiar with the operation of the 3270 data stream and equipment. The intended audience is the host computer programmer who needs to design interfaces to wireless stations set up for 3270 terminal emulation. This guide describes the subset of commands and orders that can be used for wireless stations on the network.

What to Read First

Before you begin, read the sections about the wireless stations you are designing interfaces to. The information will give you a basic understanding of the equipment you will be working with. You can also skim the appropriate data stream commands for programming guidance on the 3270 commands the wireless stations support.

If your wireless station network has not yet been installed, read first the installation and user guides provided with your hardware. The guide describes how to install the hardware and configure it 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 the wireless stations. This Introduction contains a brief overview of this programmer's guide. It also describes the components on the radio network.

Sections 2 through 7 describe how the wireless stations' annunciators and keyboards emulate IBM 3278 Model 2 terminal operation. Specific sections are:

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

The remaining sections do the following:

- Section 8, "Controller Commands" describes the controller commands used with the asynchronous data stream.
- Section 9, "Data Stream Commands" covers asynchronous wireless station command and orders, and the subset of 3270 SNA/SDLC commands and orders used to program the wireless stations.
- Section 10, "Extended Commands" describes the commands you can use to print, scan bar codes, and send communications over the wireless station's RS-232 port. Extended commands provide additional functions for physical characteristics that extend beyond the normal operation of an IBM 3278 Model 2 terminal.

- Appendixes contain bar code scanning information, conversion charts, and line configuration guides for IBM VTAM, System/36, System/38, AS/400 host computers, and Tandem.

Conventions

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

Convention	Meaning
ALL CAPS	Wireless station firmware menu options.
▶	Notes that you should read.
[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 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)**

Controllers and Gateways

RC3250 Controller SST User's Guide **(961-047-061)**

The user guide for the RC3250 Controller describes how to install, set up, and troubleshoot the controller.

RC4030E Gateway User's Guide **(961-047-087)**

The user guide for the RC4030E Gateway describes how to install, configure, and troubleshoot the gateway.

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 it.

Multiple Base Adapter

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

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

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.

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

This guide describes 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.

Other Publications

Application Developer's Kit Reference Manual **(961-051-001)**

This manual covers the commands that programmers can use to write various applications for the wireless stations.

IBM 3270 Information Display System Component Description

This reference manual provides more detailed descriptions of 3270 data stream commands than what is presented in this reference guide. This manual is available through IBM.

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

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

Radio Network Description

A radio network using the 3270 data stream corresponds directly to an IBM 3270 hard-wired network. A controller emulates an IBM 3174 or 3274 Control Unit. The wireless stations emulate IBM 3278 Model 2 terminals. The radio link between a base radio and wireless station replaces the coax link between a control unit and display station.

Programs are written for the wireless stations exactly as they would be written for a 3278 Model 2 terminal, with the exception of screen size and specific extensions. Nomenclature for commands, orders, and functions are the same where possible.

The following pages briefly describe the components on the radio network. For more information about each one, refer to its user's guide.

Host Computer

The radio network operates with a midrange host computer (IBM AS/400, System/36, System/38) or a mainframe (ES/9000, ESA/370, ES/3090, ES/4381) as a central distribution point for commands and data storage. Commands originate in the application program on the host computer.

The host computer using SNA/SDLC communicates in strings of EBCDIC characters. The asynchronous host commonly uses the ASCII character set. Asynchronous hosts include desktop computers and compatible PCs, and midrange computers using operating systems such as DOS, OS/2, and UNIX. Many types of computers (including some mainframe systems) use ASCII and the asynchronous data stream.

An asynchronous host is commonly used as a backup host. The wireless network supports both synchronous and asynchronous communications for the purpose. The sequence of events that make up the communication cycle is the same for any protocol, data stream, or system of transmission:

1. The host computer's operating system makes a connection with the controller, or vice versa.
2. Each wireless station starts a session with the host computer's operating system.
3. The wireless station selects the host connection and application.
4. The application communicates with the wireless station.

The host computer's application program serves as a conduit to the controller. The controller, in turn, serves as a distribution point for the radio network, maintaining the sessions for the wireless station. When a wireless station logs onto the system, the controller activates the host program. Based on data from the host computer, the controller program then controls the screens sent to the wireless station and uses the wireless station's responses to access or update the host computer's database.

Controller

The controller is the "gateway" that passes messages between a host computer and the wireless stations. The controller links the host computer to a base radio, which communicates with the portable wireless stations on the wireless network. The wired and wireless network is transparent to the host computer, which sees the wireless network as a set of desktop terminals.

The controller establishes a communication session with each wireless station to exchange digital information. While the wireless station's application program handles the individual wireless stations, the controller makes the complement of wireless stations look like a hard-wired network to the host computer operator.

For SNA/SDLC operations, a controller can emulate an IBM 3174 or 3274 Cluster Controller. One controller supports 64 logical units (LUs). These correspond with wireless station network addresses 0 through 63.

The IBM document GA23-0061-2, *3274 Control Unit Description and Programmer's Guide*, is a reference for the information in this programmer's guide. The controller supports the SNA/SDLC PU 2.0 protocol as described in the 3274 document.

Base Radios

Base radios (also called bridges and access points) directly connect to the network and pass information from the wireless stations to the controller. Multiple base radios can be hard-wired to the cable, or linked through a radio connection between base radios. Wireless stations passing from the coverage area of one base radio to another are tracked automatically by the network. This is called "roaming."

The controller communicates with the base radios over a wired network. Messages to the wireless stations from the controller are passed over the wired network to the base radio. The base radio converts the message into the protocol used by the wireless station, and distributes the message onto the network.

The wireless station receives the message over the radio link. The process of formatting and handling the messages between base radios and the wireless stations is transparent to the operator.

Base radios operate within the 900 MHz or 2.4 GHz (WLIF) frequency range. UHF base radios operate in the 450 to 470 MHz band of radio waves.

Wireless Stations

The wireless stations provide portable, wireless interactive data communication and support bar code scanning for real-time data collection. Their small size allows them to be used in applications for warehouses or plants to gather information through a keyboard or integrated bar code scanner. The wireless stations provide interactive communication between the operator and host computer.

Each wireless station monitors messages from the host computer and responds only to those containing its unique address number. This communication process allows commands and data to be received, stored, and processed. Data collected by the wireless station's keyboard or scanner is returned in a similar fashion. The controller buffers (saves) the data to be forwarded to the host computer.

The information in this programmer's guide applies to all wireless stations set up for 3270 terminal emulation. Wireless stations have UHF, 900 MHz, or WLIF radios.

Types of Radio Networks

The following pages briefly describe how radio networks emulate an IBM 3270 hard-wired network. Multiple network configurations are possible.

UHF Radio Network

A UHF radio network has the following components:

- Host computer
- RC3250 Controller
- RB3000, RB3001, RB3020, or RB3021 Base with UHF radio
- RT3210, RT1100, RT1700, or RT5900 Radio Terminals with UHF radios

Figure 1-1 shows a sample UHF radio network. Note how the radio link from the base radio to the wireless stations replaces the coax links (dotted lines) between the control unit and Model 2 terminals.

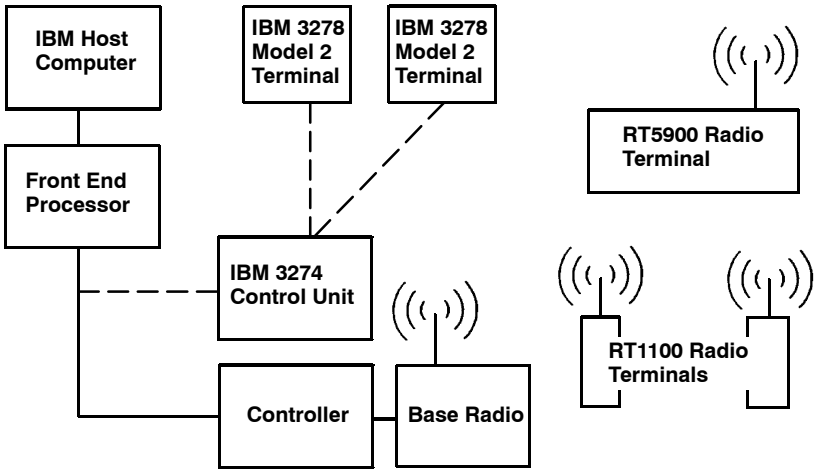


Figure 1-1
Sample UHF Radio Network

SST Radio Network With Ethernet Backbone

A radio network with an Ethernet backbone has the following components:

- Host computer
- RCB4030 Base/Controller
- RCB4030 Base/Controller with SST 900 MHz radio
- RT3210, RT1100, RT1700, or RT5900 Radio Terminals with 900 MHz radios

Figure 1-1 shows a sample radio network. Note how the radio links from the base radios to the wireless stations replace the coax links (dotted lines) between the control unit and Model 2 terminals.

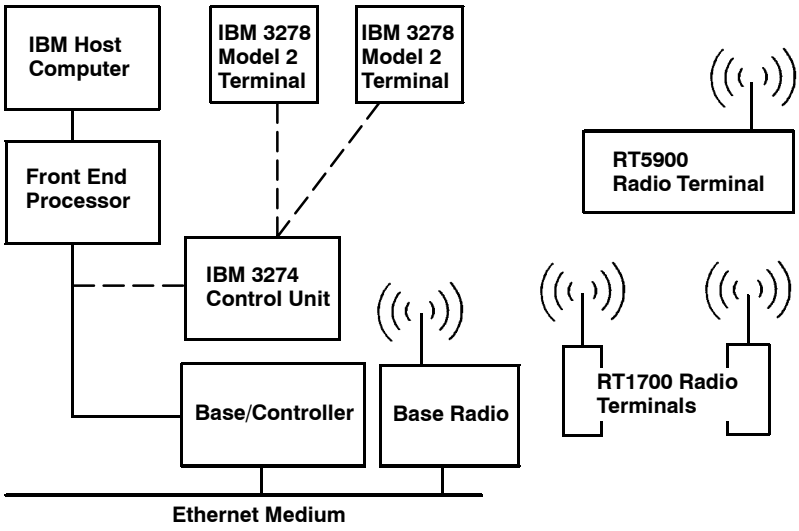


Figure 1-2
Sample SST Radio Network With Ethernet Medium

Open Wireless LAN

Open wireless LAN components connect to an Ethernet medium. Components include the following:

- Host computer
- RC4030E Gateway
- 6710 Access Point with synthesized UHF, 900 MHz, or WLIF radio
- Wireless stations with synthesized UHF, 900 MHz, or WLIF radios

Figure 1-1 shows a sample radio network with an RC4030E Gateway. Note how the radio links from the 6710 Access Point to the wireless stations replace the coax links (dotted lines) between the control unit and Model 2 terminals.

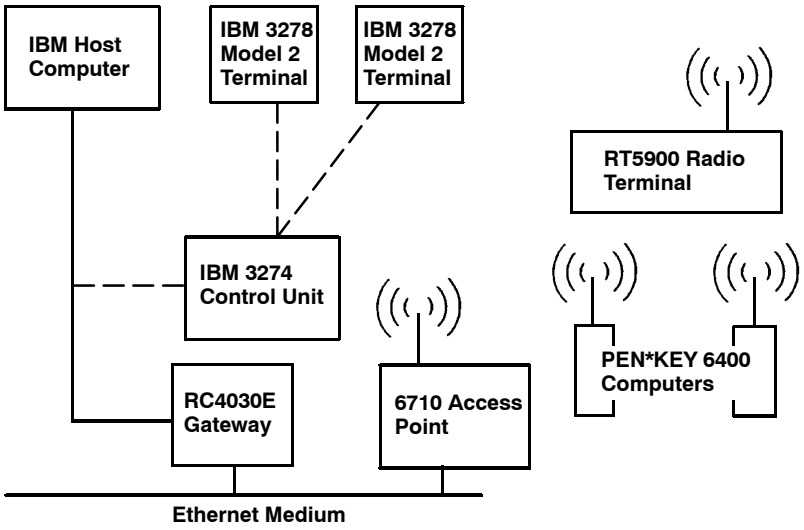


Figure 1-3
Sample Open Wireless LAN

Section 2

RT3210 Radio Terminal

Overview

The RT3210 Radio Terminal appears to the host computer as an IBM 3278 Model 2 terminal. To help you design interfaces to the radio terminal, this section describes the screen size, screen modes, annunciators, keyboard, and IBM display emulation for the radio terminal as part of the 3270 data stream.

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

RT3210 Radio Terminals are compatible with other radio terminals with UHF radio modules in the RT1100, RT1700, and RT5900 Series. This lets the RT3210 Radio Terminal work interchangeably with other radio terminals on a network.

▶ **NOTE:** *On a UHF network the RT3210, RT1100, RT1700, and RT5900 operate at 4800 baud only.*

You can set up the radio terminal through its firmware menus or from the host through the Set Parameters extended command. Extended commands are described in Section 10. For information about firmware menus, refer to the radio terminal's user guide.

Screen Size

The RT3210 Radio Terminal has a 128 by 128 pixel super-twist, liquid crystal display (LCD). The display shows radio terminal and host computer prompts, as well as data entered by the operator.

Because the IBM terminal has a screen size of 80 characters by 24 lines, the radio terminal presents a part of the information on the larger display station.

Character Sizes

The RT3210 Radio Terminal has two character sizes: a 5- by 7-dot, or a 7- by 9- dot set. Each dot occupies one pixel on the LCD display. The 5 by 7-dot characters are smaller, but allow the operator to view a larger portion of the 1920-byte buffer represented on the display station.

When the radio terminal powers up, it defaults to a 7- by 9-dot character size. This yields a usable screen size of 9 rows by 16 columns. The bottom row is reserved for annunciators and system messages. The total number of characters this size can display is 144. By using the firmware menus or the Set Parameters extended command, you can change the character size to the smaller 5- by 7-dot pixel characters. This yields a usable screen size of 15 lines by 21 characters (the bottom row is reserved for system use). The maximum number of characters with this size is 315.

Screen Modes

The radio terminal has these screen modes: center cursor, corner, page, lazy, and locked.

The modes present a window onto a standard IBM terminal's 80-character by 24-line 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. The display does not wrap around when the cursor reaches the top, bottom, or side boundaries of the larger 80x24 screen. 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 IBM 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 3270 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 IBM 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 IBM 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 IBM 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.

Annunciators

The RT3210 Radio Terminal's display reserves a location for icons or small pictures, called "annunciators," which show the radio terminal's current status or operation in progress. The following annunciators can appear in the radio terminal's display.

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

The radio terminal is **receiving** information from the base radio. 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 radio may not have power, or communications from the host computer to the base radio may not be properly set up.

The radio terminal's keyboard is in **function** mode. The key you press on the keyboard in combination with [FUNC] returns the function 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 **shift** mode. The letters you press on the keyboard after you press [SFT] will be in uppercase, until you press [SFT] again.

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**. The fast charge algorithm uses this annunciator to indicate the fully charged condition.

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

Input inhibited. Keyboard has accepted enough information for the defined input field. The "key ahead" feature stores keystrokes after this annunciator appears. These are saved for the next field.

Insert mode. The keyboard inserts characters instead of overwriting them.

Message waiting. The host has a message waiting for the radio terminal operator.

Keyboard

The radio terminal's 50-key keyboard (Figure 2-1) has shift keys, alphabetic keys, numeric and numeric function keys, 3278 SNA keys, and PF AID keys.

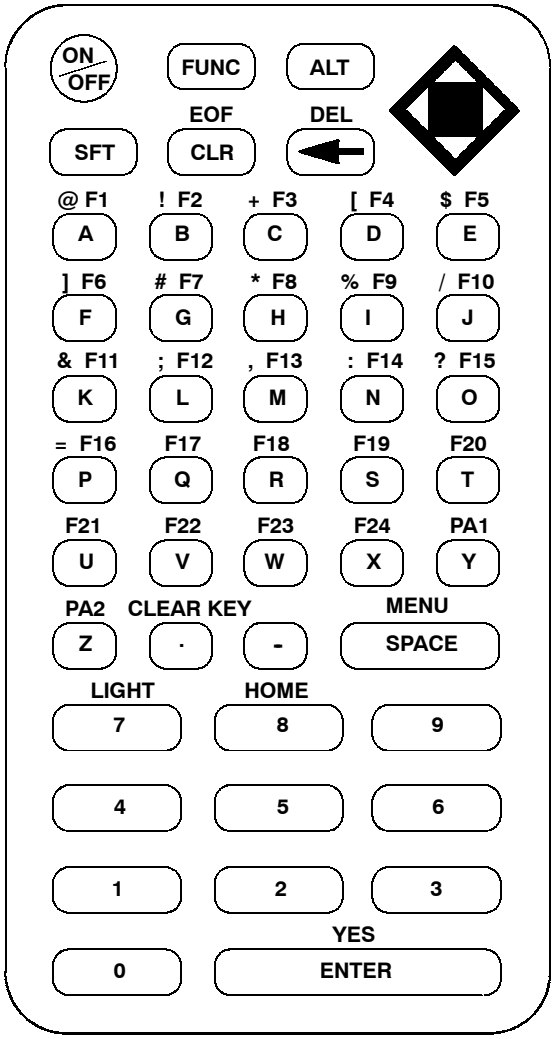


Figure 2-1
RT3210 Keyboard

Shift Keys

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

Shift Key	Description
[SFT]	Press [SFT] plus a letter to type the letter in uppercase. The [SFT] key is located near the top of the keyboard.
[FUNC]	The [FUNC] key (located at the top of the keyboard) puts the keyboard into function mode. Press the [FUNC] key plus a keyboard key to do an operation printed in black on the overlay.
[ALT]	The [ALT] key (located at the top of the keyboard) puts the keyboard into alternate mode. Press the [ALT] key plus a keyboard key to type a special character printed in yellow on the overlay.

Notice that the [FUNC] key is to the left of the [ALT] key. Characters and operations 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 above a key and to the right (yellow lettering) indicates alternate mode. For example:

- To type the special character "@" (printed in black on the overlay and to the left of F1), press [FUNC]+[A].
- Press [FUNC]+[U] to do the [F21] function (printed in black on the overlay).

When you press [SFT], [FUNC], or [ALT], an annunciator in the display indicates the current shift mode.

Alphabetic Keys

Press a letter without first pressing [SFT] to type a lowercase letter. Press [SFT] plus a letter to type the letter in uppercase. For example, [SFT]+[A] types a capital "A."

To lock the keyboard into shift mode press [SFT]. To unlock the keyboard press [SFT] again. The annunciator of an arrow pointing up means the keyboard is in shift mode.

Numeric Keys

Ten numeric keys (0 through 9) are arranged in a 10-key format on the bottom half of the keyboard. Use them to enter numeric data.

Numeric Function Keys

The radio terminal has 10 function keys (0 through 9) which perform local functions to modify the display buffer contents. To use a numeric function key, do the following:

1. Press [SFT] to put the radio terminal into shift mode.
2. Press the [FUNC] key plus the desired numeric key.

Two of the numeric function keys have preassigned definitions. Function 7 erases the entire display buffer and sends a message to the host in the form of a unique AID character (hexadecimal 6D) with no address or data. This tells the host that the RT3210 display buffer is empty. Function 9 erases all unprotected fields in the display buffer. This function sends no message to the host.

Special Characters

Table 2-1 describes how to type special characters.

Table 2-1
RT3210 Special Characters

Special Character	Press
@ (at)	[FUNC]+[A]
! (exclamation mark)	[FUNC]+[B]
+ (plus)	[FUNC]+[C]
[(left bracket)	[FUNC]+[D]
$ (dollar)	[FUNC]+[E]
] (right bracket)	[FUNC]+[F]
# (pound)	[FUNC]+[G]
* (asterisk)	[FUNC]+[H]
% (percent)	[FUNC]+[I]
/ (forward slash)	[FUNC]+[J]
& (ampersand)	[FUNC]+[K]
; (semicolon)	[FUNC]+[L]
, (comma)	[FUNC]+[M]
: (colon)	[FUNC]+[N]
? (question mark)	[FUNC]+[O]
= (equal)	[FUNC]+[P]

3278 SNA Keys

Table 2-2 describes 3278 SNA keys.

Table 2-2
RT3210 SNA Keys

3278 Key	Press	Description
Clear	[FUNC]+[.]	Erases from the cursor to the current unprotected end-of-field.
Clr	[CLR]	Erases the current unprotected field. Also sets the modified data tag (MDT) bit and does a reverse tab. A beep means the field is protected and cannot be erased.
Home	[FUNC]+[8]	Sends the cursor to the unprotected field in the display buffer. The first unprotected field is determined by the Insert Cursor order.
EOF	[FUNC]+[CLR]	Erases all data from the position of the cursor to the end of the unprotected field. The cursor remains in the same location. A beep indicates that the field is protected.
Delete	[←]	Deletes the character to the left of the cursor. All data located to the right of the cursor shifts left one position.

Table 2-2 (Continued)
RT3210 SNA Keys

3278 Key	Press	Description
Del	[FUNC]+[←]	Deletes the character over the cursor in the current unprotected field. All data located to the right of the cursor shifts left one position. A beep indicates the character is in a protected field and cannot be erased.
Enter	[ENTER]	Transmits all modified data fields to the host.

Cursor Movement Keys

The four cursor control keys in the upper right corner of the keyboard move the cursor within the screen buffer. Each key moves the cursor in the direction indicated by the arrow.

Cursor left and right move the cursor one character position at a time in the display buffer. The cursor up and down keys move the cursor up or down one line. The screen mode governs how the radio terminal represents this movement.

Attempting to move the cursor off the screen in any direction causes the window to shift in the direction of movement. This feature allows you to move the viewing window around within the larger IBM terminal's 80-character by 24-line screen (Figure 2-2).

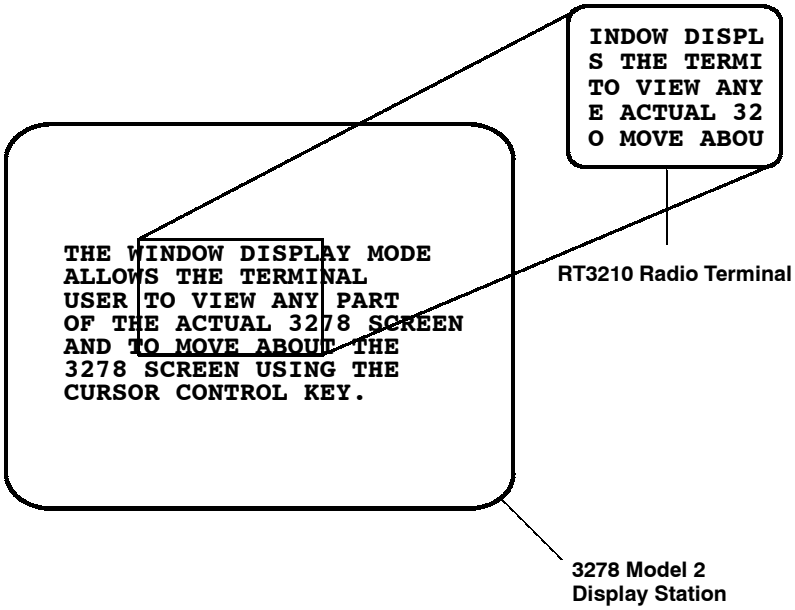


Figure 2-2
RT3210 Windowing Mode

Cursor location is not limited to the current window. All cursor movement keys respond just as they would on the 80x24 display.

Use the cursor control keys in combination with [FUNC] and [ALT] to move through the radio terminal's display a single space at a time or eight spaces at a time. The following chart shows key combinations.

To	Press
Forward tab	[▶]
Reverse tab	[◀]
Move 8 spaces up	[▲]
Move 8 spaces down	[▼]
Move 1 space right	[FUNC]+[▶]
Move 1 space left	[FUNC]+[◀]
Move 1 space up	[FUNC]+[▲]
Move 1 space down	[FUNC]+[▼]
Move 8 spaces right	[ALT]+[▶]
Move 8 spaces left	[ALT]+[◀]
Move 8 spaces up	[ALT]+[▲]
Move 8 spaces down	[ALT]+[▼]

AID Keys

The RT3210 Radio Terminal emulates the programmable function (PF) AID keys on the IBM terminal.

- Programmable function keys send modified input fields and AID key values to the host. The keys lock the keyboard until the host unlocks it.
- PA1 and PA2 keys send the AID key value to the host but leave the keyboard unlocked.
- The Clear AID key clears the data buffer but leaves the keyboard unlocked. It sends the Clear AID key value to the host.

The AID keys are emulated when you press [FUNC] plus an alphabetic identifier. The identifier depends on the particular program or function desired. Table 2-3 lists key sequences for AID keys. The AID code is the ASCII value of the letter pressed.

Table 2-3
RT3210 AID Keys

3278 AID Key	Press
PF1–PF24	[FUNC]+[A] – [FUNC]+[X]
PA1	[FUNC]+[Y]
PA2	[FUNC]+[Z]
Clear	FUNC]+[.]

Other Keys

Table 2-4 lists other radio terminal keys and their operations.

Table 2-4
Other RT3210 Keys

Operation	Press	Description
Menu	[FUNC]+ [MENU]	Brings up the radio terminal's main menu and firmware parameters.
Backlight	[FUNC]+[7]	Toggles the display's backlight on and off.

You can also use the keyboard for key ahead, scan ahead, and repeat key operations.

Key Ahead

Key ahead stores keystrokes after the Input Inhibited annunciator appears, and saves them for the next input field. The Input Inhibited annunciator appears on the status line while the radio terminal is waiting for the host to respond. Key ahead is enabled as a default but can be disabled through the radio terminal's firmware.

Scan Ahead

Scan ahead stores one bar code after the Input Inhibited annunciator appears, and saves it for the next input field. The Input Inhibited annunciator appears on the status line while waiting for the host to respond.

Key Repeat

Key repeat on the radio terminal's keyboard is similar to the key repeat on the IBM terminal. For example, to fill an input field with the letter "a," do one of the following:

- Press the "A" key repeatedly until the field is full.
- Press and hold the "A" key until the field is full.

Key repeat does not work with all keys. Table 2-5 shows which keys do and do not repeat.

Table 2-5
RT3210 Key Repeat

Repeating	Nonrepeating
Backspace	Alt
Del	Backlight
EBCDIC characters	Clear
Enter	Clr
Forward Tab	EOF
Reverse Tab	Func
Cursor control keys used with [FUNC] and [ALT]	Home
	Menu
	PA1
	PA2
	F1–F24
	Sft
	Shift Lock

Section 3

RT1100 Radio Terminal

Overview

The RT1100 Radio Terminal appears to the host computer as an IBM 3278 Model 2 terminal. To help you design interfaces to the radio terminal, this section describes the screen size, screen modes, annunciators, keyboard, and IBM display emulation for the radio terminal as part of the 3270 data stream.

▶ **NOTE:** *RT1100 Radio Terminals have UHF, 900 MHz, or 2.4 GHz radio modules.*

RT1100 Radio Terminals are compatible with RT3210 (UHF radio only), RT1700, and RT5900 Radio Terminals; and PEN*KEY® 6400 Computers (900 MHz and 2.4 GHz only). This lets the RT1100 Radio Terminal work interchangeably with other wireless stations on a network.

You can set up the radio terminal through its firmware menus or from the host through the Set Parameters extended command. Extended commands are described in Section 10. For information about firmware menus, refer to the radio terminal's user guide.

Screen Size

The RT1100 Radio Terminal has a supertwist, liquid crystal display with 4, 6, 8, or 9 lines with 12 or 16 characters per line. You can set the screen size through the radio terminal's firmware menus.

The display shows radio terminal and host computer prompts, as well as data entered by the operator. Because the IBM terminal has a screen size of 80 characters by 24 lines, the radio terminal presents a part of the information on the larger display station.

Screen Modes

The radio terminal has these screen modes: center cursor, corner, page, lazy, and locked. The modes present a window onto the standard IBM terminal's 80-character by 24-line 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. The display does not wrap around when the cursor reaches the top, bottom, or side boundaries of the larger 80x24 screen. 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 IBM terminal's screen that 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 3270 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 IBM 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 IBM 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 IBM 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.

Annunciators

The RT1100 Radio Terminal's display reserves a location for icons or small pictures, called "annunciators," which 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 radio.
CL	**Communications loss**. The radio terminal cannot communicate with the host computer. The radio terminal may be out of radio range, the base radio may not have power, or communication from the host to the access point may not be properly set up.
▲	The radio terminal's keyboard is in **shift** mode. The letter key you press while the keyboard is in this mode types the letter in uppercase.
◀	The radio terminal's keyboard is in **black shift** mode. The key you press while the keyboard is in this mode does the operation 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 keyboard is in this mode types the special character or does the operation printed in gold on the overlay and to the upper right of the key.

X

Input inhibited. The keyboard has accepted enough information for the defined input field. The "key ahead" feature stores keystrokes after "input inhibited" appears. These are saved for the next field.

Insert mode. The keyboard inserts characters instead of overwriting them.

C

The **battery** is charging.

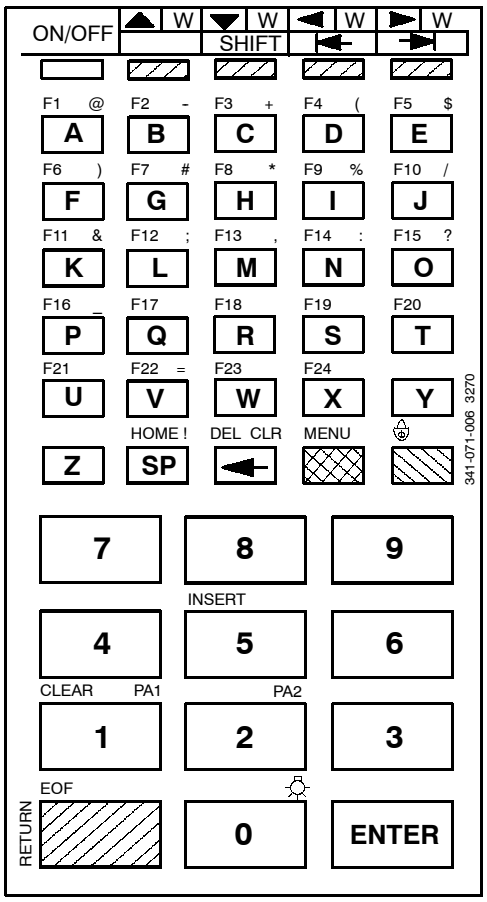
The **battery** needs to be recharged. When this annunciator appears, you will not be able to operate your radio terminal until you place it on a charger.

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.

Keyboard

The radio terminal's 47-key keyboard (Figure 3-1) has shift keys, alphabetic keys, numeric keys, 3278 SNA keys, and PF AID keys.



Unlabeled key colors:

Black

Gold

Brown

Figure 3-1
RT1100 Keyboard

Shift Keys

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

Shift Key	Description
[SHIFT]	Press the brown-colored [SHIFT] key plus a letter to type the letter in uppercase. The [SHIFT] key is located near the top of the keyboard.
[GOLD]	The gold-colored key puts the keyboard into gold shift mode. Press the [GOLD] key plus a keyboard key to type a special character or do an operation printed in gold on the overlay.
[BLACK]	The black-colored key puts the keyboard into black shift mode. Press the [BLACK] key plus a keyboard key to do an operation printed in black on the overlay.

The special characters and functions printed on the overlay are color-coded to correspond with the shift keys. For example:

- To type the special character "@" (printed in gold on the overlay), press [GOLD]+[A].
- Press [BLACK]+[U] to do the [F21] function (printed in black on the overlay).

When you press [SHIFT], [GOLD], or [BLACK], an annunciator in the display indicates the current shift mode.

The [RETURN] key has its operation printed to the left of it. The operation printed to the left is its *unshifted* value. The operation printed above [RETURN] is the *shifted* value.

Alphabetic Keys

Press a letter without first pressing [SHIFT] to type a lowercase letter. Press [SHIFT] plus a letter to type the letter in uppercase. For example, [SHIFT]+[A] types a capital "A."

To lock the keyboard into shift mode, press [BLACK]+[GOLD]. To unlock the keyboard, press [BLACK]+[GOLD] again. The annunciator of a triangle pointing up means the keyboard is in shift mode.

Numeric Keys

Ten numeric keys (0 through 9) are arranged in a 10-key format on the bottom half of the keyboard. Use them to enter numeric data.

Special Characters

Table 3-1 describes how to type special characters.

Table 3-1
RT1100 Special Characters

Special Character	Press
@ (at)	[GOLD]+[A]
- (minus)	[GOLD]+[B]
+ (plus)	[GOLD]+[C]
((left parenthesis)	[GOLD]+[D]
$ (dollar)	[GOLD]+[E]
) (right parenthesis)	[GOLD]+[F]
# (pound)	[GOLD]+[G]
* (asterisk)	[GOLD]+[H]

Table 3-1 (Continued)
RT1100 Special Characters

Special Character	Press
% (percent)	[GOLD]+[I]
/ (forward slash)	[GOLD]+[J]
& (ampersand)	[GOLD]+[K]
; (semicolon)	[GOLD]+[L]
, (comma)	[GOLD]+[M]
: (colon)	[GOLD]+[N]
? (question mark)	[GOLD]+[O]
_ (underscore)	[GOLD]+[P]
= (equal)	[GOLD]+[V]
! (exclamation mark)	[GOLD]+[SP]

3278 SNA Keys

Table 3-2 describes 3278 SNA keys.

Table 3-2
RT1100 SNA Keys

3278 Key	Press	Description
Clear	[BLACK]+[1]	Erases from the cursor to the current unprotected end-of-field.
Clr	[GOLD]+[←]	Erases the current unprotected field. Also sets the MDT bit and does a reverse tab. A beep means the field is protected and cannot be erased.
Home	[BLACK]+[SP]	Sends the cursor to the unprotected field in the display buffer. The first unprotected field is determined by the Insert Cursor order.

Table 3-2 (Continued)
RT1100 SNA Keys

3278 Key	Press	Description
EOF	[BLACK]+ [RETURN]	Erases all data from the position of the cursor to the end of the unprotected field. The cursor remains in the same location. A beep indicates that the field is protected.
Delete	[←]	Deletes the character to the left of the cursor. All data located to the right of the cursor shifts left one position.
Del	[BLACK]+[←]	Deletes the character over the cursor in the current unprotected field. All data located to the right of the cursor shifts left one position. A beep indicates the character is in a protected field and cannot be erased.
Enter	[ENTER]	Transmits all modified data fields to the host.
Insert	[BLACK]+[5]	Toggles between insert mode and normal mode. In insert mode characters are inserted instead of overwritten.
Return	[RETURN]	Moves cursor to the first position on the next line.

Cursor Movement Keys

The four cursor control keys at the top of the keyboard move the cursor within the screen buffer. Each key moves the cursor in the direction indicated by the arrow.

Cursor left and right move the cursor one character position at a time in the display buffer. The cursor up and down keys move the cursor up or down one line. The screen mode governs how the radio terminal represents this movement.

Attempting to move the cursor off the screen in any direction causes the window to shift in the direction of movement. This feature allows you to move the viewing window around within the larger IBM terminal's 80-character by 24-line screen (Figure 3-2).

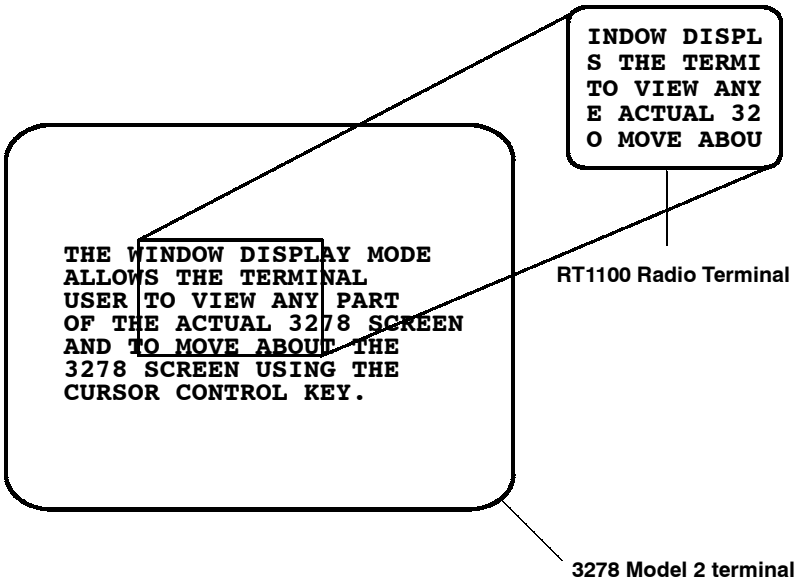


Figure 3-2
RT1100 Terminal Display Windowing Mode

Cursor location is not limited to the current window. All cursor movement keys respond just as they would on the 80x24 display.

Use the cursor control keys in combination with [BLACK] and [GOLD] to move through the radio terminal's display a single space at a time or eight spaces at a time. The following chart shows key combinations.

To	Press
Forward Tab	→|
Reverse Tab	|←
Move 1 space right	[GOLD]+[▶]
Move 1 space left	[GOLD]+[◀]
Move 1 space up	[GOLD]+[▲]
Move 1 space down	[GOLD]+[▼]
Move 8 spaces right	[BLACK]+[▶]
Move 8 spaces left	[BLACK]+[◀]
Move 8 spaces up	[BLACK]+[▲]
Move 8 spaces down	[BLACK]+[▼]

AID Keys

The RT1100 Radio Terminal emulates all of the AID-generating keys on the IBM terminal.

- Programmable function keys F1 through F24 send modified input fields and AID key values to the host. The keys lock the keyboard until the host unlocks it. The function keys are used exclusively for 3270 AID key emulation.

- PA1 and PA2 keys send the AID key value to the host but leave the keyboard unlocked.
- The Clear AID key clears the data buffer but leaves the keyboard unlocked. It sends the Clear AID key value to the host.

The AID keys are emulated when you press [BLACK] plus an alphabetic identifier. The identifier depends on the particular program or function desired. Table 3-3 lists key sequences for AID-generating keys. The AID code is the ASCII value of the letter pressed.

Table 3-3
RT1100 AID-Generating Keys

3278 AID Key	Press
PF1–PF24	[BLACK]+[A] – [BLACK]+[X]
Clear	[BLACK]+[1]
PA1	[GOLD]+[1]
PA2	[GOLD]+[2]

Other Keys

Table 3-4 lists other radio terminal keys and their operations.

Table 3-4
Other RT1100 Keys

Operation	Press	Description
Menu	[GOLD]+ [BLACK]	Brings up the radio terminal's main menu and firmware parameters.
Backlight	[GOLD]+[0]	Toggles the display's backlight on and off.

You can also use the keyboard for key ahead and scan ahead operations.

Key Ahead

Key ahead stores keystrokes after the Input Inhibited annunciator appears, and saves them for the next input field. The Input Inhibited annunciator appears on the status line while the radio terminal is waiting for the host to respond. Key ahead is enabled as a default but can be disabled through the radio terminal's firmware.

Scan Ahead

Scan ahead stores one bar code after the Input Inhibited annunciator appears, and saves it for the next input field. The Input Inhibited annunciator appears on the status line while waiting for the host to respond.

Section 4

RT1700 Radio Terminal

Overview

The RT1700 Radio Terminal appears to the host computer as an IBM 3278 Model 2 terminal. To help you design interfaces to the radio terminal, this section describes the screen size, screen modes, annunciators, keyboards, and IBM display emulation for the radio terminal as part of the 3270 data stream.

▶ **NOTE:** *RT1700 Radio Terminals have UHF, 900 MHz, or 2.4 GHz radio modules.*

RT1700 Radio Terminals are compatible with RT3210 (UHF radio only), RT1100, and RT5900 Radio Terminals; and PEN*KEY® 6400 Computers (900 MHz and 2.4 GHz only). This lets the RT1700 Radio Terminal work interchangeably with other wireless stations on a network.

You can set up the radio terminal through its firmware menus or from the host through the Set Parameters extended command. Extended commands are described in Section 10. For information about firmware menus, refer to the radio terminal's user guide.

Screen Size

The RT1700 Radio Terminal has a supertwist, liquid crystal display with 12, 17, 22, or 26 characters per line by 4, 6, 8, 10, 12, 15, or 21 lines. You can set the screen size through the radio terminal's firmware menus.

The display shows radio terminal and host computer prompts, as well as data entered by the operator. Because the IBM terminal has a screen size of 80 characters by 24 lines, the radio terminal presents a part of the information on the larger display station.

Screen Modes

The radio terminal has these screen modes: center cursor, corner, page, lazy, and locked. The modes present a window onto a standard IBM terminal's 80-character by 24-line 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. The display does not wrap around when the cursor reaches the top, bottom, or side boundaries of the larger 80x24 screen. 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 IBM 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 5250 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 IBM 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 IBM 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.

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.

Annunciators

The RT1700 Radio Terminal's display reserves a location for icons or small pictures, called "annunciators," which 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 radio.
CL	**Communications loss**. The radio terminal cannot communicate with the host computer. The radio terminal may be out of radio range, the base radio may not have power, or communication from the host to the access point may not be properly set up.

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

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

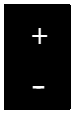
Input inhibited. The keyboard has accepted enough information for the defined input field. The "key ahead" feature stores keystrokes after this annunciator appears. These are saved for the next field.

Insert mode. The keyboard inserts characters instead of overwriting them.

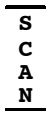
Message waiting. The host has a message waiting for the radio terminal operator.

C

The **battery** is charging.



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.



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.

Keyboard

The RT1700 Radio Terminal has a standard 57-key keyboard or a 37-key keyboard.

57-Key Keyboard

The 57-key keyboard (Figure 4-1) has shift keys, alphabetic keys, numeric keys, 3278 SNA keys, and PF AID keys.

37-Key Keyboard

The 37-key keyboard (Figure 4-2) has standard numeric keys, an [ENTER] key, and user-defined function keys in its primary plane. It has alphabetic keys and special characters in its secondary plane.

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

- To access password-protected menus, press [F12] and then [F11], and then 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.

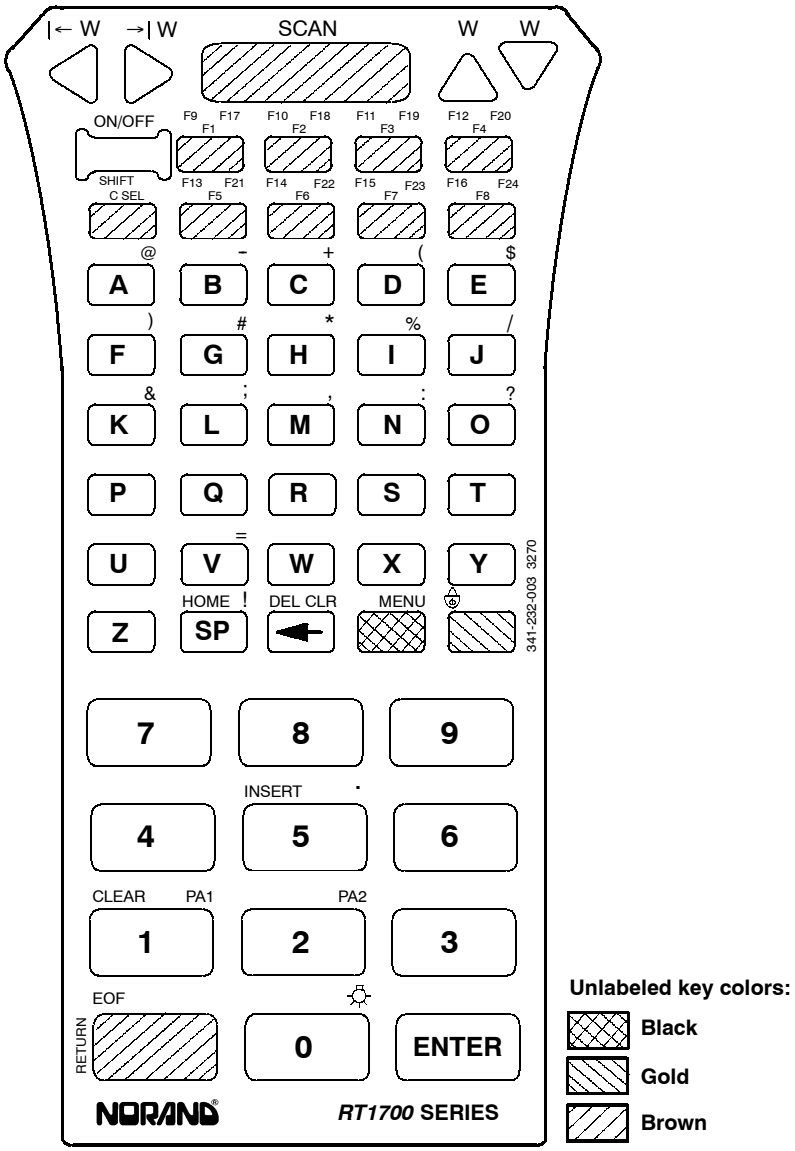


Figure 4-1
RT1700 57-Key Keyboard

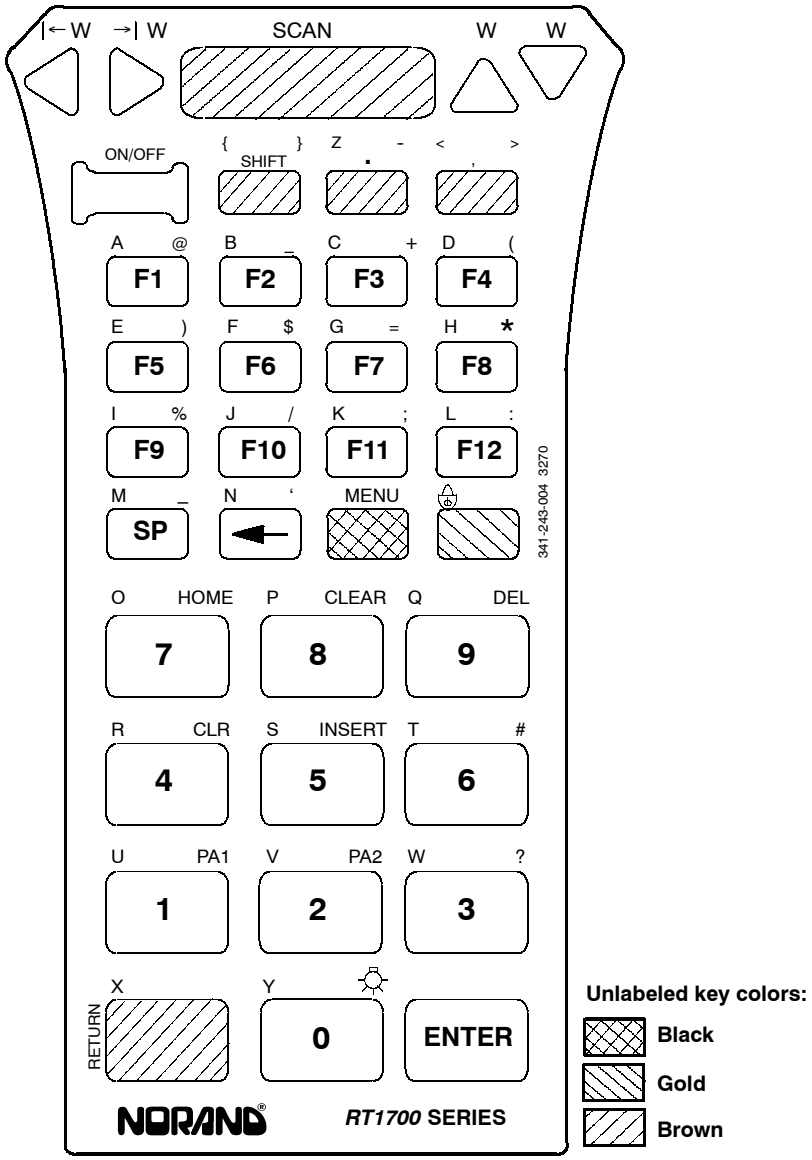


Figure 4-2
RT1700 37-Key Keyboard

Shift Keys

Use the shift keys on the 57- and 37-key keyboards to type uppercase letters and special characters, and to do special functions. Shift keys are described in the following chart.

Shift Key	Description
[SHIFT]	Press the [SHIFT] key plus a letter to type the letter in uppercase. The [SHIFT] key is located near the top of the keyboard.
[GOLD]	The gold-colored key puts the keyboard into gold shift mode. Press [GOLD] plus a keyboard key to type a character or do an operation printed in gold on the overlay.
[BLACK]	The black-colored key puts the keyboard into black shift mode. Press [BLACK] plus a keyboard key to do an operation printed in black on the overlay.

The special characters and functions printed on the overlay are color-coded to correspond with the shift keys. For example:

- On the 57-key keyboard, to type the special character "@" (printed in gold on the overlay), press [GOLD]+[A].
- On the 57-key keyboard, press [BLACK]+[F5] to do the F13 function (printed in black on the overlay).
- On the 37-key keyboard, press [GOLD]+[F4] to type the special character "(" (printed in gold on the overlay).

The [RETURN] key has its operation printed to the left of it. The operation printed to the left is its *unshifted* value. The operations printed above [RETURN] are the *shifted* values.

Alphabetic Keys

On the 57-key keyboard, press a letter without first pressing [SHIFT] to type a lowercase letter. Press [SHIFT] plus a letter to type the letter in uppercase. For example, [SHIFT]+[A] types a capital "A."

Table 4-1 describes how to type letters on the 37-key keyboard.

Table 4-1
RT1700 Letters, 37-Key Keyboard

Letter	37-Key Keyboard
a–l	[BLACK]+[F1] – [SHIFT]+[F12]
m	[BLACK]+[SP]
n	[BLACK]+[←]
o–w	[BLACK]+[F7] – [SHIFT]+[3]
x	[BLACK]+[RETURN]
y	[BLACK]+[0]
z	[BLACK]+[.]
A–L	[SHIFT]+[F1] – [SHIFT]+[F12]
M	[SHIFT]+[SP]
N	[SHIFT]+[←]
O–W	[SHIFT]+[7] – [SHIFT]+[3]
X	[SHIFT]+[RETURN]
Y	[SHIFT]+[0]
Z	[SHIFT]+[.]

To lock the keyboard into shift mode, press [BLACK]+[GOLD]. To unlock the keyboard, press [BLACK]+[GOLD] again. The annunciator of a triangle pointing up means the keyboard is in shift mode.

Numeric Keys

Numeric keys are arranged in a 10-key format on the bottom half of the 57- and 37-key keyboards. Use the numbers to enter numeric data.

Special Characters

Table 4-2 describes how to type special characters on the 57-key and 37-key keyboards.

Table 4-2
RT1700 Special Characters

Special Character	57-Key Keyboard	37-Key Keyboard
@ (at)	[GOLD]+[A]	[GOLD]+[F1]
– (minus)	[GOLD]+[B]	[GOLD]+[SP]
+ (plus)	[GOLD]+[C]	[GOLD]+[F3]
((left parenthesis)	[GOLD]+[D]	[GOLD]+[F4]
$ (dollar)	[GOLD]+[E]	[GOLD]+[F6]
) (right parenthesis)	[GOLD]+[F]	[GOLD]+[F5]
# (pound)	[GOLD]+[G]	[GOLD]+[6]
* (asterisk)	[GOLD]+[H]	[GOLD]+[F8]
% (percent)	[GOLD]+[I]	[GOLD]+[F9]
/ (forward slash)	[GOLD]+[J]	[GOLD]+[F10]
& (ampersand)	[GOLD]+[K]	Not applicable
; (semicolon)	[GOLD]+[L]	[GOLD]+[F11]
, (comma)	[GOLD]+[M]	[,]
: (colon)	[GOLD]+[N]	[GOLD]+[F12]
? (question mark)	[GOLD]+[O]	[GOLD]+[3]
= (equal)	[GOLD]+[V]	[GOLD]+[F7]
! (exclamation mark)	[GOLD]+[SP]	Not applicable
. (period)	[GOLD]+[5]	[.]

Table 4-2 (Continued)
RT1700 Special Characters

Special Character	57-Key Keyboard	37-Key Keyboard
< (left angle bracket)	Not applicable	[BLACK]+[,]
> (right angle bracket)	Not applicable	[GOLD]+[,]
_ (underscore)	Not applicable	[GOLD]+[F2]
{ (left brace)	Not applicable	[BLACK]+[SHIFT]
} (right brace)	Not applicable	[GOLD]+[SHIFT]

3278 SNA Keys

Table 4-3 describes 3278 SNA keys.

Table 4-3
RT1700 SNA Keys

3278 Key	57-Key Keyboard	37-Key Keyboard	Description
Clear	[BLACK]+[1]	[GOLD]+[8]	Erases from the cursor to the current unprotected end-of-field.
Clr	[GOLD]+[←]	[GOLD]+[4]	Erases the current unprotected field. Also sets the MDT bit and does a reverse tab. A beep means the field is protected and cannot be erased.
Home	[BLACK]+[SP]	[GOLD]+[7]	Sends the cursor to the unprotected field in the display buffer. The first unprotected field is determined by the Insert Cursor order.
EOF	[BLACK]+ [RETURN]	[GOLD]+ [RETURN]	Erases all data from the position of the cursor to the end of the unprotected field. The cursor remains in the same location. A beep indicates that the field is protected.

Table 4-3 (Continued)
RT1700 SNA Keys

3278 Key	57-Key Keyboard	37-Key Keyboard	Description
Delete	[←]	[←]	Deletes the character to the left of the cursor. All data located to the right of the cursor shifts left one position.
Del	[BLACK]+[←]	[GOLD]+[9]	Deletes the character over the cursor in the current unprotected field. All data located to the right of the cursor shifts left one position. A beep indicates the character is in a protected field and cannot be erased.
Enter	[ENTER]	[ENTER]	Transmits all modified data fields to the host.
Insert	[BLACK]+[5]	[GOLD]+[5]	Toggles between insert mode and normal mode. In insert mode characters are inserted instead of overwritten.
Return	[RETURN]	[RETURN]	Moves cursor to the first position on the next line.
Reset	[▶]	[▶]	Resets from an error condition.

Cursor Movement Keys

The four cursor control keys at the top of the keyboard move the cursor within the screen buffer. Each key moves the cursor in the direction indicated by the arrow.

Cursor left and right move the cursor one character position at a time in the display buffer. The cursor up and down keys move the cursor up or down one line. The screen mode governs how the radio terminal represents this movement.

Attempting to move the cursor off the screen in any direction causes the window to shift in the direction of movement. This feature allows you to move the viewing window around within the larger IBM terminal's 80-character by 24-line screen (Figure 4-3).

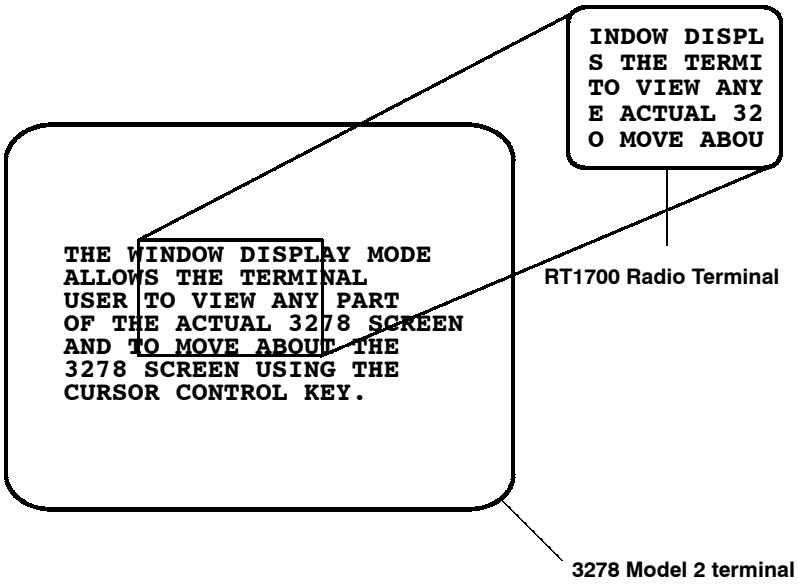


Figure 4-3
RT1700 Windowing Mode

Cursor location is not limited to the current window. All cursor movement keys respond just as they would on the 80x24 display.

Use the cursor control keys in combination with [BLACK] and [GOLD] to move through the radio terminal's display a single space at a time or eight spaces at a time. The following chart shows key combinations for the 57- and 37-key keyboards.

To	Press
Forward Tab	[GOLD]+[▶]
Reverse Tab	[GOLD]+[◀]
Move 1 space right	[GOLD]+[▶]
Move 1 space left	[GOLD]+[◀]
Move 1 space up	[GOLD]+[▲]
Move 1 space down	[GOLD]+[▼]
Move 8 spaces right	[BLACK]+[▶]
Move 8 spaces left	[BLACK]+[◀]
Move 8 spaces up	[BLACK]+[▲]
Move 8 spaces down	[BLACK]+[▼]

AID Keys

The RT1700 Radio Terminal emulates all of the AID-generating keys on the IBM terminal.

- Programmable function keys F1 through F24 send modified input fields and AID key values to the host. The keys lock the keyboard until the host unlocks it. The function keys are used exclusively for 3270 AID key emulation.
- PA1 and PA2 keys send the AID key value to the host but leave the keyboard unlocked.
- The Clear AID key clears the data buffer but leaves the keyboard unlocked. It sends the Clear AID key value to the host.

The AID keys are emulated when you press [BLACK] plus an alphabetic identifier. The identifier depends on the particular program or function desired. Table 4-4 lists key sequences for AID-generating keys. The AID code is the ASCII value of the letter pressed.

Table 4-4
RT1700 AID-Generating Keys

3278 AID Key	57-Key Keyboard	37-Key Keyboard
PF1–PF12	[BLACK]+[A] – [BLACK]+[L]	[F1] – [F12]
PF13–PF24	[BLACK]+[M] – [BLACK]+[X]	Not applicable
PA1	[BLACK]+[Y]	[GOLD]+[1]
PA2	[BLACK]+[Z]	[GOLD]+[2]
Clear	[BLACK]+[1]	[GOLD]+[8]

Other Keys

Table 4-5 describes other radio terminal keys on the 57- and 37-key keyboards.

Table 4-5
Other RT1700 Keys

Operation	Press	Description
Menu	[GOLD]+ [BLACK]	Brings up the radio terminal's main menu and firmware parameters.
Backlight	[GOLD]+[0]	Toggles display's backlight on and off.

You can also use the keyboard to do key ahead, scan ahead, and repeat key operations.

Key Ahead

Key ahead stores keystrokes after the Input Inhibited annunciator appears, and saves them for the next input field. The Input Inhibited annunciator appears on the status line while the radio terminal is waiting for the host to respond. Key ahead is enabled as a default but can be disabled through the radio terminal's firmware.

Scan Ahead

Scan ahead stores one bar code after the Input Inhibited annunciator appears, and saves it for the next input field. The Input Inhibited annunciator appears on the status line while waiting for the host to respond.

Key Repeat

Key repeat on the radio terminal's keyboard is similar to the key repeat on the IBM terminal. For example, to fill an input field with the letter "a," do one of the following:

- Press the "A" key repeatedly until the field is full.
- Press and hold the "A" key until the field is full.

Key repeat does not work with all keys. Table 4-6 shows which keys do and do not repeat.

Table 4-6
RT1700 Key Repeat

Repeating	Nonrepeating
Backspace	Backlight
Del	Clear
EBCDIC characters	Clr
Enter (Yes)	EOF
Forward Tab	Home
Reverse Tab	Menu
Cursor control keys used with [BLACK] and [SHIFT]	PA1
	PA2
	PF1–PF24
	Return
	Shift
	Shift Lock

Section 5

RT5900 Radio Terminal

Overview

The RT5900 Mobile Mount Radio Terminal appears to the host computer as an IBM 3278 Model 2 terminal. To help you design interfaces to the radio terminal, this section describes the screen size, screen modes, annunciators, keyboard, and IBM display emulation for the radio terminal as part of the 3270 data stream.

▶ **NOTE:** *RT5900 Radio Terminals have UHF, 900 MHz, or 2.4 GHz radios.*

RT5900 Radio Terminals are compatible with RT3210 (UHF radio only), RT1100, and RT1700 Radio Terminals; and PEN*KEY® 6400 Computers (900 MHz and 2.4 GHz only). This lets the RT5900 Radio Terminal work interchangeably with other wireless stations on a network.

You can set up the radio terminal through its firmware menus or from the host through the Set Parameters extended command. Extended commands are described in Section 10. For information about firmware menus, refer to the radio terminal's user guide.

Screen Size

The RT5900 Radio Terminal has a 2.5 by 9 inch, super-twist, liquid crystal display with 480 by 128 pixels. It can display 8, 10, 12, 16, or 25 lines and 40, 60, or 80 characters per line. You can set the screen size through the radio terminal's firmware menus.

The display shows radio terminal and host computer prompts, as well as data entered by the operator. Because the IBM terminal has a screen size of 80 characters by 24 lines, the radio terminal presents a part of the information on the larger display station.

Screen Modes

The radio terminal has these screen modes: center cursor, corner, page, lazy, and locked. The modes present a window onto a standard IBM terminal's 80-character by 24-line 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. The display does not wrap around when the cursor reaches the top, bottom, or side boundaries of the larger 80x24 screen. 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 IBM 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 3270 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 IBM 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 IBM 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 IBM 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.

Annunciators

The RT5900 Radio Terminal's display reserves a location for icons or small pictures, called "annunciators," which show the radio terminal's current status or operation in progress. You can change an annunciator's location in the display through the radio terminal's firmware menus. Refer to the radio terminal's user guide for more information about the annunciators. The following annunciators can appear in the radio terminal's display.

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

The radio terminal is **receiving** information from the base radio.

Communication loss. The radio terminal cannot communicate with the host computer. The radio terminal may be out of radio range, the base radio may not have power, or communication from the host to the base radio may not be properly set up.

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

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

Input inhibited. The keyboard has accepted enough information for the defined input field. The "key ahead" feature stores keystrokes after this annunciator appears. They are saved for the next field.

Insert mode. The keyboard inserts characters instead of overwriting them.

High speed. The base radio is transmitting at 9600 bps (versus 4800 bps).

Keyboard

The radio terminal's 58-key keyboard (Figure 5-1) has shift keys, alphabetic keys, numeric keys, 3278 SNA keys, and PF AID keys.

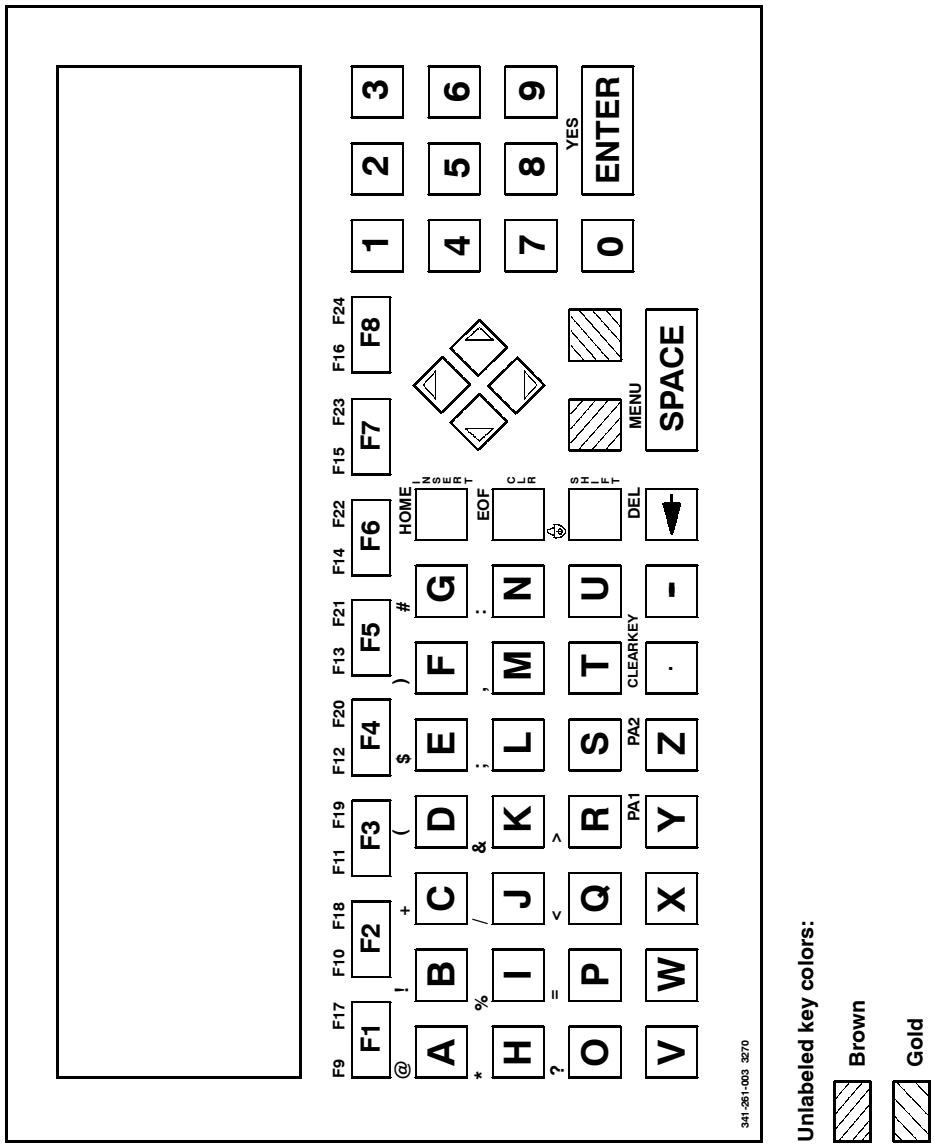


Figure 5-1
RT5900 Keyboard

Shift Keys

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

Shift Key	Description
[SHIFT]	Press [SHIFT] plus a letter to type the letter in uppercase.
[BROWN]	The brown-colored key puts the keyboard into brown shift mode. Press the [BROWN] key plus a keyboard key to do an operation printed in brown on the overlay.
[GOLD]	The gold-colored key puts the keyboard into gold shift mode. Press the [GOLD] key plus a keyboard key to type a special character or do an operation printed in gold on the overlay.

The special characters and functions printed on the overlay are color-coded to correspond with the shift keys. For example:

- To type the special character "@" (printed in brown on the overlay), press [BROWN]+[A].
- Press [GOLD]+[F1] to do the [F17] function (printed in gold on the overlay).

When you press [SHIFT], [BROWN], or [GOLD], an annunciator in the display indicates the current shift mode.

The [INSERT], [CLR], and [SHIFT] keys have their operations printed to the right of them. Operations printed to the right are the *unshifted* values. Operations printed above the keys are the *shifted* values.

Alphabetic Keys

Press a letter without first pressing [SHIFT] to type a lowercase letter. Press [SHIFT] plus a letter to type the letter in uppercase. For example, [SHIFT]+[A] types a capital "A."

To lock the keyboard into shift mode, press [BROWN]+[SHIFT]. To unlock the keyboard, press [BROWN]+[SHIFT] again. The annunciator of a triangle pointing up means the keyboard is in shift mode.

Numeric Keys

Ten numeric keys are arranged in a 10-key format on the right side of the keyboard. Use them to enter numeric data.

Special Characters

Table 5-1 describes how to type special characters.

Table 5-1
RT5900 Special Characters

Special Character	Press
@ (at)	[BROWN]+[A]
! (exclamation mark)	[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]

Table 5-1 (Continued)
RT5900 Special Characters

Special Character	Press
/ (forward slash)	[BROWN]+[J]
& (ampersand)	[BROWN]+[K]
; (semicolon)	[BROWN]+[L]
, (comma)	[BROWN]+[M]
: (colon)	[BROWN]+[N]
? (question mark)	[BROWN]+[O]
= (equal)	[BROWN]+[P]
< (left angle bracket)	[BROWN]+[Q]
> (right angle bracket)	[BROWN]+[R]

3278 SNA Keys

Table 5-2 describes 3278 SNA keys.

Table 5-2
RT5900 SNA Keys

SNA Key	Press	Description
Clear	[GOLD]+[.]	Erases from the cursor to the current unprotected end-of-field.
Clr	[CLR]	Erases the current unprotected field. Also sets the MDT bit and does a reverse tab. A beep means the field is protected and cannot be erased.
Home	[GOLD]+ [INSERT]	Sends the cursor to the unprotected field in the display buffer. The first unprotected field is determined by the Insert Cursor order.

Table 5-2 (Continued)
RT5900 SNA Keys

SNA Key	Press	Description
EOF	[GOLD]+ [CLR]	Erases all data from the position of the cursor to the end of the unprotected field. The cursor itself remains in the same location. A beep indicates that the field is protected.
Delete	[←]	Deletes the character to the left of the cursor. All data located to the right of the cursor shifts left one position.
Del	[GOLD]+[←]	Deletes the character over the cursor in the current unprotected field. All data located to the right of the cursor shifts left one position. A beep indicates the character is in a protected field and cannot be erased.
Enter	[ENTER]	Transmits all modified data fields to the host.
Insert	[INSERT]	Toggles between insert mode and normal mode. In insert mode characters are inserted instead of overwritten.

Cursor Movement Keys

The four cursor control keys in the upper-right center of the keyboard move the cursor within the screen buffer. Each key moves the cursor in the direction indicated by the arrow.

Cursor left and right move the cursor one character position at a time in the display buffer. The cursor up and down keys move the cursor up or down one line. The screen mode governs how the radio terminal represents this movement.

Attempting to move the cursor off the screen in any direction causes the window to shift in the direction of movement. This feature allows you to move the viewing window around within the larger IBM terminal's 80-character by 24-line screen (Figure 5-2).

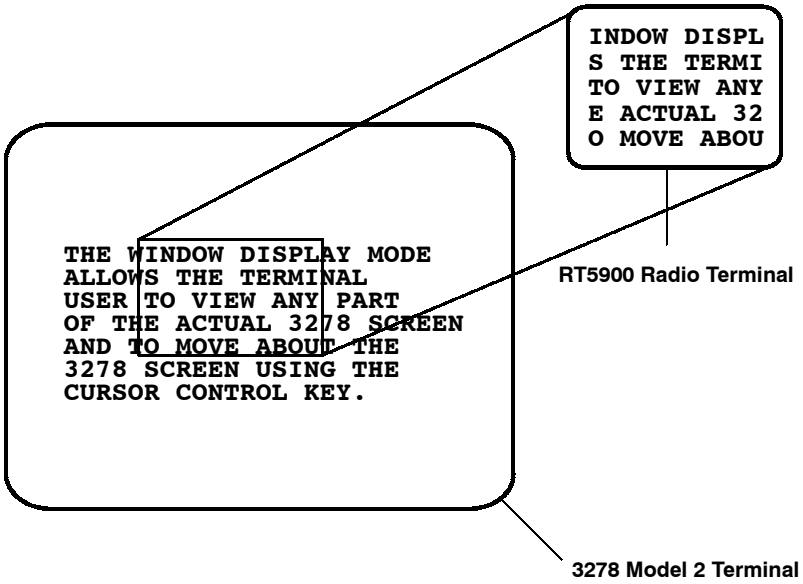


Figure 5-2
RT5900 Windowing Mode

Cursor location is not limited to the current window. All cursor movement keys respond just as they would on the 80x24 display.

Use the cursor control keys in combination with [BROWN] and [GOLD] to move through the radio terminal's display a single space at a time or eight spaces at a time. The following chart shows key combinations.

To	Press
Forward tab	[▶]
Reverse tab	[◀]
Page up	[▲]
Page down	[▼]
Move 1 position right	[BROWN]+[▶]
Move 1 position left	[BROWN]+[◀]
Move 1 position up	[BROWN]+[▲]
Move 1 position down	[BROWN]+[▼]
Move 8 spaces right	[GOLD]+[▶]
Move 8 spaces left	[GOLD]+[◀]
Move 8 spaces up	[GOLD]+[▲]
Move 8 spaces down	[GOLD]+[▼]

AID Keys

The RT5900 Radio Terminal emulates all of the AID-generating keys on the IBM terminal.

- Programmable function keys F1 through F24 send modified input fields and AID key values to the host. The keys lock the keyboard until the host unlocks it. The function keys are used exclusively for 3270 AID key emulation.
- PA1 and PA2 keys send the AID key value to the host but leave the keyboard unlocked.
- The Clear AID key clears the data buffer but leaves the keyboard unlocked. It sends the Clear AID key value to the host.

The AID keys are emulated when you press the function key, [BROWN] plus a function key, or the [BROWN] or [GOLD] key plus an identifier. The identifier depends on the particular program or function desired. Table 5-3 lists key sequences for AID-generating keys. The AID code is the ASCII value of the letter pressed.

Table 5-3
RT5900 AID-Generating Keys

3278 AID Key	Press
PF1–PF8	[F1] – [F8]
PF9–PF16	[BROWN]+[F1] – [BROWN]+[F8]
PF17–PF24	[GOLD]+[F1] – [GOLD]+[F8]
PA1	[GOLD]+[Y]
PA2	[GOLD]+[Z]
Clear	[GOLD]+[.]

Other Radio Terminal Keys

Table 5-4 describes other radio terminal keys.

Table 5-4
Other RT5900 Keys

Operation	Press	Description
Menu	[BROWN]+ [SPACE]	Brings up the radio terminal's main menu and firmware parameters.

You can also use the keyboard to do key ahead, scan ahead, and repeat key operations.

Key Ahead

Key ahead stores keystrokes after the Input Inhibited annunciator appears, and saves them for the next input field. The Input Inhibited annunciator appears on the status line while the radio terminal is waiting for the host to respond. Key ahead is enabled as a default but can be disabled through the radio terminal's firmware.

Scan Ahead

Scan ahead stores one bar code after the Input Inhibited annunciator appears, and saves it for the next input field. The annunciator appears on the status line while waiting for the host to respond.

Key Repeat

Key repeat on the radio terminal's keyboard is similar to the key repeat on the IBM terminal. For example, to fill an input field with the letter "a," do one of the following:

- Press the "A" key repeatedly until the field is full.
- Press and hold the "A" key until the field is full.

Key repeat does not work with all keys. Table 5-5 shows which keys do and do not repeat.

Table 5-5
RT5900 Key Repeat

Repeating	Nonrepeating
Backspace	Clear
Del	Clr
EBCDIC characters	EOF
Enter	PF1 - PF24
Forward Tab	Home
Reverse Tab	Menu
Cursor control keys used with [BLACK] and [SHIFT]	PA1
	PA2
	Return
	Shift
	Shift Lock

Section 6

PEN*KEY® 6400 Computer

Overview

The PEN*KEY 6400 Computer appears to the host as an IBM 3278 Model 2 terminal. To help you design interfaces to the PEN*KEY 6400, this section describes the screen size, screen modes, annunciators, keyboard, and IBM display emulation for the PEN*KEY 6400 as part of the 3270 data stream.

▶ **NOTE:** *PEN*KEY 6400 Computers have 900 MHz or 2.4 GHz radios.*

PEN*KEY 6400 Computers are compatible with RT1100, RT1700, and RT5900 Radio Terminals (900 MHz and 2.4 GHz radios only). This lets the PEN*KEY 6400 work interchangeably with other wireless stations on a network.

You can set up the PEN*KEY computer through its firmware menus or from the host through the Set Parameters extended command. Extended commands are described in Section 10. For information about firmware menus, refer to the PEN*KEY computer's user guide.

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.

The display shows PEN*KEY computer and host computer prompts, as well as data entered by the operator. Because the IBM terminal has a screen size of 80 characters by 24 lines, the PEN*KEY computer presents a part of the information on the larger display station.

Screen Modes

The PEN*KEY computer has these screen modes: center cursor, corner, page, lazy, and locked. The modes present a window onto a standard IBM 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.

You can move the cursor by using the four direction arrows on the PEN*KEY computer's diamond-shaped keypad. The display does not wrap around when the cursor reaches the top, bottom, or side boundaries of the larger 80x24 screen. 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 IBM 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 3270 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 IBM 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 IBM 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- and blue-colored keys, 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 IBM 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.

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.

Annunciators

The PEN*KEY computer's display reserves a location for icons or small pictures, called "annunciators," which show the PEN*KEY computer's current status or operation in progress. You can change an annunciator's location in the display through the PEN*KEY computer's firmware menus. Refer to the PEN*KEY computer user's guide for more information about annunciators.

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.

X

Input inhibited. The keyboard has accepted enough information for the defined input field. The “key ahead” feature stores keystrokes after this annunciator appears. These are saved for the next field.

Insert mode. The keyboard inserts characters instead of overwriting them.

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 batty pack has less than 25 percent capacity, one symbol appears.

Keyboard

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

51-Key Keyboard

The 51-key keyboard (Figure 6-1) has shift keys, alphabetic keys, numeric keys, 3278 SNA keys, and programmable function (PF) AID keys.

41-Key Keyboard

The 41-key keyboard (Figure 6-2) has numeric keys and user-defined PF AID keys in its primary plane. It has alphabetic keys, special characters, and function keys in its secondary plane.

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

- To enter the password for the Set-up Parms firmware menu, press [BLUE]+[3] (a “C”) and then [BLUE]+ [F8] (an “R”). Then press the correct numbers, which are 52401.
- To initiate the COLD START? menu option, press [BLUE]+ [PA1] to answer “yes.”

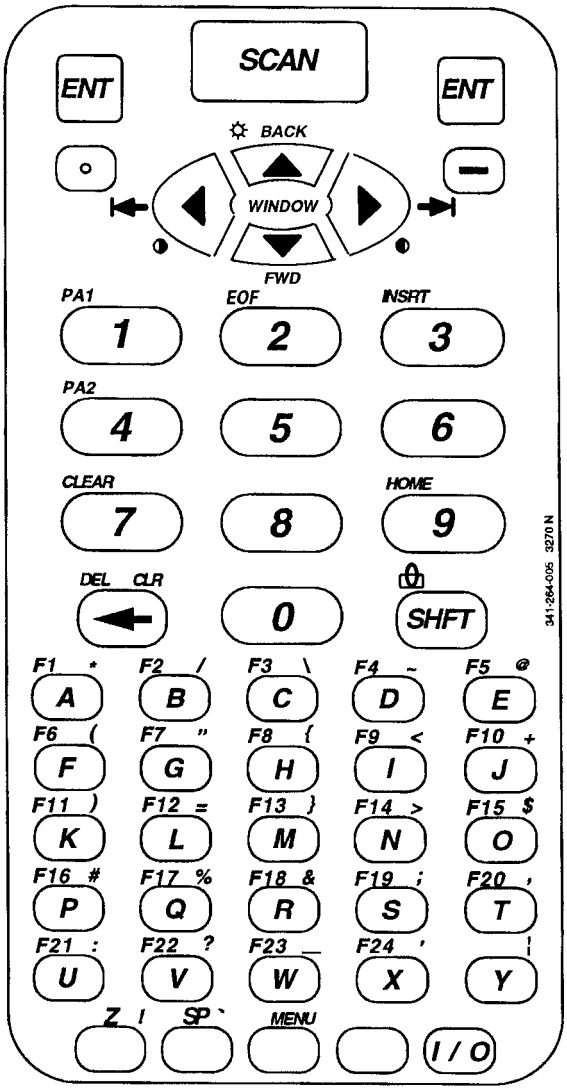


Figure 6-1
PEN*KEY 6400 51-Key Keyboard

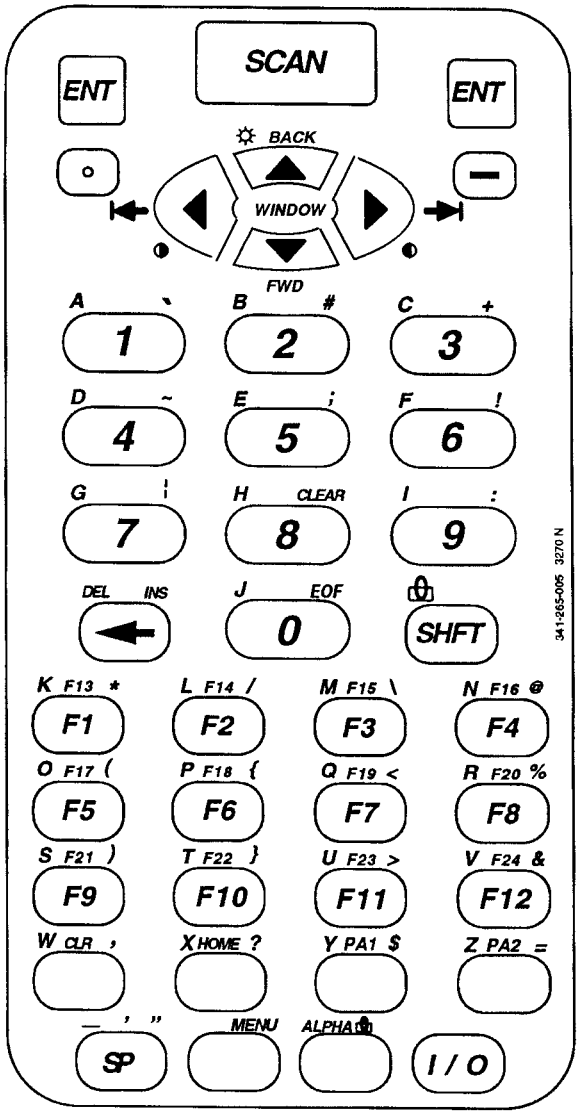


Figure 6-2
PEN*KEY 6400 41-Key Keyboard

Shift Keys

Use the shift keys on the 51- and 41-key keyboards to type uppercase letters and special characters, and to do special functions. Shift keys are described in the following chart.

Shift Key	Description
[SHFT]	Press the green [SHFT] key plus a letter to type the letter in uppercase.
[GOLD]	The gold key puts the keyboard into gold shift mode. Press [GOLD] plus a keyboard key to type a character or do an operation printed in gold on the overlay.
[BLUE]	The blue key puts the keyboard into blue shift mode. Press [BLUE] plus a keyboard key to do an operation printed in blue on the overlay.

The special characters and functions printed on the overlay are color-coded to correspond with the shift keys. For example:

- On the 51-key keyboard, to type the special character "@" (printed in gold on the overlay), press [GOLD]+[E].
- On the 51-key keyboard, press [BLUE]+[M] to do the F13 function (printed in blue on the overlay).
- On the 41-key keyboard, press [SHFT]+[F1] to do the F13 function (printed in green on the overlay).

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

- The key with "Z" printed above it is the letter Z.
- The key with "SP" printed above it is the Space key.

The 41-key keyboard has four white, unlabeled keys near the bottom row of the keyboard. Following are the key's functions when they are in the primary plane:

- The key with "CLR" printed above it is the Clear key.
- The key with "HOME" printed above it is the Home key.
- The key with "PA1" printed above it is the PA1 key.
- The key with "PA2" printed above it is the PA2 key.

Alphabetic Keys

On the 51-key keyboard, press a letter without first pressing [BLUE]+[SHFT] (lock) to type a lowercase letter. Press [BLUE]+ [SHFT] plus a letter to type the letter in uppercase. Table 6-1 describes how to type letters on the 51-key keyboard.

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

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

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 switches the alphabetic keys with the function keys. That is, it moves lowercase alphabetic keys from their normal [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 combinations.

▶ **NOTE:** *Alpha lock mode moves only the 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 listed in the table. The keyboard stays in alpha lock mode until you press [BLUE]+[GOLD] 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]+[CLR]	[CLR]
x	[BLUE]+[HOME]	[HOME]
y	[BLUE]+[PA1]	[PA1]
z	[BLUE]+[PA2]	[PA2]
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]+[CLR]	[SHFT]+[CLR]
X	[SHFT]+[BLUE]+[HOME]	[SHFT]+[HOME]
Y	[SHFT]+[BLUE]+[PA1]	[SHFT]+[PA1]
Z	[SHFT]+[BLUE]+[PA2]	[SHFT]+[PA2]

Numeric Keys

Numeric keys are arranged in a 10-key format on the top half of the 51- and 41-key keyboards. Use the numbers to enter numeric data.

Special Characters

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

Table 6-3
PEN*KEY 6400 Special Characters

Special Character	51-Key Keyboard	41-Key Keyboard
* (asterisk)	[GOLD]+[A]	[GOLD]+[F1]
/ (forward slash)	[GOLD]+[B]	[GOLD]+[F2]
\ (backslash)	[GOLD]+[C]	[GOLD]+[F3]
~ (tilde)	[GOLD]+[D]	[GOLD]+[4]
@ (at)	[GOLD]+[E]	[GOLD]+[F4]
((left parenthesis)	[GOLD]+[F]	[GOLD]+[F5]
” (double quotes)	[GOLD]+[G]	[GOLD]+[SP]
{ (left brace)	[GOLD]+[H]	[GOLD]+[F6]
< (left angle bracket)	[GOLD]+[I]	[GOLD]+[F7]
+ (plus)	[GOLD]+[J]	[GOLD]+[3]
) (right parenthesis)	[GOLD]+[K]	[GOLD]+[F9]
= (equal)	[GOLD]+[L]	[GOLD]+[PA2]
} (right brace)	[GOLD]+[M]	[GOLD]+[F10]
> (right angle bracket)	[GOLD]+[N]	[GOLD]+[F11]
$ (dollar)	[GOLD]+[O]	[GOLD]+[PA1]
# (pound)	[GOLD]+[P]	[GOLD]+[2]

Table 6-3 (Continued)
PEN*KEY 6400 Special Characters

Special Character	51-Key Keyboard	41-Key Keyboard
% (percent)	[GOLD]+[Q]	[GOLD]+[F8]
& (ampersand)	[GOLD]+[R]	[GOLD]+[F12]
; (semicolon)	[GOLD]+[S]	[GOLD]+[5]
, (comma)	[GOLD]+[T]	[GOLD]+[CLR]
: (colon)	[GOLD]+[U]	[GOLD]+[9]
? (question mark)	[GOLD]+[V]	[GOLD]+[HOME]
_ (underscore)	[GOLD]+[W]	[BLUE]+[SP]
’ (left single quote)	[GOLD]+[X]	[SHFT]+[SP]
¦ (piping symbol)	[GOLD]+[Y]	[GOLD]+[7]
! (exclamation mark)	[GOLD]+[Z]	[GOLD]+[6]
‘ (grave accent)	[GOLD]+[SP]	[GOLD]+[1]

3278 SNA Keys

Table 6-4 describes 3278 SNA keys in standard (nonalpha-lock mode).

Table 6-4
PEN*KEY 6400 SNA Keys

3278 Key	51-Key Keyboard	41-Key Keyboard	Description
Clear	[BLUE]+[7]	[GOLD]+[8]	Erases from the cursor to the current unprotected end-of-field.
Clr	[GOLD]+[←]	[CLR]	Erases the current unprotected field. Also sets the MDT bit and does a reverse tab. A beep means the field is protected and cannot be erased.

Table 6-4 (Continued)
PEN*KEY 6400 SNA Keys

3278 Key	51-Key Keyboard	41-Key Keyboard	Description
Home	[BLUE]+[9]	[HOME]	Sends the cursor to the unprotected field in the display buffer. The first unprotected field is determined by the Insert Cursor order.
EOF	[BLUE]+[2]	[GOLD]+[J]	Erases all data from the position of the cursor to the end of the unprotected field. The cursor itself remains in the same location. A beep indicates that the field is protected.
Delete	[←]	[←]	Deletes the character to the left of the cursor. All data located to the right of the cursor shifts left one position.
Del	[BLUE]+[←]	[BLUE]+[←]	Deletes the character over the cursor in the current unprotected field. All data located to the right of the cursor shifts left one position. A beep indicates the character is in a protected field and cannot be erased.
Enter	[ENT]	[ENT]	Transmits all modified data fields to the host.
Insrt	[BLUE]+[3]	[GOLD]+[←]	Toggles between insert mode and normal mode. In insert mode characters are inserted instead of overwritten.

Cursor Movement Keys

The four cursor control keys near the top of the keyboard move the cursor within the screen buffer. Each key moves the cursor in the direction indicated by the arrow.

Cursor left and right move the cursor one character position at a time in the display buffer. The cursor up and down keys move the cursor up or down one line. The screen mode governs how the PEN*KEY computer represents this movement.

Attempting to move the cursor off the screen in any direction causes the window to shift in the direction of movement. This feature allows you to move the viewing window around within the larger IBM terminal's 80-character by 24-line screen (Figure 6-3).

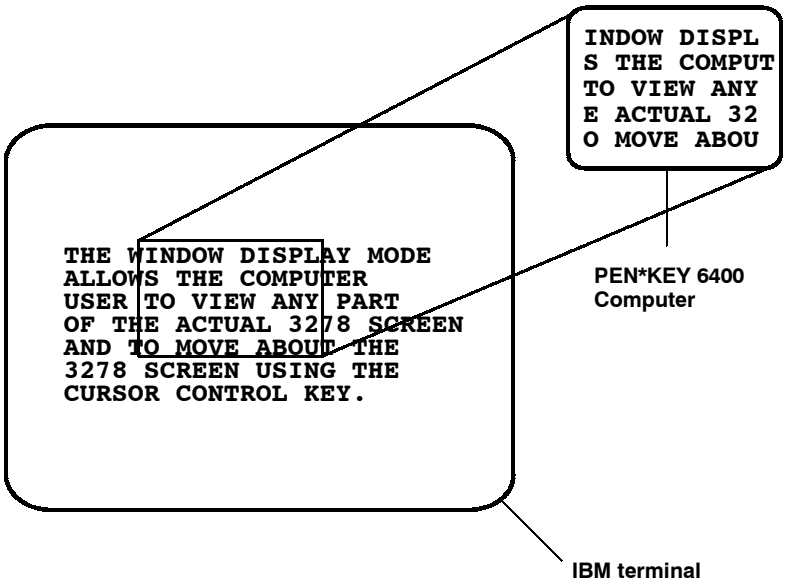


Figure 6-3
PEN*KEY 6400 Windowing Mode

Cursor location is not limited to the current window. All cursor movement keys respond just as they would on the 80x24 display.

Use the cursor control keys in combination with [BLUE] and [GOLD] 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 combinations for the 51- and 41-key keyboards.

To	Press
Forward Tab	[GOLD]+[▼]
Reverse Tab	[GOLD]+[▲]
Move 1 space right	[GOLD]+[▶]
Move 1 space left	[GOLD]+[◀]
Move 1 space up	[GOLD]+[▲]
Move 1 space down	[GOLD]+[▼]
Move 8 spaces right	[BLUE]+[▶]
Move 8 spaces left	[BLUE]+[◀]
Move 8 spaces up	[BLUE]+[▲]
Move 8 spaces down	[BLUE]+[▼]

AID Keys

The PEN*KEY computer emulates all of the AID-generating keys on the IBM terminal.

- Programmable function keys F1 through F24 send modified input fields and AID key values to the host. The keys lock the keyboard until the host unlocks it. The function keys are used exclusively for 3270 AID key emulation.

- PA1 and PA2 keys send the AID key value to the host but leave the keyboard unlocked.
- The Clear AID key clears the data buffer but leaves the keyboard unlocked. It sends the Clear AID key value to the host.

The AID keys are emulated when you press [BLUE] or [SHFT] plus an alphabetic identifier. The identifier depends on the particular program or function desired. Table 6-5 lists key sequences for AID-generating keys on the 51-key keyboard. The AID code is the ASCII value of the letter pressed.

Table 6-5
PEN*KEY 6400 AID-Generating Keys, 51-Key Keyboard

To Do Function	Press
F1–F24	[BLUE]+[A] – [BLUE]+[X]
PA1	[BLUE]+[1]
PA2	[BLUE]+[4]
Clear	[BLUE]+[7]

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 [F24]) move to the [SHFT]+[BLUE] plane.

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

To Do Function	Standard Mode	Alpha Lock Mode
cNJcNO	xcNz J xcNOz	x_ i r bzHxcNz J x_ i r bzHxcNOz
cNPJcOQ	xp e c qzHxcNz J xp e c qzHxcNOz	xp e c qzHx_ i r bzHxcNz J xp e c qzHx_ i r bzHxcNOz

Other Keys

Table 6-7 describes other keys on the 51- and 41-key keyboards.

Table 6-7
Other PEN*KEY 6400 Keys

Operation	Keys	Description
Menu	[GOLD]+[BLUE]	Brings up the main menu and firmware parameters.
Backlight	[SHFT]+[▲]	Toggles display's backlight on and off.

You can also use the keyboard to do key ahead, scan ahead, and repeat key operations.

Key Ahead

Key ahead stores keystrokes after the Input Inhibited annunciator appears, and saves them for the next input field. The Input Inhibited annunciator appears on the status line while the PEN*KEY computer is waiting for the host to respond. Key ahead is enabled as a default but can be disabled through the PEN*KEY computer's firmware.

Scan Ahead

Scan ahead stores one bar code after the Input Inhibited annunciator appears, and saves it for the next input field. The Input Inhibited annunciator appears on the status line while waiting for the host to respond.

Key Repeat

Key repeat on the PEN*KEY computer's keyboard is similar to the key repeat on the IBM terminal. For example, to fill an input field with the letter "a," do one of the following:

- Press the "A" key repeatedly until the field is full.
- Press and hold the "A" key until the field is full.

Key repeat does not work with all keys. Table 6-8 shows which keys do and do not repeat.

Table 6-8
PEN*KEY 6400 Key Repeat

Repeating	Nonrepeating
Backspace	Backlight
Del	Clear
EBCDIC characters	Clr
Enter	EOF
Forward Tab	Home
Reverse Tab	Menu
Cursor control keys used with [BLUE] and [SHFT]	PA1
	PA2
	F1–F24
	SHFT
	SHFT Lock

Section 7

PEN*KEY® 6500 Computer

Overview

The PEN*KEY 6500 Computer appears to the host as an IBM 3278 Model 2 terminal. To help you design interfaces to the PEN*KEY 6500, this section describes the screen size, screen modes, annunciators, keyboard, and IBM display emulation for the PEN*KEY 6500 as part of the 3270 data stream.

▶ **NOTE:** *PEN*KEY 6500 Computers have WLIF radios only.*

PEN*KEY® 6500 Computers are compatible with RT1100, and RT1700 PEN*KEY computers; and PEN*KEY 6400 Computers (with WLIF radios only). This lets the PEN*KEY 6500 Computer work interchangeably with other wireless stations on a network.

You can set up the PEN*KEY computer through its firmware menus or from the host through the Set Parameters extended command. Extended commands are described in Section 10. For information about firmware menus, refer to the PEN*KEY computer's user guide.

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

The display shows PEN*KEY computer and host computer prompts, as well as data entered by the operator. Because the IBM terminal has a screen size of 80 characters by 24 lines, the PEN*KEY computer presents a part of the information on the larger display station.

Screen Modes

The PEN*KEY computer has these screen modes: center cursor, corner, page, lazy, and locked. The modes present a window onto a standard IBM 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.

You can move the cursor by using the four direction arrows on the PEN*KEY computer's diamond-shaped keypad. The display does not wrap around when the cursor reaches the top, bottom, or side boundaries of the larger 80x24 screen. 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 IBM 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 3270 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 IBM 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 IBM 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 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 IBM 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.

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.

Annunciators

The PEN*KEY computer's display reserves a location for icons or small pictures, called "annunciators," which show the PEN*KEY computer's current status or operation in progress. You can change an annunciator's location in the display through the PEN*KEY computer's firmware menus. Refer to the PEN*KEY computer's user guide for more information about the annunciators.

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

X **Input inhibited**. The keyboard has accepted enough information for the defined input field. The "key ahead" feature stores keystrokes after this annunciator appears. They are saved for the next field.

^ **Insert mode**. The keyboard inserts characters instead of overwriting them.

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.

Keyboard

The PEN*KEY computer's 81-key external keyboard (Figure 7-1) has shift keys, alphabetic keys, numeric keys, 3278 SNA keys, and PF AID keys. Note that these keys are not supported: Fn, Setup, SysReq, Pause, Break, End, ScrLk, PgDn, and PgUp.

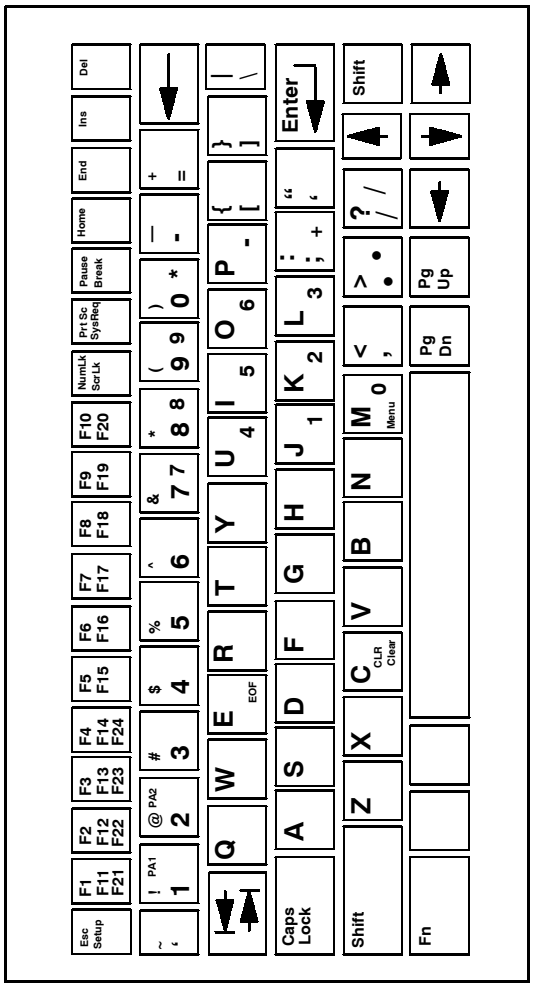


Figure 7-1
PEN*KEY 6500 Keyboard

Shift Keys

Use the shift keys to type uppercase letters and special characters, and to do special functions. 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 mode. Press the [Blue] key 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 mode. Press the [Gold] key 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 [F21] function (printed in gold on the key).

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

Alphabetic Keys

Press a letter without first pressing [Shift] to type a lowercase letter. Press [Shift] plus a letter to type the letter in uppercase. For example, [Shift]+[A] types a capital "A." To lock the keyboard into shift mode, press [Caps Lock]. To unlock the keyboard, press [Caps Lock] again.

Numeric Keys

Ten numeric keys are arranged in a 10-key format near the top of the keyboard. Use them to enter numeric data.

Special Characters

Table 7-1 describes how to type special characters.

Table 7-1
PEN*KEY 6500 Special Characters

Special Character	Press
~ (tilde)	[Shift]+[‘]
! (exclamation mark)	[Shift]+[1]
@ (at)	[Shift]+[2]
# (pound)	[Shift]+[3]
$ (dollar)	[Shift]+[4]
% (percent)	[Shift]+[5]
^ (circumflex)	[Shift]+[6]

Table 7-1 (Continued)
PEN*KEY 6500 Special Characters

Special Character	Press
& (ampersand)	[Shift]+[7]
* (asterisk)	[Shift]+[8]
((left parenthesis)	[Shift]+[9]
) (right parenthesis)	[Shift]+[0]
- (hyphen)	[-]
+ (plus)	[Shift]+[=]
{ (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)	[`]

3278 SNA Keys

Table 7-2 describes 3278 SNA keys.

Table 7-2
PEN*KEY 6500 SNA Keys

SNA Key	Press	Description
Clear	[Gold]+[C]	Erases from the cursor to the current unprotected end-of-field.
CLR	[Blue]+[C]	Erases the current unprotected field. Also sets the MDT bit and does a reverse tab. A beep means the field is protected and cannot be erased.
Home	[Home]	Sends the cursor to the unprotected field in the display buffer. The first unprotected field is determined by the Insert Cursor order.
EOF	[Gold]+[F]	Erases all data from the position of the cursor to the end of the unprotected field. The cursor itself remains in the same location. A beep indicates that the field is protected.
Delete	←	Deletes the character to the left of the cursor. All data located to the right of the cursor shifts left one position.
Del	[Del]	Deletes the character over the cursor in the current unprotected field. All data located to the right of the cursor shifts left one position. A beep indicates the character is in a protected field and cannot be erased.

Table 7-2 (Continued)
PEN*KEY 6500 SNA Keys

SNA Key	Press	Description
Enter	[Enter]	Transmits all modified data fields to the host.
Insert	[Ins]	Toggles between insert mode and normal mode. In insert mode characters are inserted instead of overwritten.

Cursor Movement Keys

The four cursor control keys in the lower-right corner of the keyboard move the cursor within the screen buffer. Each key moves the cursor in the direction indicated by the arrow.

Cursor left and right move the cursor one character position at a time in the display buffer. The cursor up and down keys move the cursor up or down one line. The screen mode governs how the PEN*KEY computer represents this movement.

Attempting to move the cursor off the screen in any direction causes the window to shift in the direction of movement. This feature allows you to move the viewing window around within the larger IBM terminal's 80-character by 24-line screen (Figure 7-2).

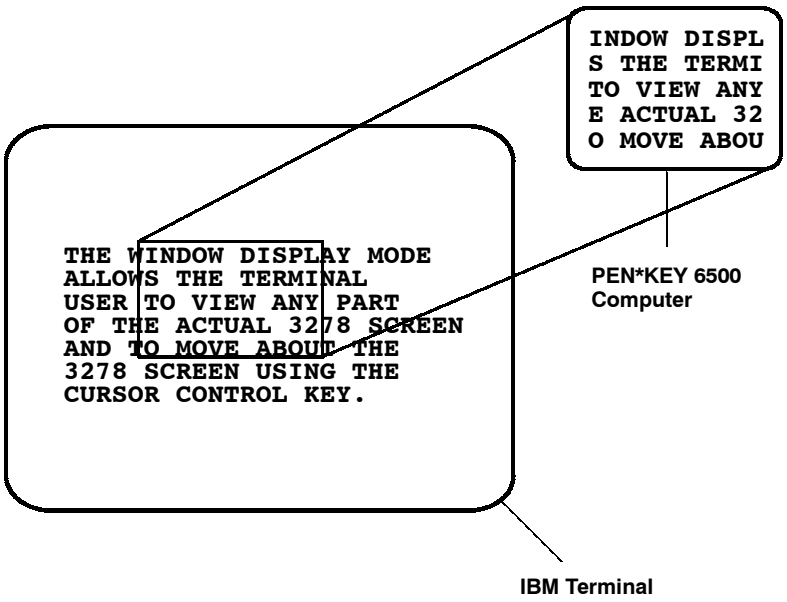


Figure 7-2
PEN*KEY 6500 Windowing Mode

Cursor location is not limited to the current window. All cursor movement keys respond just as they would on the 80x24 display.

Use the cursor control keys in combination with [Blue] and [Gold] 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 combinations.

To Move	Press
Forward Tab	
Reverse Tab	
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]+

AID Keys

The PEN*KEY 6500 Computer emulates all of the AID-generating keys on the IBM terminal.

- Programmable function keys F1 through F24 send modified input fields and AID key values to the host. The keys lock the keyboard until the host unlocks it. The function keys are used exclusively for 3270 AID key emulation.
- PA1 and PA2 keys send the AID key value to the host but leave the keyboard unlocked.
- The Clear AID key clears the data buffer but leaves the keyboard unlocked. It sends the Clear AID key value to the host.

The AID keys are emulated when you press the function key, [BROWN] plus a function key, or the [Blue] or [Gold] key plus an identifier. The identifier depends on the particular program or function desired. Table 7-3 lists key sequences for AID-generating keys. The AID code is the ASCII value of the letter pressed.

Table 7-3
PEN*KEY 6500 AID-Generating Keys

3278 AID Key	Press
F1–F10	F1–F10
F11–F20	[Blue]+[F1] – [Blue]+[F10]
F21–F24	[Gold]+[F1] – [Gold]+[F4]
PA1	[Gold]+[1]
PA2	[Gold]+[2]
Clear	[Gold]+[C]

Other Keys

You can also use the keyboard to do key ahead, scan ahead, and repeat key operations.

Key Ahead

Key ahead stores keystrokes after the Input Inhibited annunciator appears, and saves them for the next input field. The Input Inhibited annunciator appears on the status line while the PEN*KEY computer is waiting for the host to respond. Key ahead is enabled as a default but can be disabled through the PEN*KEY computer's firmware.

Scan Ahead

Scan ahead stores one bar code after the Input Inhibited annunciator appears, and saves it for the next input field. The annunciator appears on the status line while waiting for the host to respond.

Key Repeat

Key repeat on the PEN*KEY computer's keyboard is similar to the key repeat on the IBM terminal. For example, to fill an input field with the letter "a," do one of the following:

- Press the "A" key repeatedly until the field is full.
- Press and hold the "A" key until the field is full.

Key repeat does not work with all keys. Table 7-4 shows which keys do and do not repeat.

Table 7-4
PEN*KEY 6500 Key Repeat

Repeating	Nonrepeating
Backspace	Caps Lock
Del	Clear
EBCDIC characters	CLR
Enter	EOF
Forward Tab	Home
Reverse Tab	Menu
Cursor control keys used with [Blue] and [Gold]	PA1
	PA2
	F1–F24
	Shift

Section 8

Controller Commands

Overview

This section describes controller parameter commands and diagnostic commands for the asynchronous 3270 data stream. This section is intended for asynchronous computers (mainly PCs) using the 3270 datastream for communication with the wireless emulation station.

Command Summary

Table 8-1 lists the controller parameter commands, and Table 8-2 lists controller diagnostic commands. Each command is described in more detail after the tables. In the command descriptions, controllers are the RC3250 Controller, RC4030E Gateway, and RCB4030 Base/Controller.

Table 8-1
Controller Parameter Commands

Command	Name
CMTI	Set Default Parameter
CMT0	Response Delay
CMT1	Data Timeout
CMT2	Interactive Mode

Table 8-1 (Continued)
Controller Parameter Commands

Command	Name
CMT3	Response Delay Expansion
CMT4	Add Line Feed to Controller Responses
CMT5	Gap Timeout
CMT7	Interactive Timeout
CMT8	Set Data Error Checking
CMT10	Extended Response Mode
CMT11	Set Dual Base Radio
CMT12	Set Dual Speed
CMT13	Automatic Enable
CMT15	Remote Base Radio Support
CMT16	3270 Data Stream Light Pen Option
CMT17	Set 3270 Data Stream Field Delimiter
CMT18	Enable Multiple Base Adapter
CMT20	Set Modem Delay Rate for Multiple Base Adapter
CMT21	One Character Address Mode
CMT22	Multiple Buffering Mode
CMT23	Enhanced Host Poll Mode
CMT24	Set Respond Timer
CMT25	Flow Control
CMT	Request All Parameters
CMT,	Controller List
CCS	System Callsign
E	Enable or Disable Wireless Stations
R	Enable Controller Response
T	Repeat Controller Response
?	Get Transmit Message Status
F	Get Emulation Station Type

Table 8-2
Controller Diagnostic Commands

Command	Name
DMC	Clear Controller Buffers
DME	Controller Echo-Back Diagnostics
DMP	Controller Power-Up Self-Test Diagnostic
DMV	Controller Firmware or Software Version

CMTI
Set Default Parameter

The CMTI command restores all controller parameters to their default values. Table 8-3 lists default values.

Host Command	Controller Response
CMTI<cr>	--

Table 8-3
Controller Parameter Default Values

Command	RC3250	RC4030E and RCB4030
CMT0	x = 0	x = 0
CMT1	x = 255	x = 255
CMT2	x = 0	x = 0
CMT3	x = 0	x = 0
CMT4	x = 0	x = 0
CMT5	x = 0	x = 0
CMT7	x = 6	x = 6
CMT8	x = 0	x = 0
CMT10	x = 0	x = 0
CMT11	x = 0	

Table 8-3 (Continued)
Controller Parameter Default Values

Command	RC3250	RC4030E and RCB4030
CMT12	x = 0	
CMT13	x = 0	x = 0
CMT15	x = 0	
CMT16	x = 0	x = 0
CMT17	x = 47	x = 47
CMT18	x = 0	
CMT20	x = 0	
CMT21	x = 0	x = 0
CMT22	x = 0	x = 0
CMT23	x = 0	x = 0
CMT24	x = ACK	x = ACK
CMT25	n = 15	n = 15

CMT0 Response Delay

The CMT0 command sets a time delay for the controller to respond to a command from the host computer. For the controllers the time delay is “x” times 10 milliseconds. This time delay may be required after transmitting for the host computer to prepare to receive data.

CMT0 without the “x” variable returns to the host the previously set and stored value. CMTI resets all parameters to default values. The default is x = 0 for CMT0.

Host Command	Function	Controller Response
CMT0,x<cr>	Sets time delay to "x" x 10 milliseconds.	OK<cr>

Variables: x = 0 to 255 (0 = no response delay)

Defaults: x = 0

EXAMPLE: Command: CMT0,5<cr>
Response: Controller sets response delay to 50 milliseconds

CMT1
Data Timeout

The CMT1 command sets the time the controller waits for data from a wireless station before responding to an "R" command from the host. Data received within this time is passed immediately to the host. The controller returns an "empty" response (OK<cr>) to the host after the specified timeout if no data is available. Data entered at a wireless station after the time limit is returned after the next "R" command.

The default value for CMT1 is 255, which disables data timeout so that the controller responds to an "R" command only when it has wireless station data for the host. CMT1 sent without the variable returns the current value.

Host Command	Function	Controller Response
CMT1,x<cr>	Sets timeout to "x" seconds.	OK<cr>

Variables: x = 0 to 254 (in 1-second or 3.4-second increments; 0 returns immediately)
x = 255 (disables data timeout)

Default: x = 255

EXAMPLE 1: Command: CMT1,2<cr>
Response: Data timeout = 2 seconds

EXAMPLE 2: Command: CMT1<cr>
Response: 2<cr> (setting from example 1)

CMT2
Interactive Mode

The CMT2 command turns interactive mode on or off. ON is CMT2,1 (or any nonzero digit). OFF is CMT2,0. Interactive mode orders the controller to respond to all commands from the host computer whether or not data is requested. The response (in interactive mode) when there is no data is "OK<cr>." The default is 0 (interactive mode disabled).

Host Command	Controller Response
CMT2,x<cr>	OK<cr>

Variables: x = 0 (disable)
x = 1 (enable)

Default: x = 0 (disable)

EXAMPLE 1: Command: CMT2,1<cr>
Response: OK<cr>

EXAMPLE 2: Command: CMT2<cr>
Response: 1<cr> (assumes previous setting from example 1)

CMT3
Response Delay Expansion

The CMT3 command increases the response delay (CMT0) by "x" times 256 milliseconds.

For example, if CMT0 = 20 and CMT3 = 2, the total response delay time is 20 + (2 x 256) = 532 milliseconds. CMT3 without the variable returns the currently-stored value.

Host Command	Controller Response
CMT3,x<cr>	OK<cr>

Variables: x = 0 to 255

Default: x = 0

EXAMPLE 1:
Command: CMT3,2<cr>
Response: OK<cr> extends response delay by 2 x 256, or 512 milliseconds

EXAMPLE 2:
Command: CMT3<cr>
Response: 2<cr> (assumes previous setting from example 1)

CMT4
Add Line Feed to Controller Responses

The CMT4 command enables and disables the automatic addition of an ASCII line feed character to the end of each data string from the controller to the host. CMT4,1 enables the automatic line feed character and CMT4,0 disables it.

Host Command	Controller Response
CMT4,x<cr>	OK<cr>

Variables: x = 0 (disable) or 1 (enable)
Default: x = 0 (disable)

EXAMPLE 1:
Command: CMT4,1<cr>
Response: OK<cr><lf>

EXAMPLE 2: Command: CMT4<cr>
Response: 1<cr><lf> (assumes previous setting from example 1)

CMT5
Gap Timeout

The CMT5 command sets the time the controller waits between characters before terminating a message. When enabled, the controller expects messages from the host computer to be terminated with a <cr> (carriage return). Without the <cr> it automatically terminates a message after a time interval equal to the gap timeout setting.

The value "x" can range from 0 to 255. At 255, however, the controller waits indefinitely for a carriage return. This command can be used only in interactive mode (CMT2,1).

Host Command	Function	Controller Response
` j qRlñYÅê[	Sets gap timeout to "x" x 30 milliseconds.	l hYÅê[

Variables: x = 0 to 255 (x = 255 disables gap timeout. The controller waits for a carriage return.)

Default: x = 0

EXAMPLE 1: Command: CMT5,3<cr>
Response: The controller sets gap timeout to 90 milliseconds (3 ñ 30)

EXAMPLE 2: Command: CMT5<cr>
Response: 3<cr> (assumes example 2 begins with settings in example 1)

CMT7
Interactive Timeout

The CMT7 command sets the time the controller retains a wireless station on the "active" list without a response to a poll. If a wireless station fails to respond within "x" x 13.7 seconds, the controller places it on "inactive" status and ceases to poll its address. The default setting is 6, which gives a wireless station about 2 minutes of inactivity before it is no longer polled in the regular cycle. Without the "x" variable the controller returns the current setting.

Host Command	Controller Response
CMT7,x<cr>	OK<cr>

Variables: x = 0 to 255 (x = 255 wireless station remains active)

Default: x = 6

EXAMPLE 1:
Command: CMT7,3<cr>
Response: Controller sets inactivity timeout to 41 seconds

EXAMPLE 2:
Command: CMT7<cr>
Response: 3<cr> (example 2 begins with settings in example 1)

CMT8
Set Data Error Checking

The CMT8 command controls two data checking mechanisms. One is the CRC-16, and the other is LRC (7-bit). These data checks are performed independently from parity checks or other error checking devices in the network. The variable "x" may be 0, 1 or 2.

Setting x = 0 disables both checks. At x = 1, only CRC-16 is active, and at x = 2 only LRC is active.

CRC is cyclic redundancy checking, which uses an algorithm to divide a constant into the numeric binary value of all character bits in a block of data. Quotients are discarded and the remainders are compared.

LRC is longitudinal redundancy checking. It uses all character bits to form a check character at both ends of the communication link. These are compared.

Host Command	Controller Response
CMT8,x<cr>	OK<cr>

Variables: x = 0 (disable error checking)
x = 1 (enable CRC-16 error checking; disable LRC)
x = 2 (enable LRC error checking; disable CRC-16)

Default: x = 0 (disable error checking)

EXAMPLE 1:
Command: CMT8,1<cr>
Response: OK<cr> The controller checks commands from the host for a two-digit CRC-16 value following <cr>

EXAMPLE 2:
Command: CMT8<cr>
Response: 1<cr> (settings from example 1)

CMT10
Extended Response Mode

The CMT10 command is a data checking mechanism which adds a character count to all responses from the controller to the host. For CMT10,1, each string sent to the host is followed by a comma and a decimal character count of the string. For CMT10,2, each string is preceded by a decimal character and a comma.

Character counts are one greater for CMT10,2 than for CMT10,1 because the CMT10,2 count includes the carriage return at the end of the string and CMT10,1 does not.

Host Command	Controller Response
CMT10,x<cr>	OK<cr>

Variables: x = 0 (disable extended response)
x = 1 (enable extended response suffix; comma follows)
x = 2 (enable extended response prefix; comma precedescounts up to 1)

Default: x = 0 (disable extended response)

EXAMPLE 1:
Command: CMT10,1<cr>
Response: OK<cr>

EXAMPLE 2:
Command: CMT10,2<cr>
Response: OK<cr>

EXAMPLE 3:
Command : CMT10<cr>
Response: 0002,2<cr> (assumes setting example 1)

CMT11
Set Dual Base Radio

The CMT11 command enables dual UHF base radio operation in the RC3250 Controller.

▶ **NOTE:** *This command applies to UHF operation only.*

Controller	Host Command	Controller Response
RC3250 (UHF)	` j qNNIñYÅê[	l hYÅê[

Variables: x = 0 (single base radio operation only)
x = 1 (auxiliary base radio operation only)
x = 2 (dual base radio operation)

Default: x = 0 (single base radio operation only)

EXAMPLE 1: Command: CMT11,1<cr>
Response: OK<cr> The controller sends to the auxiliary port only

EXAMPLE 2: Command: CMT11<cr>
Response: 1<cr> (assumes setting from example 1)

CMT12
Set Dual Speed

The CMT12 command enables dual baud rate operation on the RC3250 Controller channels 1 and 2; or, with the MBA3000 Multiple Base Adapter, channels 1, 2, 3, and 4. The variable "x" in the command CMT12,x is the sum of the selected options in the variable list below. The default is x = 0.

▶ **NOTE:** *This command applies to UHF operation only.*

Controller	Host Command	Controller Response
RC3250 (UHF)	CMT12,x<cr>	OK<cr>

Channel	Programmed to	Add
1 (base)	4800 bps or disabled (default)	0
	4800 and 9600 bps	1
	9600 bps only	2
2 (auxiliary)	4800 bps or disabled (default)	0
	4800 and 9600 bps	4
	9600 bps only	8

With MBA3000 Multiple Base Adapter Only:

Channel	Programmed to	Add
3	4800 bps or disabled (default)	0
	4800 and 9600 bps	16
	9600 bps only	32
4	4800 bps or disabled (default)	0
	4800 and 9600 bps	64
	9600 bps only	128

EXAMPLE 1: Command: CMT12,137<cr> (choosing 1+8+0+128 = 137)
Response: OK<cr> The controller enables channel 1 for dual bps operation, channel 2 for 9600 bps only, disables channel 3, and enables channel 4 for 9600 bps operation

EXAMPLE 2: Command: CMT12<cr>
Response: 137<cr> (assumes setting from example 1)

CMT13
Automatic Enable

The CMT13 command enables all responding wireless stations, only when using RTC protocol. CMT13,0 disables the feature, requiring each wireless station in the network to be enabled by address number. For Automatic Enable use CMT13,1.

Host Command	Controller Response
CMT13,x<cr>	OK<cr>

Variables: x = 0 (disable)
x = 1 (enable)

Default: x = 0 (disable)

EXAMPLE: Command: CMT13,1<cr>
Response: OK<cr> The controller enables all responding wireless stations

▶ **NOTE:** *When using this option, the host computer does not receive powerup messages from the wireless stations.*

CMT15
Remote Base Radio Support

The CMT15 command enables ports for base radios and modems. Sixteen settings for "x" enables any combination of 4 pairs of outputs. Channels 3 and 4 require the MBA3000 Multiple Base Adapter. The default is x = 0.

▶ **NOTE:** *This command applies to UHF operation only.*

Controller	Host Command	Function	Controller Response
RC3250 (UHF)	CMT15,x<cr>	See Table 8-4.	OK<cr>

▶ **NOTE:** *Both bases for a given pair connected to the MBA3000 Multiple Base Adapter must be either direct connect or remote. They can be mixed between pairs, but not within a single pair.*

Table 8-4
Positions for CMT15

x	Base Channel 1	Auxiliary Channel 2	MBA Channel 3	MBA Channel 4
M	lcc	OFF	OFF	OFF
1	ON	OFF	OFF	OFF
2	OFF	ON	OFF	OFF
3	ON	ON	OFF	OFF
4	OFF	OFF	ON	OFF
5	ON	OFF	ON	OFF
6	OFF	ON	ON	OFF
7	ON	ON	ON	OFF
8	OFF	OFF	OFF	ON
9	ON	OFF	OFF	ON
10	OFF	ON	OFF	ON
11	ON	ON	OFF	ON
12	OFF	OFF	ON	ON
13	ON	OFF	ON	ON
14	OFF	ON	ON	ON
15	ON	ON	ON	ON

EXAMPLE: Command: CMT15,1<cr>
Response: OK<cr> enables channel 1 port

CMT16
3270 Data Stream Light Pen Option

The CMT16 command controls the light pen bit for scanning. Command CMT16,1<cr> enables the light pen bit in 3270 format to control the scanning function. CMT16,0<cr> disables the light pen function.

Host Command	Controller Response
CMT16,x<cr>	OK<cr>

Variables: x = 0 (normal scanner activation; light pen bit does not control scanner)
x = 1 (alternate scanner activation; light pen bit controls light pen scanner)

Default: x = 0 (normal scanner activation; light pen bit does not control scanner)

EXAMPLE 1: Command: CMT16,1<cr>
Response: OK<cr> (light pen bit controls scanner)

EXAMPLE 2: Command: CMT16<cr>
Response: 1<cr> (assumes setting from example1)

CMT17
Set 3270 Data Stream Field Delimiter

The CMT17 command changes the input field delimiter. The default symbol is the slash, "/" (ASCII decimal number 47). By placing another ASCII decimal number indicator after the comma, the new new ASCII character is designated. The command CMT17,92 replaces the slash "/" with the backslash " \".

Host Command	Controller Response
CMT17,x<cr>	OK<cr>

Variables: x = two digits representing an ASCII decimal number

Default: x = 47 (ASCII decimal number for "/")

EXAMPLE 1: Command: CMT17,92<cr>
Response: OK<cr> The controller changes the field delimiter character for 3270 data stream operation from "/" (47) to " \" (92)

EXAMPLE 2: Command: CMT17<cr>
Response: 92<cr> (assumes setting from example 1)

CMT18
Enable Multiple Base Adapter

The CMT18 command enables the MBA3000 Multiple Base Adapter, which expands the controller to eight UHF radio ports in 4 pairs.

▶ **NOTE:** *This command applies to UHF operation only.*

Controller	Host Command	Controller Response
RC3250 (UHF)	CMT18,x<cr>	OK<cr>

Variables:

Channel 1

x = 0, no ports enabled
x = 1, port A enabled
x = 2, port B enabled
x = 3, A and B enabled

Channel 2

x = 0, no ports enabled
x = 4, port A enabled
x = 8, port B enabled
x = 12, A and B enabled

Channel 3

x = 0, no ports enabled
x = 16, port A enabled
x = 32, port B enabled
x = 48, A and B enabled

Channel 4

x = 0, no ports enabled
x = 64, port A enabled
x = 128, port B enabled
x = 192, A and B enabled

Default: x = 0 (no ports enabled)

EXAMPLE 1: Command: CMT18,1<cr>
Response: OK<cr> Enables port A, channel 1

EXAMPLE 2: Command: CMT18<cr>
Response: 1,<cr> (setting from example 1)

CMT20
Set Modem Delay Rate for Multiple Base Adapter

The CMT20 command sets a delay compensation time for each of the four pairs of ports on the MBA3000 Multiple Base Adapter. The delay (in milliseconds) may be required to accommodate a modem on a communication line. The "x" parameter, from 0 to 8, sets the delay rate for each pair of ports at 0 to 8 milliseconds.

▶ **NOTE:** *This command applies to UHF operation only.*

Controller	Host Command	Controller Response
RC3250 (UHF)	CMT20,x_1,x_2,x_3,x_4<cr>	OK<cr>

Variables: X_1 (pair 1) = 0 through 8
X_2 (pair 2) = 0 through 8
X_3 (pair 3) = 0 through 8
X_4 (pair 4) = 0 through 8

Syntax: CMT20,x_1,x_2,x_3,x_4<cr>

Default: x = 0

EXAMPLE 1: Command: CMT20,4,4,4,4<cr>
Response: OK<cr> The controller sets all four pairs of ports on MBA3000 Multiple Base Adapter to a 4-millisecond response delay

EXAMPLE 2: Command: CMT20<cr>
Response: 4,4,4,4<cr> (assumes setting from example 1)

CMT21
One Character Address Mode

With CMT21 enabled, the controller appears to be an RM2216 Controller at powerup. The controllers deliver the same powerup message. That is, there is no wireless station powerup type on the reset message, and there is a 1-byte wireless station addresses. With the controller's async host mode configured as RM2216, and the RM2216 mode enabled, CMT21,1 (one character address mode enabled), causes the controller to act like a 1-byte address RTC controller, with RTC wireless station reset messages. The CMT21 command does nothing if the controller is configured in normal character address mode.

Host Command	Controller Response
CMT21,x<cr>	OK<cr>

Variables: x = 0 (disable)
x = 1 (enable)

Default: x = 0 (disable)

EXAMPLE 1: Command CMT21,1<cr>
Response: OK<cr> Sets one character address, RTC mode if host mode setup is RM2216

EXAMPLE 2: Command CMT21<cr>
Response: 1,<cr> Reports the setting from example 1

CMT22
Multiple Buffering Mode

The CMT22 command is a means of the controller buffering commands sent by the host. Up to 25 commands per wireless station may be buffered before the controller rejects the host command with an out-of-buffers, ?10, response. This can easily happen if the host program issues commands to a wireless station that is not powered up or is out of range. The wireless station must act on the commands before the controller allows the host to send more commands.

When the option is disabled, which is the default, the controller handles commands in a transaction based order. The controller expects the host to wait until the response to the command is sent back to the host before the host sends the next command. If the host program violates this protocol by sending several commands to the controller in succession without the controller fully acting on the command, the commands may be overwritten and lost.

Host Command	Controller Response
CMT22,x<cr>	OK<cr>

Variables: x = 0 (disable)
x =1 (enable)

Default: x = 0 (disable)

Examples

Following are examples of multiple buffering disabled and multiple buffering enabled.

Multiple Buffering Disabled

Suppose that the host program issues the time to a particular wireless station every second. For a native datastream wireless station the command syntax may be W000DB/08:38:00<cr>, followed one second later with W000DB/08:38:01<cr>, W000DB/08:38:02<cr>, ... In the default case with multiple buffering disabled, the transaction may be processed as:

Host Command	Controller Response	Wireless Station Display
W000DB/08:38:00	OK<cr>	08:38:00
W000DB/08:38:01	OK<cr>	08:38:00
W000DB/08:38:02	OK<cr>	08:38:00
W000DB/08:38:03	OK<cr>	08:38:00
W000DB/08:38:04	OK<cr>	08:38:04

The results in this case cannot be predicted and is dependent on system transaction throughput and host overhead. This shows that "newer" host commands may overwrite "older" commands before that older command is actually transmitted to the wireless station.

Multiple Buffering Enabled

With multiple buffering enabled, host commands are not overwritten. They are buffered in the controller and issued to the wireless station sequentially. (There is no guarantee that these commands arrive at the wireless station exactly 1 second apart.) See the following chart.

Host Command	Controller Response	Wireless Station Display
W000DB/08:38:00	OK<cr>	08:38:00
W000DB/08:38:00	OK<cr>	08:38:00
t MMM a _LMUWPUWMN	l hYÅê[	MUWPUWMM
t MMM a _LMUWPUWMO	l hYÅê[	MUWPUWMM
t MMM a _LMUWPUWMP	l hYÅê[	MUWPUWMN
t MMM a _LMUWPUWMQ	l hYÅê[	MUWPUWMO

CMT23
Enhanced Host Poll Mode

Enhanced host polling is a more efficient method of host to controller communication. With this option enabled the controller can respond to a wireless station command with data instead of a simple acknowledgement. It reduces response time by reducing the number of read commands required to send data to the host.

Host Command	Controller Response
CMT23,x<cr>	OK<cr>

Variables: x = 0 (disable)
x = 1 (enable)

Default: x = 0 (disable)

EXAMPLE 1:

Regular Host Polling		Enhanced Host Polling	
W000D/\C0		W000D/\C0	
	OK		001Kresponse
R		W001D/PROMPT	
	000K\\0		000K\\0

Example 1 shows the traditional polling method and the potential advantages of the enhanced polling method. The controller does not have to wait for a Read command to be issued by the host in order to respond.

However, as example 2 shows, it is possible with the combination of enhanced host polling and multiple buffering for the commands to get out of step with the responses.

EXAMPLE 2:

t MMMaLy`M	
	OK
W000D/\XXXXXX	
	000K\\0
R	
	000D\\9

In this example the \\0 response is in response to the W000D/\C0 command, not the W000D/\XXXXXX command. The host program must keep track of which response is paired to which command.

CMT24
Set Respond Timer

The CMT24 command sets the timer between 0 and 255 in tenths of a second. The default is 10, or one second. An asynchronous host-to-controller link running in full-duplex mode uses two timers, one at each end of the link. CMT24 is the full-duplex asynchronous command. Two timers monitor message response time, one at each end of the message link. The respond timer is started when a message is received, and expires after the set length of time from 0 to 255, in tenths of a second. The default is 10, or one second.

When the respond timer expires, it signals that the received message must be acknowledged. An "ACK" must be sent even if there is no data to send. If a message is transmitted, the timer is stopped.

▶ **NOTE:** *This command applies to full duplex operation only.*

Host Command	Controller Response
CMT24,x<cr>	Data or ACK<cr>

Syntax: CMT24,x<cr>

Default: x = data or ACK

CMT25 Flow Control

CMT25 controls the maximum number of bytes of data the controller can send without acknowledgement. The controller monitors the size of the frames outstanding in its 8-buffer transmit queue. When data from a wireless station is ready to be sent to the host, the number of bytes in the frame is added to the unacknowledged number in the queue. It the number exceeds the parameter set by CMT25, and if the number in the queue is greater than 64 bytes, the frame is not sent. The host must acknowledge more data to receive more messages from the host. If the queue contains 64 bytes or less, messages of any length are not stopped.

The command parameter "n" sets the maximum message to n x 128 bytes, between n = 1 and n = 45, for a range of 128 to 5760 bytes. To leave space for controller responses that may follow a data transmission, the host should set the number of bytes to 128 or 256 bytes less than the actual size of the host's receive buffer. The default setting is n = 15 (1920 bytes).

▶ **NOTE:** *This command applies to full duplex operation only.*

Host Command	Controller Response
CMT25,n<cr>	OK<cr>

Syntax: CMT25,n<cr>

Default: n =15

EXAMPLE:
Command: CMT25,21<cr>
Response: OK<cr> The controller is allowed to send a maximum of 2688 bytes without acknowledgement

CMT
Request All Parameters

The CMT command returns the value of all CMT parameters. The CMT command can be used with all controllers, but the return varies with the controller in use:

- The controller returns CMT0 through CMT23
- Full duplex fda host controllers return CMT24 and CMT25

CMT20 always returns a “0” even if it contains nonzero values.

Command	Controller Response
CMT<cr>	002,255,000,000,000,000,000,006,000,000,000,000,000,000,000,000,000,047,000,000<cr>

Variables: None

Syntax: CMT<cr>

EXAMPLE:
Command: CMT<cr>
Response: 002,255,000,000,000,000,000,006,000,000,000,000,000,000,000,000,000,047,000,000<cr>

CMT, Controller List

The CMT, command allows the programmer to set the parameters for CMT0 through CMT25 at once with one command line. Default settings are maintained by leaving out a parameter and including the comma (example 1). Parameters following an incomplete series remain unchanged (example 2).

In full duplex mode, CMT0 through CMT25 can be set. In asynchronous mode, CMT0 through CMT23 can be set.

Host Command	Controller Response
CMT,a,b,c,d,e,f,g, h,i,j,k,l,m,n,o,p,q,r,s,t,u,v,w<cr>	OK<cr>

Variables:

a = CMT0	h = CMT9	o = CMT17	v = CMT24
b = CMT1	i = CMT11	p = CMT18	w = CMT25
c = CMT2	j = CMT12	q = CMT19	
d = CMT4	k = CMT13	r = CMT20	
e = CMT5	l = CMT14	s = CMT21	
f = CMT7	m = CMT15	t = CMT22	
g = CMT8	n = CMT16	u = CMT23	

Syntax: CMT,a,b,c,d,e,f,g,h,i,j,k,l,m,n,o,p,q,r,s,t,u,v,w<cr>

EXAMPLE 1:

Command: CMT,2,2,1,,,,,,,,,,,,,47,,<cr>
Response: OK<cr>
Sets: CMT0 to 2
CMT1 to 2
CMT2 to 1
CMT17 to 47
CMT3 through CMT16, CMT18
CMT20 to default values

EXAMPLE 2: Command: CMT,1,1,<cr>
Response: OK<cr>
Sets: CMT0 to 1 and CMT1 to 1, and leaves the remaining parameters set at the values in example 1, assuming that example 1 precedes example 2

CCS
System Callsign

The CCS command defines and reads the FCC (Federal Communications Commission) callsign used by the network. CCS without the "x" variable returns the callsign.

▶ **NOTE:** *This command applies to UHF operation only.*

Controller	Host Command	Controller Response
RC3250 (UHF)	CCS/[callsign] <cr>	OK<cr>

Variables: [callsign] = FCC callsign (such as: KD22895)

EXAMPLE 1: Command: CCS/KD22895<cr>
Response: Transmits "KD22895" at least once in each 15-minute interval while the network is on the air

EXAMPLE 2: Command: CCS<cr>
Response: KD22895<cr>

E
Enable or Disable Wireless Stations

The E command enables wireless stations in a network. Wireless stations may be enabled individually or all at once. See CMT10 for extended response details.

Host Command	Function	Controller Response
Ess...s<cr>(up to 127) or Etf<cr>	Enables wireless stations 0, 1, 2…126 or wireless station "t."	OK<cr>

Variables: s = Y (enable)
s = N (disable)
x = extended response
(no X) = no extended response

The first "s" (Y or N) is for the wireless station with address 0. The last "s" is for the wireless station with the address number equal to one less than the capacity of the network controller. Thus, wireless station 3, where 4 is the total number of channels, 15 when 16 total, etc.

The E command enables and disables wireless stations (communication channels) on the radio data network. Before a wireless station can be polled or sent a message, it must be enabled by the host computer or allowed to enable and identify itself to the controller. Enabling a wireless station opens a channel to that wireless station.

The first syntax in the table selectively enables or disables channels. The second syntax enables all wireless stations.

EXAMPLE:

Command: EYYYYYNNNNNNNYYYYYYYYYY<cr>
Response: OK<cr>
Enables wireless stations 0–4 and 12–21
Disables wireless stations 5–11
Wireless stations 22–127 are unchanged

R
Enable Controller Response

The R (Read) command enables the controller to transmit wireless station data to the host computer.

Commands sent by the host to the controller (or wireless station) must generally be followed by an R command so that the controller can respond or forward any data it has received from a wireless station and stored. There are four responses to the R command (summarized in Table 8-5):

Response 1) t(K or S)d<cr> The controller indicates it has data or a message ready for the host. The parameter "S" indicates scanned data and K indicates keyboard data.

Response 2) tP,c<cr> The controller indicates that the wireless station has been reset or powered up. The parameter "c" is the wireless station type code.

Response 3) ,0<cr>POWER UP QXASYNC Vy.yy,127<cr> The controllers indicate that Vy.yy is the software version.

Response 4) OK<cr> The controller indicates interactive mode is enabled and data timeout.

Variables: c = wireless station type code (see Table 8-6)
t = wireless station number (network address)
d = wireless station data
x = S (scan data) for all controllers
K (keyboard data) for all controllers
Vy.yy = software version

Table 8-5
Controller Responses to R Command

Host Command	Controller Response
R<cr>	▶ td<cr> data from wireless station t
	▶ tP,c<cr> wireless station powerup
	▶ ,0<cr> POWER UP QXSASYNC Vy.yy,127<cr>
	▶ OK<cr>

Table 8-6
Wireless Station Type Codes

Value	Station	Firmware	Display	Protocol	Data Stream
32	RT3210	FWP321C5	16x9	RTC	Native
33	RT3210	FWP321C5	21x15	RTC	Native
34	RT3210	FWP321S5	16x9	RTC	3270
35	RT3210	FWP321S5	21x15	RTC	3270
36	RT3210	FWP321S5	80x22 (16x9)	RTC	3270
37	RT3210	FWP321S5	80x24 (21x15)	RTC	3270
46	RT3210	FWP321W5	80x24 (16x9)	RTC	3270
47	RT3210	FWP321W5	80x24 (21x15)	RTC	3270
46	RT3210	FWP351W5	80x24 (16x9)	RTC	3270
47	RT3210	FWP351W5	80x24 (21x15)	RTC	3270
52	RT3210	FWP321L5	80x24 (16x9)	RTC	5250
53	RT3210	FWP321L5	80x24 (21x15)	RTC	5250
60	RT1100 Series			RTC	Native
61	RT1100 Series			RTC	3270
62	RT1100 Series			RTC	5250
63	RT1100 Series			RTC	VT220
60	RT1700 Series			RTC	Native
61	RT1700 Series			RTC	3270
62	RT1700 Series			RTC	5250
63	RT1700 Series			RTC	VT220
60	RT5910	FWP591HO	80x24	RTC	Native
61	RT5910	FWP591HO	80x24	RTC	3270
62	RT5910	FWP591HO	80x24	RTC	5250
63	RT5910	FWP591HO	80x24	RTC	VT220

* Brackets (value) indicate that the wireless station type number is not returned.

** 80x24 is a logical screen size of which the wireless station displays a portion.

T
Repeat Controller Response

The T command requires the controller to retransmit its last message to the host computer. Use it in the event of a partially missed or corrupted message as indicated by a parity, framing or length error as received by the host computer.

Host Command	Controller Response
T<cr>	<cr>

EXAMPLE:

Command: T<cr>
Response: The controller repeats the last message sent to the host computer, and adds a carriage return

?
Get Transmit Message Status

The ? command requests the status of the controller's transmit buffer.

Host Command	Controller Response
?<cr>	xxxxxx...x<cr> (127 characters)

The controller responds by returning a status code for each wireless station in the network. Table 8-7 lists status codes for controllers in 2216 mode.

Table 8-7
Transmit Message Status Codes

ñ	aÉÍáàáííçà
N	Wireless station is disabled
M	Message pending to wireless station
A	No message pending to wireless station (wireless station is active)
P	Message pending to inactive wireless station
I	kç ãÉëë~ÖÉ éÉåÇáåÖ íç áå~ÅíáîÉ ïáêÉäÉëë ëí~íáçå ËÄ~ëÉÇ çå ` j qTF

EXAMPLE 1: Command: ?<cr>
Response: CCCCOOOOPPPPNNN...N<cr> (127 characters)
This example indicates that wireless stations 0–3 have messages pending, 4–7 have no messages pending, 8–11 have messages pending but are inactive, and wireless stations 12–126 are disabled

F
Get Emulation Station Type

The F command returns a radio type code for each channel of the network. Essential to systems using more than one kind of wireless station, the response comes back in a series of codes, one for each *channel,* followed by a <cr>. Wireless station type codes are listed in Table 8-6.

Host Command	Controller Response
F<cr>	x,x,x...x,x,x,x<cr> (127 numbers)

EXAMPLE 1: Command: F<cr>
Response:
032,022,000,000,000,000,000,000,000,000,000,000,000,000,000,
000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,
000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,
000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,
000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,
000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,
000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,
000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,
000,000,000,000,000,000,000,000,000,000,000,000,000,000,000<cr>

This example indicates that channels 0 and 1 are RT3210 Radio Terminals and channels 2–126 are disabled.

DMC
Clear Controller Buffers

The DMC command clears the controller's buffers and resets the sequence numbers without rebooting. The controller does not check the value of Ns/Nr for this command (nor for the DMP command), although Ns/Nr must be present to maintain format, and responds with "<stx>01ACK<cr>." The DMC command is particularly useful for synchronizing after a host powerup when the state of the controller is unknown.

▶ **NOTE:** *This command applies to full duplex operation only.*

Host Command	Controller Response
DMC<cr>	<stx>01ACK<cr>

DME
Controller Echo-Back Diagnostics

The DME command checks the communication link between the host computer and the controller. Data from the host is received by the controller, which sends an identical data string back to the host computer for comparison.

The syntax is DME/x<cr>, and the response is x<cr>. The "x" variable is the data from the host, which is 1024 characters maximum

Host Command	Controller Response
DME/x<cr>	x<cr>

EXAMPLE:

Command: DME/Echo-back command.<cr>
Response: Echo-back command.<cr>

DMP
Controller Power-Up Self-Test Diagnostic

The DMP command resets the controller and starts the powerup self tests. The powerup message is returned to the host computer when the self tests are complete. Approximate tests times are 21 seconds.

Powerup restores default parameters. Redefine the operational parameters which differ from default parameters after this command.

Host Command	Controller Response
DMP<cr>	,0<cr>POWER UP QXSASYNC Vy.yy,127<cr> controller powerup

EXAMPLE:

Command: DMP<cr>
Response: ,0<cr>POWER UP QXSASYNC Vy.yy,127<cr>

DMV
Controller Firmware or Software Version

The DMV command sends the controller firmware or software version number to the host computer. The controllers return the Vy.yy software version number.

Host Command	Controller Response
DMV<cr>	QXSASYNC Vy.yy<cr>

Variable: Vy.y = software version number

EXAMPLE:

Command: DMV<cr>

Response: **RC4030E and RCB4030:** QXSASYNC V1.21<cr>
RC3250: QXSASYNC V1.21<cr>

Section 9

Data Stream Commands

Overview

This section describes 3270 SNA/SDLC and asynchronous display data stream commands and orders that the host application can send to the wireless stations. Orders govern format and data expectations within a data stream command. Also included in this section is information on formatting data to be displayed on the wireless stations.

This section is not intended as a specific guide for programming, but a comparison with your existing system. The information helps identify differences between your screen-generating utilities and features supported by the wireless stations.

Screen Design Aid

This section, along with your Screen Design Aid (SDA) documentation, can help you resolve occasional questions concerning discrepancies that may arise regarding attribute selection and the capabilities of the wireless stations. This section includes information you may not need, because you can use your SDA to do much, if not all, of the programming to handle commands and orders for the radio data network.

This information is provided to assure you have the most accurate and detailed information available and to describe variations from the 3270 data stream where they occur.

If you are comfortable using the SDA on your host computer, you can flip through this section to find out which commands and orders the wireless stations support. You can then read Section 10, which describes the extended commands you can use to do operations beyond the capability of the 3278 Model 2 terminal.

Applications

If you need to write applications specifically for the wireless station, it is recommended that you use the corner mode window onto the 3278 Model 2 terminal and write programs using the portion of the display available without moving the window. This is the most efficient method for developing custom applications for the wireless station.

3270 Data Stream Commands

The 3270 data stream consists of application data, commands and structured field functions, and orders which are transmitted between the controller and the host system. The wireless stations support a subset of the IBM 3270 command structure to display and accept keyboard or scanner input. The following chart lists the SNA/SDLC and asynchronous commands that the wireless stations support.

	Syntax	
Command	**SNA/SDLC (Hex)**	**Asynchronous**
Erase All Unprotected	6F	?
Erase/Write	F5	5
Erase/Write Alternate	7E	=
Read Buffer	F2	2
Read Modified	F6	6
Read Modified All	6E	>
Reset Terminal	Not applicable	G
System Services Control Point		4
Write	F1	1

Erase All Unprotected Command

The Erase All Unprotected command performs the following functions at the selected wireless stations:

- Clears unprotected buffer locations to nulls.
- Resets to 0 the MDT bit for each unprotected field.
- Positions cursor address to the first location of the buffer.

Erase/Write Command

The Erase/Write command performs both an erase operation and a write operation, as follows:

1. The erase operation clears the device buffer to nulls, positions the cursor address at the first location in the buffer, and resets the buffer address to its first location.

2. The Erase/Write command performs the write and write control character (WCC) operations in the same manner as the Write command. If no WCC is sent, the Erase/Write command will not erase the buffer.

Erase/Write Alternate Command

The Erase/Write Alternate command performs the same function in the wireless station as the Erase/Write command, and allows both the erase and write operations to take place.

Read Buffer (RB) Command

The RB command causes buffer data from the wireless station to be transmitted to the main storage in the central processing unit. All buffer data and nulls from the beginning to the end of the buffer location are included in the transfer. The default setting for the beginning of buffer data transfer is 0. If the RB command is chained from the Write or Erase/Write command, data transfer will begin from the current buffer address with all nulls suppressed.

The RB response starts with a 3-byte heading that includes the AID character and a 2-character cursor address. The controller inserts a Start Field order to identify the beginning of each field. Alphanumeric data for each field then follows the RB command header.

The RB command data stream uses the following format:

<AID code> <cursor address> <SF order> <attribute byte> <first data field> <second data field>

▶ **NOTE:** *Response times increase for the Read Buffer command because of the large quantity of data processed during the read buffer operation.*

Read Modified Command

A major feature of the Read Modified command is null suppression. During read modified command operations, null codes are not sent.

During a Read Modified command, all fields that have been modified are transferred to the program. All nulls are suppressed during data transfer and thus are not included in the read data stream. As a field is modified by the operator, the MDT bit is set in the attribute byte for that field. Then, when a read-modified operation is performed, successive attribute bytes are examined for a set MDT bit. When the bit is found, the data in the associated field is read (with nulls suppressed) before the next attribute byte is examined. If the screen is unformatted the entire screen (with nulls suppressed) is sent.

Read Modified All Command

The Read Modified All command is the same as the Read Modified command.

Reset Terminal

The Reset Terminal command is an asynchronous command that returns the wireless station to its first ”state,” a known condition. All wireless stations are reset when “t” is omitted. Wireless stations respond to a poll with their power-up message.

Station	Function	Syntax	Controller	R Response
RT2210 RT2210XL RT3210 RT3310 RT3410 RT5910 RT5920 RT5940 RT5960 RT5980 TM1100 TM1700	Resets wireless station(s)	Gt<cr> [t only] G<cr> [all]	OK<cr>	tP,x<cr>
RT1100 RT1201	Resets wireless station(s)	Gt<cr> [t only] G<cr> [all]	OK<cr>	tP<cr>

Variables: t = wireless station number (network address)

x= wireless station type code

EXAMPLE:

Command: G002<cr>
Response: Controller resets wireless station 002

Table 8-6 in Section 8 lists wireless station type codes.

System Services Control Point (SSCP) Command

The SSCP command reads in new data from the host and places it at the current cursor position. If a 0x15 new line character is among the data, the wireless station performs a newline function. The SSCP command has no orders or WCC character associated with it. The command generates an unformatted screen.

Write Command

A Write command from the host computer consists of a command code, a WCC, and any orders or new buffer data (or both) required to modify the existing buffer contents.

Execution of the Write command is in two steps:

1. The WCC is processed.
2. Buffer data and orders are processed.

Data may be any ASCII character in the range of 0x20 to 0x7E, and must define the character content of a field.

Buffer data characters may be written into any location of the buffer without erasing or modifying the data in other locations. Data is stored in successive buffer locations until an order alters the buffer address, or until all data has been entered.

During the write operation, the buffer address advances one location as each character is stored. If the Set Buffer Address order does not immediately follow the WCC command, the wireless station will start writing data from the first location of the buffer.

Write Control Character

Bits 0, 1, and 2 of the WCC cause action in the wireless station. The following chart describes the format of the WCC byte.

Bit #	Description
0	Reset MDT bits. When set to 1, all MDT bits in the selected buffer are reset before any data is written or orders are executed.
1	Keyboard restore bit. When set to 1, the wireless station allows input. The station locks out all data when it sends data to the host and will not accept input until it receives a command with this bit set.
2	Sound alarm bit. When set to 1, the selected wireless station's alarm sounds three short beeps after operation.
3 –7	Unused ("do not care") bits.

▶ **NOTE:** *Bit numbers are in the opposite order of those described in the IBM 3270 Information Display System Component Description manual.*

The wireless station ignores all WCC bits defined as "unused." Only the three least significant bits of the WCC byte cause action in the wireless station. These are converted to ASCII characters. Appendix B contains a binary to ASCII conversion table.

Orders and buffer data follow the WCC. Data characters are any of the displayable ASCII characters in the range hexadecimal 20 through 7E. They define the character content of a protected or unprotected field.

Buffer data characters may be written into any specific location of the buffer without erasing or modifying the data in other buffer locations. Data characters are stored in successive buffer locations until an order alters the buffer address, or until all data has been entered.

During the write operation, the buffer address is advanced one location as each character is stored. If the Set Buffer Address order does not immediately follow WCC, the wireless station starts writing data from the first location of the buffer.

3270 Data Stream Format

The 3270 data stream wireless station command format (WtDxyz) is an asynchronous format that an asynchronous host uses to send data to the wireless station.

Syntax	Controller Response	R Response
WtDxyz<cr>	None	tKas{Atu.../Atu}<cr>

Variables: t = Wireless station number

x = 3270 data stream command:
- ? Erase All Unprotected
- 5 Erase/Write
- = Erase Write Alternate
- 2 Read Buffer
- 6 Read Modified
- > Read modified all
- G Reset wireless station
- 4 SSCP
- 1 Write

y = 3270 write control character (WCC)
- Bit 0 Reset MDT bits
- Bit 1 Keyboard restore
- Bit 2 Sound alarm

z = Wireless station orders or ≤1024 characters

a = AID key code

s = 4-byte right-justified, zero-filled address of the current cursor position when the AID key was pressed (values 0–1919)

/At = Set Buffer order followed by a 4-byte right-justified, zero-filled address of the field from where the data is returned

u = Data entered or modified for this field

{} = Optional

EXAMPLE: Command: W000D5G/A0000/F'ID:/F@%/A0017/F'/A0081/
DESCRIPTION:/A0160/F@%/A0177/F'/A0241/
QUANTITY:/F@&/A0253/F'<cr>

This command is for an RT1140 in the window and 16x9 display mode. The command displays the following on the RT1140 Radio Terminal:

```
ID:%
DESCRIPTION:
%
QUANTITY:&
```

If the user enters "210458236" for the ID field, "PEACH CRATES" for the description field, and "85" for the quantity field, the screen displays:

```
ID:210458236
DESCRIPTION:
PEACH CRATES
QUANTITY: 85
```

When the wireless station operator presses [ENTER], the host receives the following response:

```
000K'0252/A0004210458236/A0161PEACH CRATES/A025085
```

Orders

Wireless station orders may be included in each 3270 data stream command, either alone or intermixed with display data. Wireless station orders are executed sequentially, and only after the complete data stream has been received by the wireless station and checked for errors. Orders are not stored in the display buffer with other data in the data stream. For the asynchronous data stream, they are added to the data stream following a "/" character.

Buffer control orders position, define, and format data being written into the buffer. They also erase selected unprotected data in the buffer and reposition the cursor address. Table 9-1 lists the orders.

Table 9-1
3270 Data Stream Orders

	Code				
Order	**SNA/ SDLC**	**Asynch.***	**Byte 2**	**Byte 3**	**Byte 4**
Erase Unprotected to Address	12	/Exxxx	1st address byte	2nd address byte	Not used
Insert Cursor	13	/C	Not used	Not used	Not used
Program Tab	05	/P	Not used	Not used	Not used
Repeat to Address	3C	/Rxxxxy	1st address byte	2nd address byte	Character to be repeated
Scanner	1F	/Sttt	Bar code control byte	1st option byte	2nd option byte
Set Buffer Address	11	/Axxxx	1st address byte	2nd address byte	Not used
Start Field	1D	/Fa	Attribute character	Not used	Not used

* xxxx = a 4-byte buffer address, 0 to 1919, right-adjusted, zero-filled
y = character to be repeated
ttt = scanner order designator
a = an attribute byte

The following pages describe buffer control orders, which are executed sequentially at the selected wireless station, after the complete data stream has been received by the station and checked for data integrity. These orders are not stored in the display buffer.

Most of the buffer control orders in Table 9-1 position, define, and format data being written into the buffer, erase selected unprotected data in the buffer, and reposition the cursor address. The Scanner order is an extension of the 3270 data stream and is not supported by the 3278 Model 2.

Erase Unprotected to Address (EUA) Order

The EUA order inserts nulls in all unprotected buffer locations, starting at the current buffer address and ending at (but not including) the specified stop address. For the asynchronous data stream, the stop address is specified by address bytes "xxxx" which immediately follow the EUA order in the write data stream. For SNA/SDLC, the stop address is specified by the two address bytes which immediately follow the EUA in the write data stream.

If an invalid stop address is specified (that is, an address outside the range of the wireless station's display buffer) the following occur (not necessarily in the order listed):

- The write operation is terminated at this point.
- The character is not stored.
- The wireless station recognizes this as an error condition.
- The wireless station performs a clear memory operation.
- The display buffer is set to nulls.
- A clear AID character is transmitted to the wireless station control unit for forwarding to the host computer.

When the stop address is lower than the current buffer address, the EUA order wraps from the end of the buffer to the beginning of the buffer and continues. When the stop address equals the current buffer address, all unprotected character locations in the buffer are erased (set to nulls).

Insert Cursor (IC) Order

The IC order changes the stored cursor address to the location specified by the current buffer address. The current buffer address does not change.

For example, if the IC order is issued when the current buffer address is 320 and the present stored cursor address is 0 (zero), the cursor address changes from 0 to 320. The current buffer address at the end of this operation remains at address 320. If multiple IC orders appear in the write data stream, the last one encountered is used in subsequent operations.

If the IC order is placed at a location past the end of display on the wireless station, the current buffer address will be updated so that the cursor address will be located on the display.

At the end of write data stream, after all orders have been executed by the wireless station and all required data has been entered into the buffer, the stored cursor address determines which unprotected field should be displayed to the user first. The following algorithm is used:

1. The wireless station searches the buffer backward to find the first protected field attribute before the stored cursor address. Unprotected attributes are not considered.
2. The wireless station then executes a forward tab (or equivalent) to an unprotected field.

3. If a protected field attribute is not found before the first location of the display buffer is found (location 0), then an unconditional forward tab equivalent will be executed, causing the first unprotected field in the buffer to be displayed.

Program Tab (PT) Order

The PT order advances the current buffer address of the first character position to the next unprotected field. Special conditions are as follows:

- If the PT order is issued when the current buffer address is the location of an attribute byte of an unprotected field, the buffer address is set to the next location of that field (location 1).
- If a PT order follows data, the rest of the field is null-filled.
- If a PT order in the write data stream does not follow a control command, order (or order sequence such as WCC), Insert Cursor order, or Repeat to Address order (4-character sequence), nulls are inserted from the current buffer address to the end of the field.
- When the PT order follows a control command, order, or sequence order, the buffer content is not modified for that field.

The PT order stops its search at the last location in the buffer. If an attribute character for an unprotected field is not found by this point, the buffer address is set to 0 (first location of the buffer). If the PT order finds an unprotected attribute in the last location of the buffer, the buffer address is still set to location 0.

To continue the search for an unprotected attribute, a second PT order must be issued immediately following the first one. Since the current buffer address was set to 0 by the first PT order, the second PT order begins its search starting at location 0. If the previous PT order was inserting nulls in each character location when it was terminated at the last buffer location, the new PT order will continue to insert nulls from buffer location 0 to the end of the current field.

Repeat to Address (RA) Order

The RA order stores a character "y" in all buffer locations starting at the current buffer address and ending at (but not including) the specified stop address. For the asynchronous protocol, the stop address is "xxxx." The stop address and the character to be repeated are identified by the five bytes immediately following the RA order in the write data stream.

For the SNA/SDLC protocol, the third character following the RA order is always interpreted as the character to be repeated. If an invalid stop address is specified (such as an address outside the range of the wireless station's display buffer), the following occur (not necessarily in the order listed):

- The write operation is terminated at that point.
- The character is not stored.
- The wireless station recognizes this as an error condition.
- The wireless station automatically performs a clear memory operation.
- The entire display buffer is set to nulls.
- A clear AID character is transmitted to the wireless station control unit for forwarding to the host.

When the stop address is lower than the current buffer address, the RA operation wraps from the end of the buffer to the beginning of the buffer and continues. When the stop address equals the current buffer address, the specified character is stored in all buffer locations.

Attribute characters will be overwritten by the RA order if they occur before the RA order stop address.

/Sttt
Scanner (SCN) Order

The SCN order is an extension to the 3270 data stream and is not supported by IBM display terminal. The order tells the wireless station which bar code algorithm to apply to the bar code data read by the bar code reading device, and what the minimum and maximum length range of a valid decode is.

When auto-discriminating bar codes, the probability of a cross-substitution increases. To reduce this probability, the application can enable only certain algorithms and specify what the minimum and maximum number of characters needed for a good decode are.

The SCN parameters are stored in the wireless station and do not need to be sent with every Write command. These parameters are in effect for all data fields (that is, they are not specific to any one field). If the decoded data is not within the bounds of the SCN parameters, then the decode is considered to be bad. If the decode meets the SCN parameters, then the data is passed to the keyboard handler which may reject the data if it does not fit the target field attributes.

The SCN order has the following format:

Syntax: (/Sttt)

- S = SCN order
- First t = bar code control
- Second t = option byte 1
- Third t = option byte 2

The "bar code control" byte indicates the method by which the option bytes are to be decoded. Multiple SCN orders may need to be sent to handle all parameters and bar codes that may be used. The wireless station contains the bar code algorithms for those bar codes listed in Table 9-2. For additional bar code scanning options for the wireless station using the 3270 extended command set, see Section 10, "Extended Commands."

Table 9-2
Scanner Order Byte Definitions

Parameter	Bar Code Control Byte (Hex)	Option Byte 1	Option Byte 2 Bit Definitions
Bar code length [1]	00	Maximum length	Minimum length
UPC bar codes	01	00	Bit 5 = enable UPC Bit 4 = enable UPC with add-ons Bit 3 = expand UPC-E to UPC-A Bit 2 = UPC-E System 1
EAN bar codes	02	00	Bit 5 = enable EAN Bit 4 = enable EAN with add ons
CODE 39 bar codes	03	00	Bit 5 = enable CODE 39 Bit 4 = enable Extended CODE 39
PLESSEY bar codes	04	00	Bit 5 = enable PLESSEY Bit 4 = retain 2nd check digit Bit 3 = validate 1st check digit Bit 2 = retain 1st check digit Bit 1 = MOD 10 1st check digit Bit 0 = MOD 11 1st check digit
CODABAR bar codes	05	00	Bit 5 = enable ABC CODABAR Bit 4 = enable CODABAR

Table 9-2 (Continued)
Scanner Order Byte Definitions

Parameter	Bar Code Control Byte (Hex)	Option Byte 1	Option Byte 2 Bit Definitions
CODE 93 bar codes	07	00	Bit 5 = enable CODE 93
2 OF 5 bar codes [2]	09	00	Bit 5 = enable Straight 2 of 5 Bit 4 = enable Computer Identics 2 of 5 Bit 3 = enable Interleaved 2 of 5
Redundancy	11	00	Bit 3 = enable CCD 20/20 scanning Bit 2 = enable HP wand scanning Bit1 = enable CCD 20/20 redundancy Bit 0 = enable laser beam redundancy
Scanning options [3]	12	00	Bit 6 = enable use of bits 1 & 2 Bit 5 = enable bar code type character Bit 4 = enable scanning concatenation Bit 3 = enable auto scan/forward tab Bit 2 = enable auto scan/enter Bit 1 = Laser Scanner voltage: 0–5 volts, 1–12 volts (RT3210) Bit 0 = enable MOD 10 check digit

1 The maximum and minimum values for bar code lengths must be a value between hexadecimal 01 and hexadecimal 20 (decimals 1 and 31). If a Length Scanner order (bar code control byte hexadecimal 00) is not sent to the wireless station, the default setting is a minimum length of 1 and maximum length of 32.

All values above (hexadecimal yy) are hex values for the lower six bits of the bytes. With the 3270 data stream, these values need to be converted into EBCDIC display characters. An EBCDIC conversion chart is provided in Appendix B.

2 The bar code control byte for 2 OF 5 (hexadecimal 09) requires four additional bytes of information, which directly follow option byte 2. These fields must have a value in the lower 6 bits between hexadecimal 01and 20 (decimals 1 and 32), and be converted to display characters by using the EBCDIC conversion chart in Appendix B. The required extra fields are:

<maximum length> <minimum length> <Fix 1 length> <Fix 2 length>

3 Scanning options may also be set through the wireless station's firmware menus.

The following chart shows an example of an SCN order in a write data stream. In this example Code 39 and Extended Code 39 are enabled with a maximum length of 24 and a minimum length of 8. CCD redundancy is also enabled.

Byte Value (Hex)	Meaning
1F	Scanner order (SCN)
03	Bar code control byte, Code 39
00	Option byte 1
60	Option byte 2, enable Code 39 and Extended Code 39
1F	Scanner order (SCN)
00	Bar code control byte, bar code lengths
18	Option byte 1, maximum length of 24 (decimal)
08	Option byte 2, minimum length of 8 (decimal)
1F	Scanner order (SCN)
11	Bar code control byte, redundancy
00	Option byte 1

Set Buffer Address (SBA) Order

The 3-byte SBA order specifies a new buffer address from which operations are to start or continue. Operations start at address 0 (zero) by default.

The SBA order may be used to write data into various areas of the buffer. An SBA order may also do the following:

- Precede another order in the data stream to specify the starting address for a Program Tab, Repeat to Address, or Erase Unprotected to Address order.
- Specify the address at which an attribute byte is stored by a Start Field order.
- Specify the cursor address for an Insert Cursor order.

If the SBA order specifies an invalid address (that is, an address outside the range of the wireless station's display buffer) the following occur:

1. The write operation is terminated at that point.
2. The wireless station recognizes this as an error condition.
3. The wireless station automatically performs a clear memory operation.
4. The entire display buffer is set to nulls.
5. A clear AID character is transmitted to the wireless station control unit for forwarding to the host.

The result of this action is the same as if the user had selected Function 7 (clear memory).

Start Field (SF) Order

The SF order notifies the wireless station that the next byte in the write data stream is an attribute character. The wireless station stores the next byte and attribute character at the current buffer address. As the attribute character is stored, the wireless station sets a control bit at the address. This bit identifies the byte as an attribute character during subsequent program or device operations with the buffer data.

▶ **NOTE:** *The byte immediately following the SF order in the data stream is always stored as an attribute character, even when the byte is intended as an order or an alphanumeric data character.*

The byte following the SF order defines the characteristics or "attributes" of the data that follows. Each attribute character, plus all the data following it up to the next attribute character (or the last location of the buffer) is called a field.

In addition to defining the start of a field, attribute characters define the following characteristics for all character locations contained within the field:

- Protected from modification by the user, or unprotected (available for the operator to modify or enter data). The unprotected definition classifies the field as an input field.
- Alphanumeric (an input field in which the operator can enter alphabetic, numeric, or symbol characters) or numeric (an input field in which the period, dash, and numbers 0–9 may be used).
- Field displayed or not displayed to the user.

Each attribute character occupies one of the character locations in the buffer, but it cannot be displayed. Table 9-3 lists attribute character bit assignments. During display operations, attribute characters appear as blanks.

Table 9-3
3270 Attribute Character Bit Assignments

Bit #	Description
7	Not used
6	Not used
5*	0 = Unprotected 1 = Protected
4*	0 = Alphanumeric 1 = Numeric only
3, 2	00 = Field is displayable, normal video mode 01= Field is displayable, normal video mode 10 = Field displayable, reverse video mode 11 = Field is nondisplayable
1	1 = Keyboard only data 0 = Keyboard or bar code reader input allowed
0	MDT bit identifies modified fields which must be sent to the controller when transmission begins: 0 = Field has not been modified. 1 = Field has been modified; may also be set by the application program in the data stream to force transmission of a particular field.

* Bits 5 and 4 equal to 11 cause an automatic skip. See "Automatic Skip" for more information.

Attribute characters are treated as characters that are protected from operator intervention. They cannot be replaced by alphanumeric characters entered from the keyboard or scanner. However, the MDT of the attribute can be changed by the operator by using Table 9-3. Also, attribute characters are not protected from being overwritten by alphanumeric data that is included in a Write, Erase/Write, or Erase All Unprotected command data stream.

Additional SF features include automatic skip, auto-forward tab, and auto enter.

Automatic Skip

Automatic skip automatically forward tabs to the next input field when the current input field is full. This is done by setting the attribute byte of the next field to be protected and numeric (bits 5 and 4 of the attribute character are equal to 11). This indicates to the wireless station that when the last byte in the input field is filled, the wireless station should advance to the next input field.

Auto-Forward Tab

The auto-forward tab on a good bar code scan is used for unprotected (input) fields to allow keystroke operations to be emulated upon the detection of a good scan. The auto-forward tab will automatically advance to the next input field after processing bar code data.

For asynchronous communications, initiate this feature by inserting a "%" character in the first byte of an unprotected (input) field after the attribute byte of a Start Field order (/Fa%).

Auto Enter

The auto enter feature is also used for unprotected input fields to allow emulation of keystroke operations when a good scan is detected. Auto enter on a good bar code scan will automatically emulate the pressing of the Enter key after processing bar code data. This sends the data to the host system.

For asynchronous communications, initiate this feature by inserting an "&" character in the first byte of an unprotected input field after the attribute byte of a Start Field order (/Fa&).

Sending Data to the Host

Data is returned to the host computer when the operator presses the [ENTER] key on the wireless station's keyboard. When this happens, the station transmits all modified data fields back to the host computer. Data is returned to the host computer in the following format:

<AID> <cursor address> <SBA> <attribute> <address +1> <data> <SBA> <attribute> <address +1> <alphanumeric data>

3270 AID Keys

The 3270 AID keys request an application program from the host computer. Press [ENTER], [PF1] through [PF24], [PA1], [PA2], or the [CLEAR] key for the desired program.

The AID key sends the AID code (an ASCII value) and any modified data. The [CLEAR], [PA1], and [PA2] keys send only the AID code. Table 9-4 lists AID keys and their values.

Table 9-4
3270 Function Key Conversions

AID Key	Hexadecimal	ASCII
PF1	41	A
PF2	42	B
PF3	43	C
PF4	44	D
PF5	45	E
PF6	46	F
PF7	47	G
PF8	48	H
PF9	49	I
PF10	4A	J
PF11	4B	K
PF12	4C	L
PF13	4D	M
PF14	4E	N
PF15	4F	O
PF16	50	P
PF17	51	Q
PF18	52	R
PF19	53	S
PF20	54	T
PF21	55	U
PF22	56	V
PF23	57	W
PF24	58	W
Enter	27	’
Clear	37	7
PA1	59	Y
PA2	5A	Z

Section 10

Extended Commands

Overview

Extended commands govern abilities unique to wireless stations. You can use extended commands to print, set menu parameters for scanning, 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 to the port 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). The wireless station sends the data to the RS-232 port until it detects a "#" character.

Line 2, Column 1 begins the start of transmit data. The host application must set up the screen with a transmit field to locate the RS-232 port I/O data. The field can be anywhere on the screen, beginning at position 80. The host application must supply the receive field (for response from the RS-232 port to the host). The receive field can be anywhere on the screen except for the position allocated for the return status field.

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. For example, if your printer requires a carriage return, you would insert "=0D." You would insert "=0A" for a line feed. Appendix B contains other hexadecimal values.

Table 10-1 describes the line and columns where characters must appear, and their meanings.

Table 10-1
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 10-1 (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
	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.
13		Return AID key.
	(Space)	AID key is Enter (default).
	X	AID key character. See Table 10-2 (page 10-7) for return AID key characters.
14–15		Maximum characters to receive.
	(Space)	Default.
	dd (or)	"dd" is a decimal digit from 00–99. Default is 99.
	Xd…dX	"X" is an uppercase literal. "d…d" is any number of decimal digits from 0–2000 inclusive. Default is 99.

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

Table 10-1 (Continued)
Transmit and Receive Characters

Line 1, Columns 2-24

Column	Character *	Description
16–17		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.
18–19		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.
20–21		Start character.
	AA	Hexadecimal ASCII code. Range is 00–99. Default of 00 implies no start character.
22		Return start character to host.
	F	Return character.
	(Space)	Do not return character.
23		Flag parity errors.
	P	Flag.
	(Space)	Do not flag.
24–25		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 the following three types of flow control:

- RTS/CTS
- DTR/DSR (RT3210 and RT5900)
- XON/XOFF

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.

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.

Return AID Key Characters

Table 10-2 lists the extended command AID keys and characters returned to the host. For example, if you want an F1 AID key, you would use “A” as the character.

Table 10-2
Return AID Keys

AID Key	Character
Enter	(Space)
Clear	7
F1	A
F2	B
F3	C

Table 10-2 (Continued)
Return AID Keys

AID Key	Character
F4	D
F5	E
F6	F
F7	G
F8	H
F9	I
F10	J
F11	K
F12	L
F13	M
F14	N
F15	O
F16	P
F17	Q
F18	R
F19	S
F20	T
F21	U
F22	V
F23	W
F24	X
PA1	Y
PA2	Z

Return Codes for Transmit and Receive

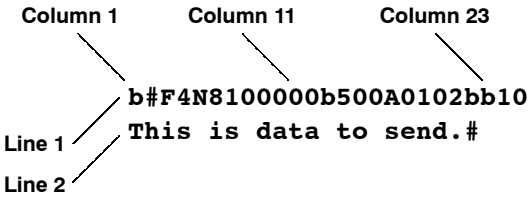
Line 24, Column 1 has the return status field. The code returned in this position tells the host the status of the extended command. The following chart lists the codes.

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	Error in AID code.	(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.

Example of Transmit and Receive

The following example and chart show what would be sent to the wireless station to cause data to be transmitted and received. A "b" indicates a space.



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	(Space)	AID key is Enter.
14–15	50	Receive a maximum of 50 characters.
16–17	0A	Delimiter character is 0A hexadecimal (line feed).
18–19	01	Data will be sent to host after one delimiter character has been received.
20–21	02	Start character is 02 hexadecimal (STX).
22	(Space)	Start character will not be returned.
23	(Space)	Do not flag parity errors.
24–25	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.

Line 2, Column 1 begins the start of transmit data. The host application must set up the screen with a transmit field to locate the RS-232 port I/O data. The field can be anywhere on the screen, beginning at position 80.

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. For example, if your printer requires a carriage return, you would insert "=0D." You would insert "=0A" for a line feed. Appendix B contains other hexadecimal values.

Table 10-3 describes the line and columns where characters must appear, and their meanings.

▶ **NOTE:** *The line and column information refer to a 3278 unit with a 24-line by 80-column display. The display buffer position refers to the same buffer but with a linear array ranging from 0–1919.*

Table 10-3
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.

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

Table 10-3 (Continued)
Transmit Only Characters

Line 1, Columns 2-12

Column	Character *	Description
7		Number of stop bits.
	1	One.
	2	Two.
8		CTS flow control.
	0	Disable.
	1	Enable.
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.
13		Return AID key.
	(Space)	AID key is Enter (default).
	X	AID key character. See Table 10-2 (page 10-7) for return AID key characters.

* 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 the following three types of flow control:

- RTS/CTS
- DTR/DSR (RT3210 and RT5900)
- XON/XOFF

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 wireless station puts the return code response in an input field in the display buffer at Line 24, Column 1. It simulates the [ENTER] key to return the value to the host.

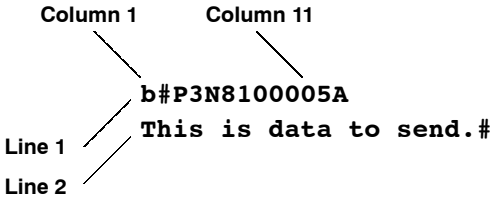
Use the Start Field order to return a code for this operation. The following chart lists return codes.

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)
8	Error in AID code.	(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.

Example of Transmit Only

The following example and chart show what would be sent to the wireless station to cause data to be transmitted. A "b" indicates a space. Following the example is an explanation of Line 1.



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.
13	A	AID key is [F1].

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.

Line 2, Column 1 is the start of the area on the screen where an input field may be placed for receive data. The host application must supply the input field for the data received on the RS-232 port. The host can place the input field anywhere on the screen except the position for the return status field.

Table 10-4 describes the line and columns where characters must appear, and their meanings.

Table 10-4
Receive Only Characters

Line 1, Columns 2-24

Column	Character *	Description
2	#	Extended command.
3	G	Receive Only On RS-232 Port command.
4		Speed (bits per second).
	1	1200.
	2	2400.
	3	4800.
	4	9600.
	5	19200.
	6	38400.

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

Table 10-4 (Continued)
Receive Only Characters

Line 1, Columns 2-24

Column	Character *	Description
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.
8–12	(Space)	Reserved (ignored by wireless station).
13		Return AID key.
	(Space)	AID key is Enter (default).
	X	AID key character. See Table 10-2 (page 10-7) for return AID key characters.
14–15		Maximum characters to receive.
	(Space)	Default.
	dd (or)	"dd" is a decimal digit from 00–99. Default is 99.
	Xd…dX	"X" is an uppercase literal. "d…d" is any number of decimal digits from 0–2000 inclusive. Default is 99.

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

Table 10-4 (Continued)
Receive Only Characters

Line 1, Columns 2-24

Column	Character *	Description
16–17		Delimiter character.
	AA	Hexadecimal ASCII code which marks the end of valid data to be received. Range is 00–7E. Default is 00.
18–19		Number of delimiter characters.
	XX	Delimiter characters received before transmitting return code to host. Range is 00–99. Default is 00.
20–21		Start character.
	AA	Hexadecimal ASCII code for start character. Range is 00–99. Default of 00 implies no start character.
22		Return start character to host.
	F	Return character.
	(Space)	Do not return character.
23		Flag parity errors.
	P	Flag.
	(Space)	Do not flag.
24–25		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

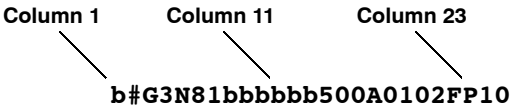
Line 24, Column 1 is the return status byte. The host application defines the 1-byte return status field location. The following chart lists return status codes.

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	Error in AID code.	(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.

Example of Receive Only

The following example and chart show what would be sent to the wireless station to cause data to be received. A "b" indicates a space. The following chart describes 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.
8–12	(Space)	Reserved.
13	(Space)	AID key is Enter.
14–15	50	Receive a maximum of 50 characters.
16–17	0A	Delimiter character is 0A hexadecimal (line feed).
18–19	01	Data will be sent to host after one delimiter character has been received.
20–21	02	Start character is 02 hexadecimal (STX).
22	F	Start character will be returned to host.
23	P	Parity errors will be flagged
24–25	10	Receive timeout length is 10 seconds.

Set Parameters (#H)

Use Set Parameters to set firmware parameters that you would otherwise set at the wireless station. The parameters are part of the 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 10-5 lists columns in which characters must appear.

Table 10-5
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.
	(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.

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

Table 10-5 (Continued)
Set Parameters Characters

Line 1, Columns 2-36

Column	Character *	Description
11	(Space)	Reserved.
12		Remote display for RT3210.
	(Space)	No change from current setting.
	0	Not attached.
	1	Attached.
13		Shift key unlock.
	(Space)	No change from current setting.
	0	Disable (default).
	1	Enable.
14		Keyboard lock.
	(Space)	No change from current setting.
	0	Disable (default).
	1	Enable.
15–17		Beeper volume.
	(Space)	No change from current setting.
	0–255	Range in seconds.
18–20		Beeper frequency setting.
	(Spaces)	No change from current setting.
	000–030	Frequency range (larger is higher)

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

Table 10-5 (Continued)
Set Parameters Characters

Line 1, Columns 2-36

Column	Character *	Description
21–23		Beeper length.
	(Spaces)	No change from current setting.
	000–010	Duration in seconds.
24		Stream scan setting.
	(Spaces)	No change from current setting.
	0	Disable.
	1	Enable.
25–27		Number of rows in primary screen size.
	(Spaces)	No change from current setting.
	000–255	Number of rows per display screen.
28–30		Number of columns in primary screen size.
	(Spaces)	No change from current setting.
	000–255	Number of columns per display screen.
31–33		Number of rows in alternate screen size.
	(Spaces)	No change from current setting.
	000–255	Number of rows per display screen.
34–36		Number of columns in 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.

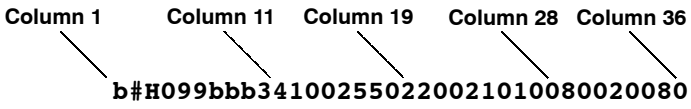
Return Codes for Set Parameters

Line 24, Column 1 has the return status field. The code returned in this position tells the host the status of the extended command. The Set Parameters return code is the status sent to the host computer. The following chart lists return codes.

Code	Description	Column
0	Good status, transaction complete.	(None)
1	Backlight timer parameter invalid.	4-6
2	Sleep mode timer parameter invalid.	7-9
3	Normal cursor set parameter invalid.	10
4	Insert cursor set parameter invalid.	11
5	Remote display parameter invalid.	12
6	Shift key unlock parameter invalid.	13
7	Keyboard lock parameter invalid.	14
8	Beeper volume parameter invalid.	15-17
9	Beeper frequency parameter invalid.	18-20
A	Beeper length parameter invalid.	21-23
B	Stream scan parameter invalid.	24
E	Incorrect setting for number of rows.	25-27
F	Incorrect setting for number of columns.	28-30

Example of Set Parameters

The following example and chart show data for Set Parameters. A “b” indicates a space.



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 (RT3210 only).
10	3	Cursor is in block mode.
11	(Space)	Reserved.
12	1	A remote display is in use.
13	0	Shift key unlock is disabled.
14	0	Keyboard lock is disabled.
15–17	255	Beeper volume is set at 255.
18–20	022	Beeper frequency setting is set at 22.
21–23	002	Beeper length is 2 seconds.
24	1	Stream scan setting is enabled.
25–27	010	Number of rows in primary screen size is 10.
28–30	080	Number of columns in primary screen size is 80.
31–33	020	Number of rows in alternate screen size is 20.
34–36	080	Number of columns in primary screen size is 80.

Return Version (#V)

The Return Version extended command returns the current firmware name and version to the host computer.
Table 10-6 lists columns in which characters must appear.

Table 10-6
Return Version Characters

Line 1, Columns 2-3

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

Line 2, Column 1 is the input field large enough to hold the program name and version number followed by the # sign, as shown below:

```
tttK'0000/A0080 "<program name><version>#"/A1841s
```

"ttt" is the wireless station number and "s" is the status.

Line 24, Column 1 has the return status field. The code returned in this position tells the host the status of the extended command. The following chart lists the codes.

Code	Description
0	Good status, transaction complete.

Tone (#T)

The Tone extended command causes the wireless station to make a tone of a specified volume, frequency, and length (Table 10-7).

Table 10-7
Tone Characters

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.

Table 10-8 lists columns in which characters must appear. Tables on the following pages list characters for each type of bar code. (Line and column references are for a 24-line by 80-column display station.)

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

Table 10-8
Scan Bar Code Parameters

Line 1, Columns 2-3

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

Control Character Byte 1

The dots in Table 10-9 indicate the Control Character (CC) Byte 1 options the characters support. (The RT1100, RT1700, RT5900, and 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 10-9
Control Byte 1 Characters

Line 1, Column 4

	Options				
CC Byte 1	**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 Character Byte 2

The dots in Table 10-10 indicate the CC Byte 2 options the characters support.

Table 10-10
Control Byte 2 Characters

Line 1, Column 5

CC Byte 2	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 Character Byte 3

The dots in Table 10-11 indicate the CC Byte 3 options the characters support.

Table 10-11
Control Byte 3 Characters

Line 1, Column 6

	Options			
CC Byte 3	**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 10-12). 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 10-12
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 of characters listed in Table 10-13. (The PEN*KEY 6400 Computer's internal engine does not support UPC-E Number System 1.)

Table 10-13
UPC Bar Code Characters

	l éíúçåë				
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 10-14).

Table 10-14
EAN Algorithms

Line 1, Column 12

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

Code 39

Code 39 (Table 10-15) 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 10-43.

Table 10-15
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 10-16) according to your requirements. See the manufacturer's bar code specifications for more information on check digits.

The dots in Table 10-18 (next page) indicate the Plessey check digits the characters support. (The PEN*KEY 6400 Computer's internal engine does not support Plessey alpha characters.)

Table 10-16
Plessey Characters

Line 1, Column 14

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

Codabar

The Codabar options (Codabar and ABC Codabar) are mutually exclusive coding algorithms and cannot be selected at the same time.

Table 10-17
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 10-18
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 10-19 lists Code 11 characters. (The PEN*KEY 6400 Computer's internal engine does not support Code 11.)

Table 10-19
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

Code 93 and Code 128 options can be enabled. (The PEN*KEY 6400 Computer's internal engine does not support Code 93.)

Table 10-20
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 10-21 lists Code 128 characters.

Table 10-21
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 10-22). (The PEN*KEY 6400 Computer's internal engine does not support Straight or Computer Identics 2of5.)

Table 10-22
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 10-23).

Table 10-23
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:

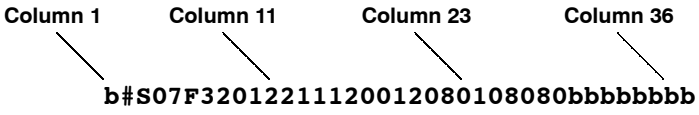
\\X<CR>

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.

Example of Scan Bar Code Parameters

The following example and chart show data for Scan Bar Code Parameters. A "b" indicates a space.



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 10-24 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 a reserved sequence (termed "reserved" in the table) the wireless station will beep and the data stream will be flushed.

Table 10-24
Key Press Sequences for Encoded Code 39

Sequence	Key
$A	Reserved
$B	Del
$C	Forward Tab
$D	Forward Tab
$E	Reverse Tab
$F	Reserved
$G	Reserved
$H	Backspace
$I	Reserved
$J	Reserved
$K	Insert
$L	Home
$M	Enter (t)
$N	End of Field
$O	Clear
$P	Reserved
$Q	PF1 (t)
$R	PF2 (t)
$S	PF3 (t)
$T	PF4 (t)
$U	PF5 (t)
$V	PF6 (t)
$W	PF7 (t)
$X	PF8 (t)
$Y	PF9 (t)
$Z	PF10 (t)

Table 10-24 (Continued)
Key Press Sequences for Encoded Code 39

Sequence	Key
%A	Clear AID (t)
%B	PF11 (t)
%C	PF12 (t)
%D	PA1
%E	PA2
%F	; (semicolon)
%G	< (less than)
%H	= (equal)
%I	> (greater than)
%J	? (question mark)
%K	[(left bracket)
%L	\ (backslash)
%M	] (right bracket)
%N	^ (circumflex)
%O	_ (underscore)
%P	{ (left brace)
%Q	¦ (piping symbol)
%R	} (right brace)
%S	~ (tilde)
%T	Delete
%U	Reserved
%V	@ (at)
%W	‘
%X	Reserved
%Y	Reserved
%Z	Reserved

Table 10-24 (Continued)
Key Press Sequences for Encoded Code 39

Sequence	Key
+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
+O	o
+P	p
+Q	q
+R	r
+S	s
+T	t
+U	u
+V	v
+W	w
+X	x
+Y	y
+Z	z

Table 10-24 (Continued)
Key Press Sequences for Encoded Code 39

Sequence	Key
/A	! (exclamation mark)
/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	- (minus)
/N	F14
/O	/ (forward slash)
/P	F15
/Q	F16
/R	F17
/S	F18
/T	F19
/U	F20
/V	F21
/W	F22
/X	F23
/Y	F24
/Z	: (colon)

Terminating Keys

Terminating keys are the nonprintable 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 radio transmission. The wireless station ignores data in the bar code buffer following these keys once a transmission takes place. When the wireless station is in global Auto Enter mode or global Auto Tab mode, there are eight Encoded Code 39 functions which will override the AutoTab/Auto Enter modes when they are scanned. They are:

Forward Tab
Reverse Tab
Home
Clear
End of Field
Backspace
Insert
Delete

These codes are all of the screen editing type, where an automatic Enter would not be desired. The encoded operations just listed will never allow an Auto Enter to occur. For example, global Auto Enter is enabled and a “$C” (forward tab) is scanned. The wireless station will forward tab to the next field but NOT cause an Enter operation, even though the Auto Enter feature has been enabled. The encoded forward tab overrides the Auto Enter mode in this case. However, if a “+D” (d) is scanned, the wireless station places a “d” at the current cursor location. The Auto Enter mode will then cause an Enter to be executed.

Escape Characters

The four escape characters in Table 10-24 yield a 3270 data stream key press equivalent when followed by another character. The escape characters are:

$ (dollar)
% (percent)
+ (plus)
/ (forward slash)

For example:

- If a bar code contains the sequence "%M" 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.

For example, if the bar code “1234” is scanned followed by the scanning of a separate “$C” bar code, the wireless station keeps the “1234” in the starting field and tabs to the next unprotected field. If concatenation was not automatically enabled, the “1234” bar code would be cleared out due to the second scan. Then the wireless station would tab to the next unprotected field.

Enabling Encoded Code 39 also allows scanning to occur when the cursor is in a protected field. This feature is provided to allow scanning of cursor movement functions (such as forward tab and reverse tab) while in a protected location on the screen. Scanning alphanumeric codes in a protected field causes an error tone for each character scanned.

Appendix A

Bar Code Scanning

Overview

Collecting and decoding bar code data are built-in features of the radio data network. 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 wireless station operator utilizing the set-up menus. Once a bar code is correctly decoded by the wireless station, the data can be encoded with descriptive information about the decoded symbol.

Unique ASCII command codes are employed by the wireless station 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 the radio data network by knowing the bar codes you use and limiting the wireless station to only those codes.

This appendix contains general information and reference data pertaining to enabling bar code algorithms and interpreting bar code data.

How to Enable Algorithms

To maximize wireless station and network performance, Norand recommends you enable only the bar code types required by your radio data network and host application software. For obvious reasons, the more bar code algorithms enabled in the wireless station, the slower the response time.

You can enable bar codes is one of three ways. The first two options require the cursor to be in an input field before the operator attempts the scan.

1. Select the "scan all fields" option from the wireless station's set-up menu. This allows the operator to use the scanner as the input device for any field requiring input.
2. If "scan all fields" in not selected, the host program can enable scanning on a field-by-field basis by enabling the magnetic stripe reader (MSR) input for each scannable field. The MSR capability is sometimes referred to as OID (operator identification) in IBM documents.
3. Select the "Encoded Code 39" option from the wireless station's set-up menus. Since Encoded Code 39 bar codes allow the operator to scan bar codes to simulate keyboard input, the scanner is always enabled. This option overrides the "scan all fields" option. This also enables the scanner **even if** the cursor is not located in an input field.

To make a field "scan only" (prevent keyboard input) you can define the field as an I/O only field (for example, magnetic stripe reader). This is sometimes referred to as "keyboard shift, inhibit keyboard entry" in IBM documents.

How Scanning Works

When scanning is enabled, data from the scanner is placed in the input field where the cursor is. If the cursor is not in an input field the scanner is not enabled. (Encoded Code 39 is one exception explained later.) If the cursor is not at the first position of the input field, the wireless station moves it there before the data is written to the field.

When the bar code data is longer than the current input field, the wireless station's response depends on the "stream scan" option in the set-up menus.

- When stream scan is disabled, the data remaining after the field is filled is ignored.
- When stream scan is enabled, any data remaining after the first field is filled is written to the next input field or fields. If a non-scannable field is encountered, any remaining bar code data is ignored. Whenever an auto-enter field is encountered, an [ENTER] key is simulated when the field is full and any remaining bar code data is ignored.

If the bar code data does not fill the input field, a [FIELD EXIT] key is simulated to clear to the end of field and move the cursor to the next input field. If the field is an auto-enter field, an [ENTER] key is simulated to send data to the host computer.

The Encoded Code 39 Exception

The preceding paragraphs about "how scanning works" mention an exception for Encoded Code 39. Encoded Code 39 allows the bar code symbol to contain certain "escape sequences" that can override the wireless station set-up just explained.

These escape sequences enable the data in the bar code to force some actions that would otherwise require the operator to press a key. For example, terminating a scan and transmitting it to the host computer or forcing a tab to the next scannable field. When these commands are included in the bar code data they override the set-up conditions of the wireless station.

Implementation of Encoded Code 39 for the 3270 data stream is nearly identical with the 5250 data stream. The exceptions include some "escape sequences." For full details of these changes see the bar code parameters for Encoded Code 39 in Section 10, "Extended Commands."

How Stream Scan Works

Stream scan controls how the wireless station handles input from the scanner when the number of characters in the bar code is not the same as the input field. 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 scanner is not enabled (Encoded Code 39 is an exception). If the cursor is not at the first position of the input field, it is moved there automatically before the data is written to the field. Whenever the wireless station encounters an auto-enter field, it generates an [ENTER] key at the end of the field and any remaining bar code data is ignored.

With stream scan enabled, the wireless station fills the first input field, then writes the remaining characters into the next field(s). When the wireless station encounters a non-scanning field, any remaining bar code data is ignored.

When the bar code does not fill the input field, a [FIELD EXIT] key is generated to clear to the end of the field and move the cursor to the next input field. If the field in an auto-enter field, an [ENTER] key is automatically generated to send the data to the host computer.

How Scan All Fields Works

Scan all fields allows the operator to use the scanner for input any time the cursor is in an input field. This option, the most common one used, enables scanner input without requiring commands from the host.

How to Scan Individual Fields

If you prefer to enable scanning on a field-by-field basis, enable the magnetic stripe reader (MSR) input for each scannable field. A portion of the command for the input field specifies scanner input. The MSR capability is sometimes referred to in IBM documents as OID. See Section 10, “Extended Commands,” for information about the bar code scanning command.

What Scan Ahead Allows

The scan-ahead feature works much like the type-ahead feature on some IBM terminal products. It lets the operator scan one bar code before the next input screen is available from the host computer. This improves response time in scanning applications by allowing the operator to keep one step ahead of the host computer.

How the Host Gets Bar Codes

The wireless station can encode descriptive information along with bar code data returned to the host computer. This encoded information 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 code digits and flags.

Bar code data streams can begin with the 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	ndddddddc	8
1	EAN short	fnddddddc	8
2	UPC long	nddddddddddc	12
3	EAN long	fnddddddddddc	13
4	UPC short add-on 2	ndddddddcaa	10
5	EAN short add-on 2	fnddddddcaa	10
6	UPC long add-on 2	nddddddddddcaa	14
7	EAN long add-on 2	fnddddddddddcaa	15
8	UPC short add-on 5	ndddddddcaaaaa	13
9	EAN short add-on 5	fnddddddcaaaaa	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
S	Code 11 ***	d.....d	1 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.

Appendix B

Conversion Tables

Decimal to Hexadecimal

Following are decimal and hexadecimal values for nondisplayable ASCII and displayable graphic characters.

Decimal	Hex	Char.	Decimal	Hex	Char.	Decimal	Hex	Char.
0	00	NUL	25	19	EM	50	32	2
1	01	SOH	26	1A	SUB	51	33	3
2	02	STX	27	1B	ESC	52	34	4
3	03	ETX	28	1C	FS	53	35	5
4	04	EOT	29	1D	GS	54	36	6
5	05	ENQ	30	1E	RS	55	37	7
6	06	ACK	31	1F	US	56	38	8
7	07	BEL	32	20	SP	57	39	9
8	08	BS	33	21	!	58	3A	:
9	09	HT	34	22	″	59	3B	;
10	0A	LF	35	23	#	60	3C	<
11	0B	VT	36	24	$	61	3D	=
12	0C	FF	37	25	%	62	3E	>
13	0D	CR	38	26	&	63	3F	?
14	0E	SO	39	27	’	64	40	@
15	0F	SI	40	28	(	65	41	A
16	10	DLE	41	29	)	66	42	B
17	11	DC1	42	2A	*	67	43	C
18	12	DC2	43	2B	+	68	44	D
19	13	DC3	44	2C	,	69	45	E
20	14	DC4	45	2D	-	70	46	F
21	15	NAK	46	2E	.	71	47	G
22	16	SYN	47	2F	/	72	48	H
23	17	ETB	48	30	0	73	49	I
24	18	CAN	49	31	1	74	4A	J

Decimal	Hex	Char.	Decimal	Hex	Char.	Decimal	Hex	Char.
75	4B	K	107	6B	k	139	8B	PLD
76	4C	L	108	6C	l	140	8C	PLU
77	4D	M	109	6D	m	141	8D	RI
78	4E	N	110	6E	n	142	8E	SS2
79	4F	O	111	6F	o	143	8F	SS3
80	50	P	112	70	p	144	90	DCS
81	51	Q	113	71	q	145	91	PU1
82	52	R	114	72	r	146	92	PU2
83	53	S	115	73	s	147	93	STS
84	54	T	116	74	t	148	94	CCH
85	55	U	117	75	u	149	95	MW
86	56	V	118	76	v	150	96	SPA
87	57	W	119	77	w	151	97	EPA
88	58	X	120	78	x	152	98	
89	59	Y	121	79	y	153	99	
90	5A	Z	122	7A	z	154	9A	
91	5B	[	123	7B	{	155	9B	CSI
92	5C	\	124	7C	|	156	9C	ST
93	5D	]	125	7D	}	157	9D	OSC
94	5E	^	126	7E	~	158	9E	PM
95	5F	_	127	7F	DEL	159	9F	APC
96	60	‘	128	80		160	A0	
97	61	a	129	81		161	A1	¡
98	62	b	130	82		162	A2	¢
99	63	c	131	83		163	A3	£
100	64	d	132	84	IND	164	A4	
101	65	e	133	85	NEL	165	A5	¥
102	66	f	134	86	SSA	166	A6	¦
103	67	g	135	87	ESA	167	A7	§
104	68	h	136	88	HTS	168	A8	¤
105	69	i	137	89	HTJ	169	A9	©
106	6A	j	138	8A	VTS	170	AA	ª

Decimal	Hex	Char.	Decimal	Hex	Char.	Decimal	Hex	Char.
171	AB	«	200	C8	È	229	E5	å
172	AC		201	C9	É	230	E6	æ
173	AD		202	CA	Ê	231	E7	ç
174	AE		203	CB	Ë	232	E8	è
175	AF		204	CC	Ì	233	E9	é
176	B0	°	205	CD	Í	234	EA	ê
177	B1	±	206	CE	Î	235	EB	ë
178	B2	²	207	CF	Ï	236	EC	ì
179	B3	³	208	D0		237	ED	í
180	B4		209	D1	Ñ	238	EE	î
181	B5	m	210	D2	Ò	239	EF	ï
182	B6	¶	211	D3	Ó	240	F0	
183	B7	·	212	D4	Ô	241	F1	ñ
184	B8		213	D5	Õ	242	F2	ò
185	B9	¹	214	D6	Ö	243	F3	ó
186	BA	º	215	D7	Œ	244	F4	ô
187	BB	»	216	D8	Ø	245	F5	õ
188	BC	¼	217	D9	ù	246	F6	ö
189	BD	½	218	DA	ú	247	F7	Œ
190	BE		219	DB	û	248	F8	ø
191	BF	¿	220	DC	Ü	249	F9	ù
192	C0	À	221	DD	ÿ	250	FA	ú
193	C1	Á	222	DE		251	FB	û
194	C2	Â	223	DF	ß	252	FC	ü
195	C3	Ã	224	E0	à	253	FD	ÿ
196	C4	Ä	225	E1	á	254	FE	
197	C5	Å	226	E2	â	255	FF	
198	C6	Æ	227	E3	ã			
199	C7	Ç	228	E4	ä			

Binary to EBCDIC

Following are binary to EBCDIC conversion values.

Bits 0-5	EBCDIC Code	Display Graphic	Bits 0-5	EBCDIC Code	Display Graphic
00 0000	40	<space>	10 0000	60	—
00 0001	C1	A	10 0001	61	/
00 0010	C2	B	10 0010	E2	S
00 0011	C3	C	10 0011	E3	T
00 0100	C4	D	10 0100	E4	U
00 0101	C5	E	10 0101	E5	V
00 0110	C6	F	10 0110	E6	W
00 0111	C7	G	10 0111	E7	X
00 1000	C8	H	10 1000	E8	Y
00 1001	C9	I	10 1001	E9	Z
00 1010	4A	¢	10 1010	6A	EBCDIC
00 1011	4B	.	10 1011	6B	,
00 1100	4C	<	10 1100	6C	%
00 1101	4D	(	10 1101	6D	-
00 1110	4E	+	10 1110	6E	>
00 1111	4F	|	10 1111	6F	?
01 0000	50	&	11 0000	F0	0
01 0001	D1	J	11 0001	F1	1
01 0010	D2	K	11 0010	F2	2
01 0011	D3	L	11 0011	F3	3
01 0100	D4	M	11 0100	F4	4
01 0101	D5	N	11 0101	F5	5
01 0110	D6	O	11 0110	F6	6
01 0111	D7	P	11 0111	F7	7
01 1000	D8	Q	11 1000	F8	8
01 1001	D9	R	11 1001	F9	9
01 1010	5A	!	11 1010	7A	:
01 1011	5B	$	11 1011	7B	#
01 1100	5C	*	11 1100	7C	@
01 1101	5D	)	11 1101	7D	’
01 1110	5E	;	11 1110	7E	=
01 1111	5F	¬	11 1111	7F	”

Appendix C

VTAM Configuration Guide

Configuration Guide for 3720 NCP Version 4 Subset VTAM 3.1 for IBM 4381 Systems using DOS/VSE

```
Group       LNCTC = SDLC,
            DUPLEX = FULL,
            REPLYTO = 1,
            RETRIES = (7,4,5),
            TYPE = NCP

LRADA LINE  ADDRESS = 003,      TRANSMIT AND RECEIVE ADDRESSES
            ANS = CONTINUE,     DON'T BREAK CROSS DOM SESSIONS
            ISTATUS = ACTIVE,   (V)VTAM
            DUPLEX = (FULL),    REQUEST TO SEND ALWAYS UP
            ETRATIO = 30,       ERROR TO TRANS RATIO = 3% NPDA
            LPDATS = YES,       LINE PROBLEM DETERMINATION AVAIL
            NRZI = NO,
            MAXPU = 003,        NUMBER OF PUs ALLOWED
            SRT = (400, 64),    TRANS THRESH = 4000, ERR RETRIES = 64
            SPEED = (9600, 9600) LINE SPEED
```

Service Order Table For Remote SDLC PU
Service Order = (PURDA), MAXLIST = 3
PU/LU Specifications For NORAND^{R} Controller

SSDLC4

```
PURDA PU      ADDR=C1,              CLUSTER ADDR=C1
              ANS=CONTINUE,         DON'T BREAK THE X-DOMAIN SESSIONS
              MAXDATA=265,          MAXIMUM AMOUNT OF DATA
              MAXLU=32,             MAXIMUM LUS ON THIS PU
              MAXOUT=4,             MAX SDLC FRAMES BEFORE RESPONSE
              PACING=0,             PACING SET BY BIND IMAGE
              PASSLIM=4,            SEND UP TO 8 PIU'S AT ONE TIME
              PUDR=YES,             THIS PU CAN BE DEL'D FROM NETWORK
              PUTYPE=2,             PU TYPE 2
              RETRIES=(,4,5),       RETRY PAUSE 4 SECONDS FOR 5
              TIMESDISCNT=(NO),     (V)VTAM
              ISTATUS=ACTIVE,       (V)VTAM
              SSCPFM=USSSCS,        (V)VTAM
              USSTAB=USSSNA,        (V)VTAM
              VPACING=0,            (V)VTAM
              MODETAB=MT327XS,      (V)VTAM
                                                                  TLLU001E
RDA0    LU    DLOGMOD = TDSPSM2,    (V)VTAM
              ISTATUS = ACTIVE,     (V)VTAM
              LOGAPPL = DBDCCICS,
              LOCADDR = 2

                                                                  TLLU001E
RDA1    LU    DLOGMOD = TDSPSM2,    (V)VTAM
              ISTATUS = ACTIVE,     (V)VTAM
              LOGAPPL = DBDCCICS,
              LOCADDR = 3
```

MODE TAB

```
TDSPSM2 MODEENT   LOGMODE=TDSPSM2,
                  FMPROF=X'03',TSPROF=X'03',PRIPROT='B1',
                  SECPROT=X'90',COMPROT=X'3080',
                  RUSIZE=X'87F8',
                  PSERVIC=X'020000000000185018507F00',
```

Configuration Guide for 3745 NCP Subset VTAM 3.1 for IBM 3090 Systems using DOS/VSE

```
A03SNA4  GROUP      ANS=CONT,
                    CLOCKING = EXT,
                    DIAL = NO,
                    DUPLEX = FULL,
                    LNCTL = SDLC,
                    MAXDATA = 265,
                    MAXOUT = 7,
                    NEWSYNC = NO,
                    NRZI = NO,
                    OWNER = VTAM01,
                    PACING = 0,
                    PASSLEM = 7,
                    PUDR = YES,
                    LUDR = YES,
                    PUTYPE = 2,
                    REPLYTO = 1,
                    RETRIES = (5,2,3),
                    SERVLIM = 7,
                    SSCPFM = USSSCS,
                    TRANSFR = 5,
                    TYPE = NCP,
                    VPACING = 0,

AL03035  LINE       ADDRESS = (35, HALF),
                    ISTATUS = ACTIVE,
                    MODETAB = MODTRSNA,
                    DLOGMOD = T3278M2,
                    SPEED = 9600,
                    USSTAB = USSTRSNA,
         SERVICE    ORDER = (AC00064, AD00037)
```

```
AC00064   PU        ADDR = 40, ISTATUS = ACTIVE,
          LU        LOCADDR = 2, ISTATUS = ACTIVE, LOGAPPL = CICSA
          LU        LOCADDR = 3, ISTATUS = ACTIVE, LOGAPPL = CICSA
          LU        LOCADDR = 4, ISTATUS = ACTIVE, LOGAPPL = CICSA
          LU        LOCADDR = 5, ISTATUS = ACTIVE, LOGAPPL = CICSA
          LU        LOCADDR = 6, ISTATUS = ACTIVE, LOGAPPL = CICSA
          LU        LOCADDR = 7, ISTATUS = ACTIVE, LOGAPPL = CICSA
          LU        LOCADDR = 8, ISTATUS = ACTIVE, LOGAPPL = CICSA

T3278M2  MODEENT    LOGMODE = 3278M2,
                    FMPROF = X '03', TSPROF = X 'O3', PRIPROT = X 'B1',
                    SECPROT = X '90', COMPROT = X '3080', RUSIZES = X '87F8'
                    PSERVIC = X '020000000000185018507F00',
                    PSNDPAC = X '00'SRCVPAC = X '00', SSNDPAC = X '00',
```

CICS TCT Listing

```
RDA0  DFHTCT        TYPE=TERMINAL,
                    TRMIDNT=RDA0,
                    TRMTYPE=LUTYPE2,
                    ACCMETH=VTAM,
                    CHNASSY=YES,
                    BUFFER=256,
                    GMMSG=NO,
                    FEATURE=UCTRAN,
                    NETNAME=RDA0,
                    PGESIZE=(24,80),
                    PGESTAT=PAGE,
                    RELREQ=(YES,YES),
                    RUSIZE=256,
                    TCTUAL=255,
                    TIOAL=(0960,4096),
                    TRMMODL=2,
                    TRMSTAT=TRANSCEIVE
```

Appendix D

System/38 Configuration Guide

0001

02/17/98 13:02:31	LINE DESCRIPTION	
Status- VARIED OFF		
Line description name-	LIND	NORANDLINE
OU number of line port-	LINNBR	20
Line type-	TYPE	*SDLCP
Connection type	CNN	*PP
Data rate-	RATE	004800
Switched network backup-	SWNBKU	*NO
Activate swt network backup-	ACTSWNBKU	
Speed select feature-	SELECT	*YES

0002

02/17/98 13:02:31	LINE DESCRIPTION	
NRZI decoding-	NONRTNZ	*NO
S/38 provided clock-	CLOCK	*NO
Autocall feature-	AUTOCALL	*NO
Autoanswer feature-	AUTOANS	*NO
S/38 answer tone feature-	ANSTONE	*NO
Wire link type-	WIRE	4 4
Data comm equipment group-	DCEGRP	*A
Non-IBM modem-	OEMMDM	*YES
Switched connection type-	SWTCNN	
Speed rate type	RATETYPE	*FULL

0003

02/17/98 13:02:31	LINE DESCRIPTION	
Dial mode-	af^i j l ab	*MANUAL
Answer mode-	ANSMODE	*MANUAL
Data terminal ready delay-	DTRDLY	0015
Idle detection time-	IDLETIME	0038
RSC receive timeout timer-	RCVTMR	
Nonproductive receive time-	NONPRDRCV	0002
Number of error retries-	RETRY	0015
Online at CPF start-	ONLINE	*YES

0004

02/17/98 13:02:31	LINE DESCRIPTION	
Attached switched control unit-		
Attached nonswitched ctl units-	CTLU	NORANDCTLU
BSC switched control units-	SWTCTLU	
S/38 station address-	STNADR	
S/38 exchange identifier-	EXCHID	0224A2C5
Line code-	Code	*EBCDIC

0005

02/17/98 13:02:31	LINE DESCRIPTION
Remote job entry-	RJE
BSC switched line disconnect-	BSCSWTDSC
3270 emulation mode-	EML3270
X.25 network type-	X25NETTYPE
X.25 network local address-	LCLNETADR
X.25 default packet size-	DFTPKTSIZE
X.25 maximum packet size-	MAXPKTSIZE
X.25 default window size-	DFTWDWSIZE
X.25 maximum PIU size-	NETMAXPIU

0001

02/17/98 13:03:24	CONTROL UNIT DESCRIPTION	
Status- VARIED OFF		
Devices varied on- 000	Devices active-000	
Control unit description name-	CUD	NORANDCTLU
Control unit type-	TYPE	3274
Model number-	MODEL	*NONE
Control unit address-	CTLADR	C120
Switched line-	SWITCHED	*NO
Nonswitched line name-	LINE	NORANDLINE
Speed select feature-	SELECT	*NO
Telephone number-	TELNBR	*NONE

0002

02/17/98 13:03:24	CONTROL UNIT DESCRIPTION	
Switched initial connection-	INLCNN	
Exchange identifier-	EXCHID	045000C1
BSC local identifier-	LCLID	
BSC remote identifiers-	RMTID	
SSCP identifier-	SSCPID	050000000000
SSCP identifier checking-	SSCPIDCHK	
Online at CPF start-	ONLINE	*YES

0003

02/17/98 13:03:24	CONTROL UNIT DESCRIPTION	
Current switched line-		
Switched network backup-	SWNBKU	*NO
Activate swt network backup-	ACTSWNBKU	
Allow delayed connection-	DLYFEAT	*NO
Attached device names-	DEV	
NORC100		
NORC102		
RSC device delay in sec-	DEVDLY	

0004

02/17/98 13:03:24	CONTROL UNIT DESCRIPTION	
BSC program delay in sec-	PGMDLY	
Remote job entry-	RJE	
Remote job entry host-	RJEHOST	
Host system signon/logon text-	RJELOGON	
3270 emulation mode-	EML3270	
Maximum length PIU-	MAXLENPIU	
Data compress/decompress-	DTACPR	
Device wait timeout value-	DEVWAIT	120

0005

02/17/98 13:02:31	CONTROL UNIT DESCRIPTION	
Link type-	LINKTYPE	*SDLCSEC
Controller code-	CODE	*LIND
X.25 address-	X25ADR	
X.25 packet size-	DFTPKTSIZE	
X.25 window size-	DFTWDWSIZE	
X.25 LLC protocol-	NETPCL	
X.25 response timer-	NETRSPTMR	
X.25 reverse charging-	NETRVSCRG	
Incoming calls-		
Outgoing calls-		

0006

02/17/98 13:02:31	CONTROL UNIT DESCRIPTION	
X.25 closed user group ID-	NETCUGID	
X.25 connection password-	NETCNNPWD	
X.25 user facilities-	NETUSRFCL	
Text description-	TEXT	
norand test		

0001

02/17/98 13:03:41	DEVICE DESCRIPTION	
Status- VARIED OFF		
Device description name-	DEVD	NORC100
Device address-	DEVADR	02C120
Device type code-	DEVTYPE	3278
Model number-	MODEL	*NONE
Control unit description name-	CTLU	NORANDCTLU
Online at CPF start-	ONLINE	*YES

0002

02/17/98 13:03:41	DEVICE DESCRIPTION	
Drop line at sign off-	DROP	*YES
Associated work stn printer-	PRINTER	
Associated message queue-	MSGQ	
Library name-		
Print image name-	PRTIMG	
Library name-		
Printer device file name-	PRTFILE	
Library name-		

0003

02/17/98 13:03:41	DEVICE DESCRIPTION	
Work stn controller address-	WSCADR	
Work stn controller keyboard-	WSCKBD	*NONE
Allow blinking cursor-	^i t _i k	*YES
BSC contention resolution-	CONTN	
Local LU name-	LCLLU	
Remote LU name-	RMTLU	
Secure LU name-	SECURELU	
Printer font-	FONT	
Feed mode-	FORMFEED	
3270 emulation device type-	EMLDEVTYP	
3270 emulation keyboard type-	EMLKBDTYP	

```
0004

   02/17/98    13:03:41                DEVICE DESCRIPTION
Maximum length RU-                     MAXLENRU
Auxiliary device-                      AUXDEV
     (No auxiliary devices)
Network device address-                NETDEVADR
Character identifier set-              CHRID
     Graphic character set-                                *SYSVAL
     Code page-
Text description-                      TEXT
     norand test

0001

   02/17/98    13:03:47                DEVICE DESCRIPTION
Status- VARIED OFF
Device description name-               DEVD                NORC102
Device address-                        DEVADR              03C120
Device type code-                      DEVTYPE             *3278
Model number-                          MODEL               NONE
Control unit description name-         CTLU                NORANDCTLU
Online at CPF start-                   ONLINE              *YES

0002

   02/17/98    13:03:47                DEVICE DESCRIPTION
Drop line at sign off-                 DROP                *YES
Associated work stn printer-           PRINTER
Associated message queue-              MSGQ
     Library name-
Print image name-                      PRTIMG
     Library name-
Printer device file name-              PRTFILE
     Library name-
```

0003

02/17/98 13:03:47	DEVICE DESCRIPTION	
Work stn controller address-	WSCADR	
Work stn controller keyboard-	WSCKBD	*NONE
Allow blinking cursor-	ALWBLN	*YES
BSC contention resolution-	CONTN	
Local LU name-	LCLLU	
Remote LU name-	RMTLU	
Secure LU name-	SECURELU	
Printer font-	FONT	
Feed mode-	FORMFEED	
3270 emulation device type-	EMLDEVTYP	
3270 emulation keyboard type-	EMLKBDTYP	

0004

02/17/98 13:03:47	DEVICE DESCRIPTION	
Maximum length RU-	MAXLENRU	
Auxiliary device-	AUXDEV	
(No auxiliary devices)		
Network device address-	NETDEVADR	
Character identifier set-	CHRID	
Graphic character set-		*SYSVAL
Code page-		
Text description-	TEXT	
norand test		

Appendix E

AS/400 Configuration Guide

Display Line Description - SDLC

Line Description	:	LIND	L3270SNA
Resource Name	:	RSRCNAME	LINO11
Online at IPL	:	ONLINE	*NO
Data link role	:	ROLE	*PRI
Physical interface	:	INTERFACE	*RS232V24
Connection type	:	CNN	*NONSWTPP
Switched network backup	:	SNBU	*NO
Activate swt network backup	:	ACTSNBU	
Autocall unit	:	AUTOCALL	
Attached nonswitched ctl(s)	:	CTL	

Display Line Description - SDLC

Exchange identifier	:	EXCHID	05600000
NRZI data encoding	:	NRZI	*NO
Maximum controllers	:	MAXCTL	1
Line speed	:	LINESPEED	9600
Modem type supported	:	MODEM	*NORMAL
Modem data rate select	:	MODEMRATE	*FULL

Display Line Description - SDLC

Maximum frame size	:	MAXFRAME	265
Error threshold level	:	THRESHOLD	*OFF
Duplex	:	DUPLEX	*HALF
Modulus	:	MODULUS	8
Maximum outstanding frames	:	MAXOUT	7
Inactivity timer	:	INACTTMR	
Poll response delay	:	POLLRSPDLY	
Nonproductive receive timer	:	NPRDRCVTMR	320
Idle timer	:	IDLTMR	30
Connect poll timer	:	CNNPOLLTMR	30
Poll cycle pause	:	POLLPAUSE	0
Frame retry	:	FRAMERTY	7

Display Line Description - SDLC

Link speed	:	LINKSPEED	9600
Cost/connect time	:	COSTCNN	0
Cost/byte	:	COSTBYTE	0
Security for line	:	SECURITY	*NONSECURE
Pripagation delay	:	PRPDLY	*TELEPHONE
User-defined1	:	USRDFN1	128
User-defined2	:	USRDFN2	128
User-defined3	:	USRDFN3	128
Text	:	TEXT	test 3270 line for ctg mak

END OF LISTING

Display Controller Description

Controller description	:	CTLD	CTL3274
Controller type	:	TYPE	3274
Controller model	:	MODEL	0
Link type	:	LINKTYPE	*SDLC
Online at IPL	:	ONLINE	*NO
Switched line	:	SWITCHED	*NO
Switched network backup	:	SNBU	*NO
Activate swt network backup	:	ACTSNBU	
Activate nonswitched line	:	LINE	L3270SNA
Switched line list	:	SWTLINLST	

Display Controller Description

Attached devices(s)	:	DEV	
TERM3278			
Character code	:	CODE	*EBCDIC
Device wait timer	:	DEVWAITTMR	120
Exchange identifier	:	EXCHID	01700000
SSCP identifier	:	SSCPID	050000000000
Initial connection	:	INLCNN	
Connection number	:	CNNNBR	
Predial delay	:	PREDIALDLY	
Redial delay	:	REDIALDLY	
Dial retry	:	DIALRTY	
Remote autoanswer	:	RMTAUTOANS	

Display Controller Description

Station address	:	STNADR	B0
SDLC poll priority	:	POLLPTY	*NO
SDLC poll limit	:	POLLLMT	0
SDLC connect poll retry	:	CNNPOLLRTY	*NOMAX
SDLC NRM poll timer	:	NRMPOLLTMR	0
SDLC NDM poll timer	:	NDMPOLLTMR	*CALC
Text	:	TEXT	*test 3274 controller for ctg
mak			

END OF LISTING

Display Device Description – Display

Device description	:	DEVD	TERM3278
Device class	:	DEVCLS	*RMT
Device type	:	TYPE	3278
Device model	:	MODEL	0
Port number	:	PORT	
Switch setting	:	SWTSET	
Local location address	:	LOCADR	02
Online at IPL	:	ONLINE	*YES
Attached controller	:	CTL	CTL3274
Keyboard language type	:	KBDTYPE	
Drop line at signoff	:	DROP	*YES
Character identifier	:	CHRID	
Allow blinking cursor	:	ALWBLN	
Auxiliary devices	:	AUXDEV	

Display Device Description - Display

Printer	: PRINTER	
Print file	: PRTFILE	QSYSPRT
Library	:	*LIBL
Max length of request unit	: MAXLENRU	*CALC
Text	: TEXT	
Blank		

END OF LISTING

Appendix F

System/36 Configuration Guide

CNFIGSSP--COMMUNICATIONS LINE DEFINITION
FOR REMOTE WORK STATIONS

THE FOLLOWING LINES HAVE BEEN DEFINED 1
1. WHICH LINE IS BEING DEFINED ..... (1-10) 1
2. WHAT TYPE OF LINE IS IT 1
1-NONSWITCHED 2-SWITCHED MANUAL CALL
3-SWITCHED AUTOANSWER 4-SWITCHED MANUAL ANSWER
5-X.21 SHORT-HOLD MODE 6- IBM TOKEN-RING NETWORK
3. AUTOMATIC RECONNECT FOR THE LINE ..... Y,N Y
4. IF LINE IS X.25, ENTER X.25 MEMBER NAME .....

`kcfdppmJobj lqb` lkqoliibo abcfkfqflk

EDIT CONTROLLER
1. DESCRIBE THE REMOTE CONTROLLER .....
NORAND SYSTEM
2. CONTROLLER TYPE 3
1. 5251 MODEL 12 2. 5294 3.3274
3. CONTROLLER STATION ADDRESS 01-F0 01
4. COMMUNICATIONS LINE 1-10 1
5. FOR A SWITCHED LINE, OPTIONALLY SPECIFY 1 TO 3
ALTERNATIVE LINES .....

CNFIGSSP - WORK STATION DEFINITION REMOTE

SPECIFY THE ARRANGEMENT OF YOUR DISPLAY STATIONS AND PRINTERS.
THE POSITIONS CORRESPOND TO THE WORK STATION PORT NUMBER

DISPLAYS - 50.3277	51.3278	52.3279 PORTS	
51	51	51	0-7 -----
			8-15 C01
			16-23 3274
			24-31 -----

DISPLAY STATION COMMUNICATIONS CONFIGURATION LINE 1

HARDWARE CONFIGURATION . . . . . EIA/CCITT
LINE TYPE . . . . . NONSWITCHED
MULTIPOINT CONTROL . . . . . N
MODEM RATE . . . . . FULL
X.25 DATA LINE . . . . . N
SWITCHED NETWORK BACKUP . . . . . N

SYSTEM COMMUNICATIONS CONFIGURATION LINE 1

HARDWARE CONFIG . . . . . EIA/CITT
LINE TYPE . . . . . NONSWITCHED
MULTIPOINT CONTROL . . . . N
CONTINUOUS CARRIER . . . . Y
SDLC RETRY COUNT 3
SELF TEST REQUIRED . . . . . N

CLOCK . . . . . MODEM
NRZI . . . . . N
ANSWER TONE. . . . . N
PRI-SDLC TIME OUT 3.0
MODEM . . . . . NON-IBM
X.25 DATA LINE . . . . . N
SEC-SDLC TIME-OUT . . . 10

Appendix G

Tandem Configuration Guide

Object: LINE\TTOWN.$SNAXP2

Characterset EBCIDIC	Dsrtimeout 4.00	Duplex FULL	Flagfill OFF
Interface RS232	IO pages 2	Luopmsg OFF	Maxlus 64
Maxplus 8	Noaq OFF	Pollint 0.25	Recsize26
Retries 9	Speed 9600	Station PRIMARY	Switched OFF
Threshold 500	Timeout 2.00	Type (58,0)	Tws OFF
Window 7	Xmttimeout 1.11	xpages 256	

Object: PU\TTOWN.$SNAXP2.#C121

Address 1	L3retry 65535	L3timeout 30.00	Maxlux 8
Maxpts 0	Noacq OFF	Puidblk 4095 %7777	%HFFF
Puichum 1048575	%3777777 %HFFFF	Puswtype OFF	Recsize 265
Regms OFF	Actpu COLD	Servicecount 1	Type (13.2)
Window 7			

Object: LU\TTOWN.$SNAXP2.#T1211

Address 3	Characterset EBCIDIC	Allowedmix 0	Dbcs NONE
Cryptotype OFF	Devtype 3278-2	Luswtype OFF	Noacq OFF
Passthru OFF	Actlu COLD	Protocol ITI	Puname #C121
Recsize 256	Static OFF	Type (14,2)	

Pathway TCP Parameters for Tandem System

```
TCP TCO-T3270
        AUTORESTART 0
        CHECK-DIRECTORY ON
        CODEAREALEN 100000
        CPUS 0:1
        DEBUG OFF
        DUMP OFF
        GUARDIAN-LIB\DEV.$SYSTEM.NEWPWAY.APCITCPL
        INSPECT ON (FILE\DEV.$SNAXP1.#T9125)
        MAXPATHWAYS 0
        MAXREPLY 2500
        MAXSERVERCLASSES 50
        MAXSERVER PROCESSES 140
        MAXTERMDATA 26000
        MAXTERMS 25
        NONSTOP 1
        PRI 140
        PROCESS $DEV2
        PROGRAM\DEV.$SYSTEM.NEWPWAY.APCITCP2
        SERVERPOOL 13000
        STATS ON
        SWAP\DEV.$DATA
        TCLPROG\DEV.$DATA.DEVOBJ.PIBM
        TERMBUF 2000
        TERMPOOL 8000
```

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