Intermec
Technologies Corporation

5250 Terminal Emulation

PROGRAMMER'S REFERENCE GUIDE

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TABLES

Section 1
Introduction

Purpose of This Guide

This programmer's reference guide describes INTERMEC® radio products using Systems Network Architecture and Synchronous Data Link Control (SNA/SDLC). The radio products emulate IBM products that communicate using the 5250 data stream.

The 5250 data stream governs the data flow between the host computer and wireless terminal emulation stations. 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 station can collect for each input field.

The purpose of this guide is to define the differences between IBM's implementation of the data stream and adaptation of the 5250 data stream for hand-held wireless stations.

This guide contains descriptions of:

- How the wireless stations' keyboards and overlays emulate the IBM 5291 Display Station
- 5250 display data stream commands and orders supported by the wireless stations
- Extended commands for the wireless stations
- Line configurations for IBM host computers

Two types of 5250 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 guide is prepared assuming you are already familiar with the operation of the 5250 data stream and equipment. The intended audience is the host computer programmer who needs to design interfaces to wireless stations set up for 5250 terminal emulation.

What to Read First

Before you begin using the wireless station as an emulation product, 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 5250 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 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 5291 Display Station 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, "Display Data Stream" describes host data stream commands (SNA and asynchronous) and orders supported by the wireless stations can be found in this section. The section also lists system codes and parameter errors.
- Section 9, "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 5291 Display Station.
- Appendixes contain bar code scanning information, conversion charts, and line configuration guides for IBM System/36, System/38, and AS/400 host computers.

Conventions

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

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

If You Need Help

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

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

Related Publications

The following publications provide information beyond the purpose of this programmer's guide. Numbers in parentheses are 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

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.

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 how to operate the RB3000 and RB3001 Base Stations.

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

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

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 RT1100, RT1700, and RT5900 Radio Terminals.

IBM 5250 Information Display System Functions Reference Manual

This reference manual provides more detailed descriptions of 5250 data stream commands than what is presented in this reference guide. The manual is available through IBM.

IBM 5394 Remote Control Unit Functions Reference Release 1 and Release 2

This publication provides information about implementing the 5250 data stream for the control unit. This manual is available through IBM.

IBM 5394 Remote Control Unit User's Guide

This publication provides general information about the control unit. 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 5250 data stream corresponds directly to an IBM 5250 hard-wired network. A controller emulates an IBM 5294 or 5394 Control Unit. Wireless stations emulate IBM 5291 Display Stations. The radio link between a base radio and a 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 5291 Display Station, 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 component, refer to its user guide.

Host Computer

The radio network operates with an IBM AS/400, System/36, or System/38 host computer as a central distribution point for commands and data storage. Commands originate in the application program on the host computer.

The 5250 host communicates in strings of EBCDIC characters. 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.

Controller operation in use is transparent to the host.

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. 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.

Controllers can emulate four multidrop IBM 5394 or eight 5294 Control Units. The primary consideration governing the configuration is which IBM host is in use:

- Emulation of 5394 Control Units works best for IBM AS/400 host computers.
- Emulation of 5294 Control Units works best for IBM System/36 and System/38 host computers.

The controller supports 64 logical units (LUs) which correspond with wireless station network addresses 0 to 63.

When emulating four 5394 Control Units, each logical controller handles 16 LUs. A group of 16 LUs is linked to each SDLC address, numbers 1 through 4. Figure 1-1 shows a logical representation of four 5394 Control Units emulated by the controller.

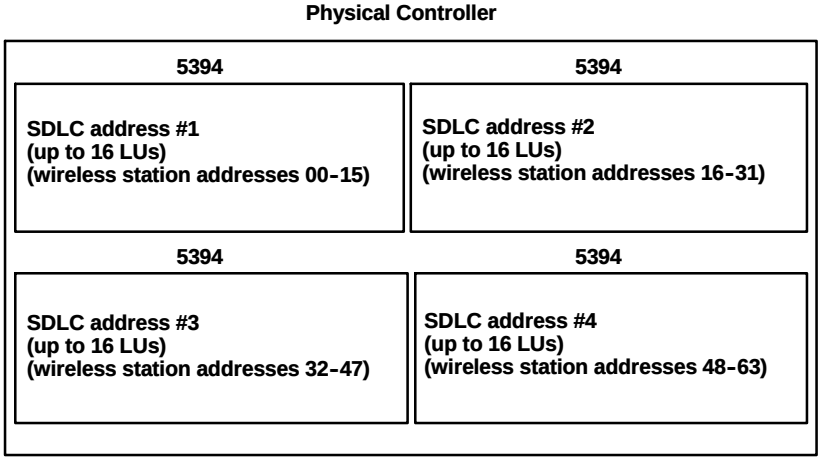


Figure 1-1
Controller Emulating 5394 Control Units for AS/400 Host

Figure 1-2 shows a different configuration. The controller emulates eight 5294 Control Units with 8 LUs each. The LUs are located at SDLC addresses 1 through 8. This provides up to 64 LUs and is suitable for IBM System/36 or System/38 host computers.

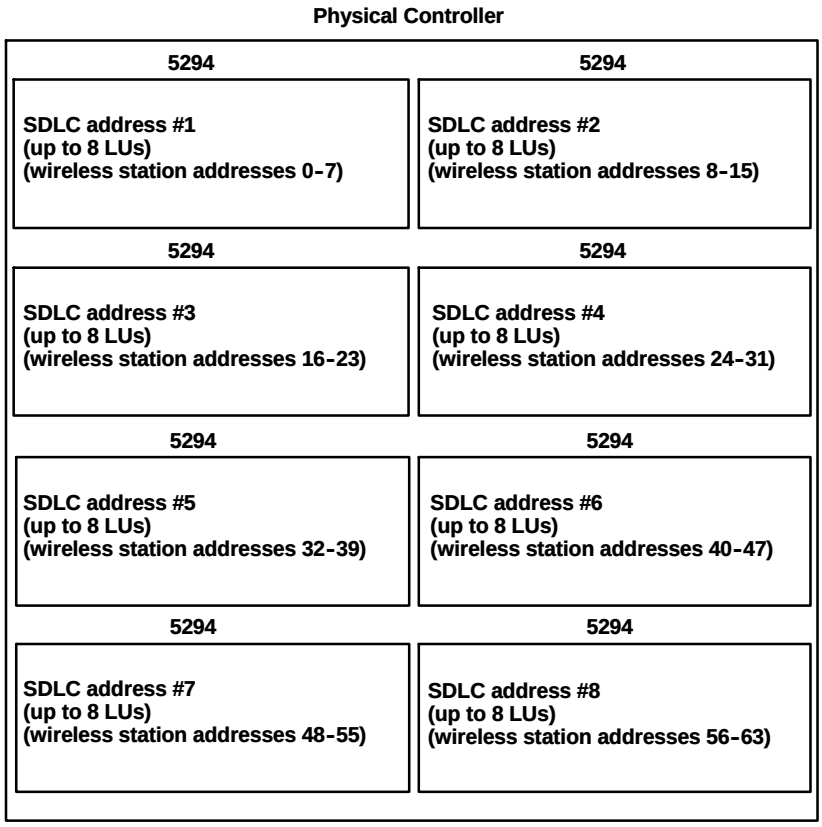


Figure 1-2
Controller Emulating 5294 Control Units for System/36 or System/38 Host

In either emulation, SDLC addresses can range from 1 to 254. Each SDLC address must be unique.

In either emulation, you can eliminate unused PUs by reducing, through the controller's setup parameters, the number of LUs supported. Refer to the controller's user guide for more information about setting up the controller.

Base Radios

Base radios (also called access points) directly connect to the network and pass information from the wireless stations to the controller. Wireless stations passing from the coverage area of one base radio to another are tracked automatically by the network. This is called “roaming.”

Multiple base radios can be hard-wired to an RS-485 or Ethernet backbone, or linked through a radio connection between base radios. One base radio must be hard-wired to the controller.

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 at 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 are the portable components on the network. Their small size allows them to be used in the warehouse or plant to gather information through the keyboard or integrated bar code scanner. The portable wireless stations provide interactive communication between the operator and host computer.

Wireless stations provide portable, wireless interactive data communication and support bar code scanning for real-time data collection. They are the network-addressable software entity which interfaces the wireless data network to the base radio.

Each wireless station monitors all 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 5250 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
- RC3240 or RC3250 Controller
- RB3000, RB3001, RB3020, or RB3021 Base with UHF radio
- RT3210, RT1100, RT1700, or RT5900 Radio Terminals with UHF radios

Figure 1-3 shows a sample UHF radio network. Note how the radio link from the base radio to the radio terminals replaces the coax links (dotted lines) between the control unit and Model 2 terminals.

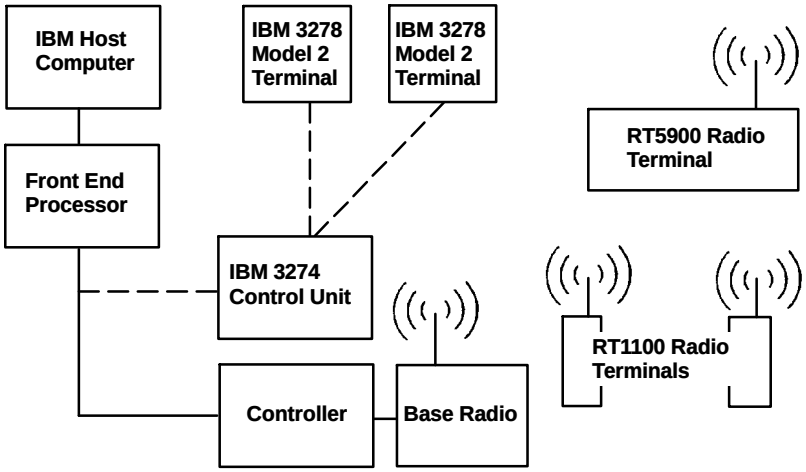


Figure 1-3
Sample UHF Radio Network

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 1-4 shows a sample radio network. Note how the radio links from the base radios to the radio terminals replace the coax links (dotted lines) between the control unit and Model 2 terminals.

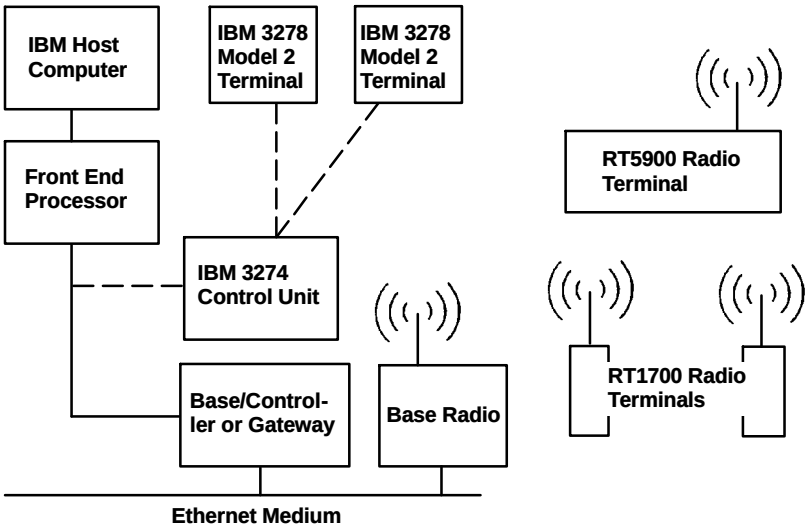


Figure 1-4
Sample SST Radio Network With Ethernet Medium

Open Wireless LAN

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

- Host computer
- RC4030E Gateway, Wireless Network Access Server, or 6950 Enterprise Gateway Server
- 6710 Access Point with synthesized UHF, 900 MHz, or WLIF radio
- Wireless stations with synthesized UHF, 900 MHz, or WLIF radios

Figure 1-5 shows a sample radio network with an RC4030E Gateway. Note how the radio links from the 6710 Access Point to the wireless terminal emulation stations replace the coax links (dotted lines) between the control unit and Model 2 terminals.

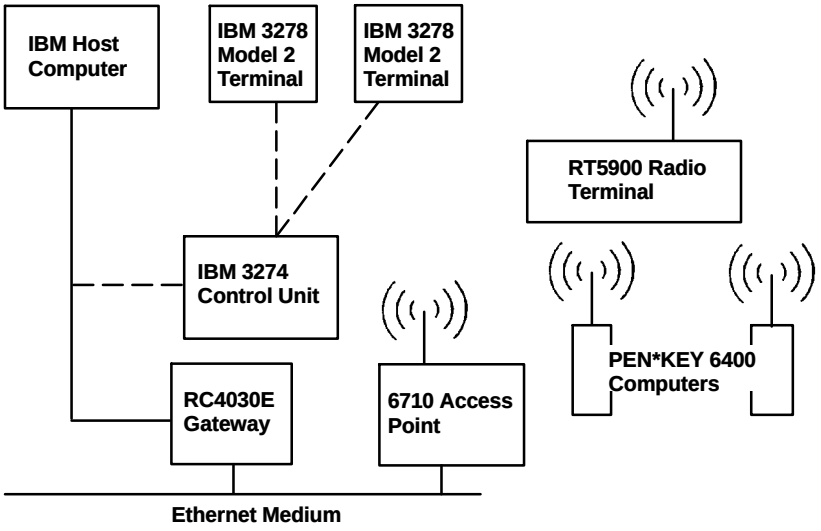


Figure 1-5
Sample Open Wireless LAN

Section 2

RT3210 Radio Terminal

Overview

The RT3210 Radio Terminal is designed to appear to the host computer as an IBM 5291 Display Station. To help the system programmer 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 5250 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 9. 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. The display shows terminal and host computer prompts, and data entered by the operator.

Because a 5291 Display Station 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 5291 Display Station'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. 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 5291 Display Station'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 5291 Display Station, 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 5291 Display Station. 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 5291 Display Station. 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. Locked mode also moves the error line to the last position in the display.

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**. This annunciator is used by the fast charge algorithm to indicate the fully charged condition.

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

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.

Keyboard

The radio terminal's 50-key keyboard (Figure 2-1) has shift keys, alphabetic keys, numeric keys, special characters, special function keys, and keys that do other operations.

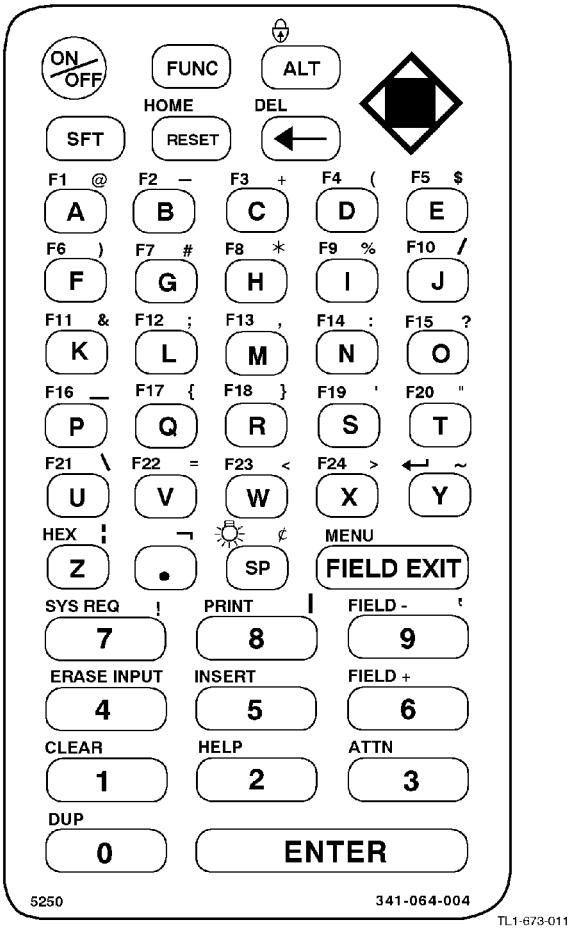


Figure 2-1
RT3210 Keyboard

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 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 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 yellow on the overlay and to the right of F1), press [ALT]+[A].
- Press [FUNC]+[U] to do the [F21] function (printed in black on the overlay and to the left of the backslash).

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 [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 are arranged in a 10-key format on the bottom half of the keyboard. Use them to enter numeric data.

Special Characters

Table 2-1 describes how to type special characters.

Table 2-1
RT3210 Special Characters

Special Character	Press
@ (at)	[ALT]+[A]
– (minus)	[ALT]+[B]
+ (plus)	[ALT]+[C]
((left parenthesis)	[ALT]+[D]
$ (dollar)	[ALT]+[E]
) (right parenthesis)	[ALT]+[F]

Table 2-1 (Continued)
RT3210 Special Characters

Special Character	Press
# (pound)	[ALT]+[G]
* (asterisk)	[ALT]+[H]
% (percent)	[ALT]+[I]
/ (forward slash)	[ALT]+[J]
& (ampersand)	[ALT]+[K]
; (semicolon)	[ALT]+[L]
, (comma)	[ALT]+[M]
: (colon)	[ALT]+[N]
? (question mark)	[ALT]+[O]
_ (underscore)	[ALT]+[P]
{ (left brace)	[ALT]+[Q]
} (right brace)	[ALT]+[R]
' (single quote)	[ALT]+[S]
" (double quote)	[ALT]+[T]
\ (backslash)	[ALT]+[U]
= (equal)	[ALT]+[V]
< (left angle bracket)	[ALT]+[W]
> (right angle bracket)	[ALT]+[X]
~ (tilde)	[ALT]+[Y]
¦ (vertical bar)	[ALT]+[Z]
¬ (not symbol)	[ALT]+[.]
¢ (cent)	[ALT]+[SP]
! (exclamation mark)	[ALT]+[7]
| (piping symbol)	[ALT]+[8]
` (grave accent)	[ALT]+[9]

Special Function Keys

Special function keys are:

- AID-generating keys
- Cursor movement keys
- Field Exit key
- Signal keys
- Special control keys
- Special host keys

The following pages describe special function keys on the RT3210 Radio Terminal. For complete descriptions refer to the appropriate IBM 5250 functions reference manual.

AID-Generating Keys

AID-generating keys generate AID codes that go in the display data stream to the host system. They alert the host system that the controller requires some action.

The RT3210 Radio Terminal emulates all of the AID-generating keys on a 5291 Display Station. Table 2-2 lists key sequences.

Table 2-2
RT3210 AID-Generating Keys

5291 AID Key	Press	Description
Clear	[FUNC]+[1]	The system environment determines the results of this key. If the radio terminal is in session, [CLEAR] issues the AID code hex BD, which requests that the host system issue a Clear Unit command to the RT3210 to clear the display. If not in session, [CLEAR] clears the entire display regeneration buffer.
Enter/Rec Adv	[ENTER]	Enters information.
Help (nonerror state)	[FUNC]+[2]	Issues a hex F3 AID byte to the host system.
F1–F24	[FUNC]+[A] – [FUNC]+[X]	User-defined command functions.
Print	[FUNC]+[8]	Tells the controller that the operator wants to print the contents of the present display. Issues hex F6 to the host system.
Record Backspace (Home)	[FUNC]+[RESET]	When pressed with the cursor in the home position, a record backspace is requested. The AID code hex F8 and cursor address are sent to the host system.
Roll ↑ (Roll up/ Page down)	[**B**]	Rolls display down one page; issues AID code hex F5.
Roll ↓ (Roll down/ Page up)	[**Y**]	Rolls display up one page; issues AID code hex F4.

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 5291 Display Station's 80-character by 24-line screen (Figure 2-2).

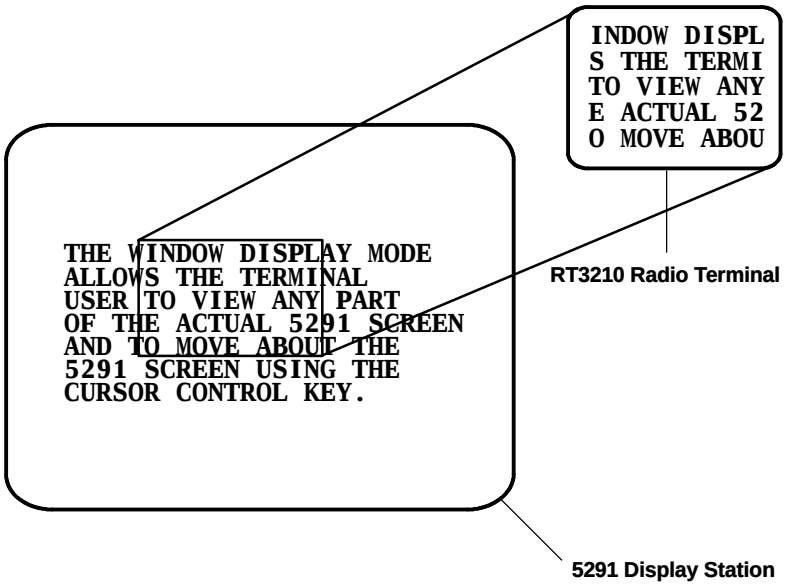


Figure 2-2
RT3210 Windowing Mode

Cursor location is not limited to the current window. All cursor movement keys (for example, Field Exit, New Line, and the cursor keys) respond just as they would on the 80x24 display. For example, when you press the [FIELD +] key and the next field is outside the current window, the window moves to the new location.

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	[**A**]
Move 1 space right	[FUNC]+[**"**]
Move 1 space left	[FUNC]+[**A**]
Move 1 space up	[FUNC]+[**Y**]
Move 1 space down	[FUNC]+[**B**]
Move 8 spaces right	[ALT]+[**"**]
Move 8 spaces left	[ALT]+[**A**]
Move 8 spaces up	[ALT]+[**Y**]
Move 8 spaces down	[ALT]+[**B**]

Field Exit Key

Field Exit clears to the end of the field and tabs to the next field. The key on the RT3210 keyboard is [FIELD EXIT].

Signal Keys

Signal keys cause a Signal command to go from the controller to the host system. Signal keys are Attn and Help (Table 2-3).

Table 2-3
RT3210 Signal Keys

5291 Signal Key	Press	Description
Attn	[FUNC]+[3]	The operator presses this key to alert the host system that the function requested (for example, [ENTER]) is not being honored. Attn is valid when the keyboard is locked or unlocked. It does not change the keyboard state or the cursor location.
Help (from error state)	[FUNC]+[2]	The operator uses this key to request that the host system send data about the error to the display.

Special Control Keys

Use the special control keys (Table 2-4) to change operator-generated information in the radio terminal's display. The keys do not work when the keyboard is locked.

Table 2-4
RT3210 Special Control Keys

5291 Special Control Key	Press	Description
Del	[FUNC]+[←]	Deletes the character in the position where the cursor was located. All remaining characters in the field shift to the left to fill the column.
Display mode	(None)	You must set the radio terminal's display contrast through the firmware menus.

Table 2-4 (Continued)
RT3210 Special Control Keys

5291 Special Control Key	Press	Description
Erase Input	[FUNC]+[4]	Clears all fields to nulls, and the cursor moves to the first input field.
Error Reset	[RESET]	Restores the original data on the error line of the display and resets the state.
Hex	[FUNC]+[Z]	Enters hexadecimal codes from the keyboard to generate any EBCDIC characters needed for input or display.
Home	[FUNC]+[RESET]	Moves the cursor to the position specified by the insert cursor (IC) address.
Insert	[FUNC]+[5]	Sets or turns off the insert mode for the input field the operator has the cursor in. The operator must reset the insert state before exiting it, by either pressing [RESET] or [INSERT] again.
Shift Lock	[FUNC]+[ALT]	Puts the keyboard into shift lock mode.
Alternate cursor	(None)	You must change the cursor type through the firmware menus.
Display cursor location	(None)	The radio terminal does not support this feature. On the 5291 keyboard, it displays the cursor location.

Special Host Keys

Special host keys are Sys Req and Test Request (Table 2-5).

Table 2-5
RT3210 Special Host Keys

5291 Special Host Key	Press	Description
Sys Req	[FUNC]+[7]	Data on the error line is saved, the error line is cleared, a column separator and underscore field attribute are supplied to column 1 of the error line, and the cursor is located under column 2 to begin polling keystrokes.
Test Request	(None)	The radio terminal does not support Test Request.

Other Keys

Table 2-6 lists other radio terminal keys and their operations.

Table 2-6
Other RT3210 Keys and Operations

Operation	Press	Description
Backspace	[←]	Moves cursor one space to the left.
Menu	[FUNC]+ [FIELD EXIT]	Brings up the radio terminal's main menu and firmware parameters.

Table 2-6 (Continued)
Other RT3210 Keys and Operations

Operation	Press	Description
Dup (duplicate enabled fields only)	[FUNC]+[0]	Controller repeats hex "1C" from the cursor position to the end of the field. This shows in the display as an overstruck asterisk.
↵ (New Line)	[FUNC]+[Y]	Moves cursor to beginning of next field.
Field–	[FUNC]+[9]	For numeric fields, makes the input a negative number.
Field+	[FUNC]+[6]	Advances cursor to the next input field. For numeric fields, makes the input a positive number.
Backlight	[FUNC]+[SP]	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 a 5291 Display Station. 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 2-7 shows which keys do and do not repeat.

Table 2-7
RT3210 Key Repeat

Repeating	Nonrepeating
Del	Alt
EBCDIC characters	Attn
Forward Tab	Backlight
New Line	Clear
Reverse Tab	Dup
Cursor control keys used with [FUNC] and [ALT]	Enter/Rec Adv
	Erase Input
	Error Reset
	F1–F24

Table 2-7 (Continued)
RT3210 Key Repeat

Repeating	Nonrepeating
	Field Exit
	Field–
	Field+
	Func
	Help
	Hex
	Home
	Insert
	Menu
	Print
	Roll ↑ (Roll up/Page down)
	Roll ↓ (Roll down/Page up)
	Shift
	Shift Lock
	Sys Req

System Messages

The radio terminal's display reserves a line for status information. The status line can display system (nonlocal) information such as a message waiting from the host computer, help messages in response to the [HELP] key, or the system request state of the radio terminal.

System codes can also appear on the status line. System messages and codes are described in Section 8, "Display Data Stream."

Section 3

RT1100 Radio Terminal

Overview

The RT1100 Radio Terminal is designed to appear to the host computer as an IBM 5291 Display Station. To help the system programmer 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 5250 data stream.

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

RT1100 Radio Terminals are compatible with RT3210 (UHF only), RT1700, and RT5900 Radio Terminals; and PEN*KEY® 6400 Computers (900 MHz and WLIF 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 9. 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 a 5291 Display Station 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 5291 Display Station's 80-character by 24-line display buffer. You can set the type of screen mode through the radio terminal's firmware menus.

The screen modes govern which portion of the larger 5291 Display Station'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 5291 Display Station, 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 5291 Display Station. 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 5291 Display Station. 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.

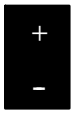
Locked Mode

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. Locked mode also moves the error line to the last position in the display.

Annunciators

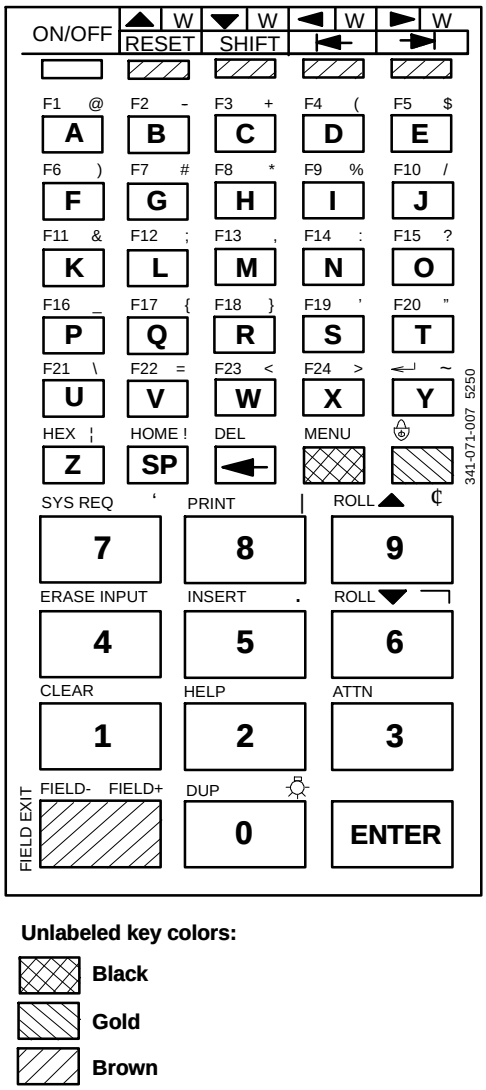
The RT1100 Radio Terminal's display reserves a location for icons or small pictures, called "annunciators," which show the radio terminal's current status or operation in progress. The following annunciators can appear in the radio terminal's display.

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.
Y	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.
A	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.
	**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 radio terminal's 47-key keyboard (Figure 3-1) has shift keys, alphabetic keys, numeric keys, special characters, special function keys, and keys that do other operations.



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.

One of the keys on the keyboard — the [FIELD EXIT] key — has its operation printed to the left of it. The operation printed to the left is its *unshifted* value. The operations printed above [FIELD EXIT] 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 [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 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]

Table 3-1 (Continued)
RT1100 Special Characters

Special Character	Press
) (right parenthesis)	[GOLD]+[F]
# (pound)	[GOLD]+[G]
* (asterisk)	[GOLD]+[H]
% (percent)	[GOLD]+[I]
/ (forward slash)	[GOLD]+[J]
& (ampersand)	[GOLD]+[K]
; (semicolon)	[GOLD]+[L]
, (comma)	[GOLD]+[M]
: (colon)	[GOLD]+[N]
? (question mark)	[GOLD]+[O]
_ (underscore)	[GOLD]+[P]
{ (left brace)	[GOLD]+[Q]
} (right brace)	[GOLD]+[R]
' (single quote)	[GOLD]+[S]
" (double quote)	[GOLD]+[T]
\ (backslash)	[GOLD]+[U]
= (equal)	[GOLD]+[V]
< (left angle bracket)	[GOLD]+[W]
> (right angle bracket)	[GOLD]+[X]
~ (tilde)	[GOLD]+[Y]
¦ (vertical bar)	[GOLD]+[Z]
! (exclamation mark)	[GOLD]+[SP]
` (grave accent)	[GOLD]+[7]
| (piping symbol)	[GOLD]+[8]
¢ (cent)	[GOLD]+[9]
. (period)	[GOLD]+[5]
¬ (not symbol)	[GOLD]+[6]

Special Function Keys

Special function keys are:

- AID-generating keys
- Cursor movement keys
- Field Exit key
- Signal keys
- Special control keys
- Special host keys

The following pages describe special function keys on the RT1100 Radio Terminal. For complete descriptions refer to the appropriate IBM 5250 functions reference manual.

AID-Generating Keys

AID-generating keys generate AID codes that go in the display data stream to the host system. They alert the host system that the controller requires some action.

The RT1100 Radio Terminal emulates all of the AID-generating keys on a 5291 Display Station. Table 3-2 lists key sequences.

Table 3-2
RT1100 AID-Generating Keys

5291 AID Key	Press	Description
Clear	[BLACK]+[1]	The system environment determines the results of this key. If the radio terminal is in session, [CLEAR] issues the AID code hex BD, which requests that the host system issue a Clear Unit command to the RT1100 to clear the display. If not in session, [CLEAR] clears the entire display regeneration buffer.
Enter/Rec Adv	[ENTER]	Enters information.
Help (nonerror state)	[BLACK]+[2]	Issues a hex F3 AID byte to the host system.
F1– F24	[BLACK]+[A] – [BLACK]+[X]	User-defined command functions.
Print	[BLACK]+[8]	Tells the controller that the operator wants to print the contents of the present display. Issues hex F6 to the host system.
Record Backspace (Home)	[BLACK]+[SP]	When pressed with the cursor in the home position, a record backspace is requested. The AID code hex F8 and cursor address are sent to the host system.
Roll ↑ (Roll up/ Page down)	[BLACK]+[6]	Rolls display down one page; issues AID code hex F5.
Roll ↓ (Roll down/ Page up)	[BLACK]+[9]	Rolls display up one page; issues AID code hex F4.

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 5291 Display Station's 80-character by 24-line screen (Figure 3-2).

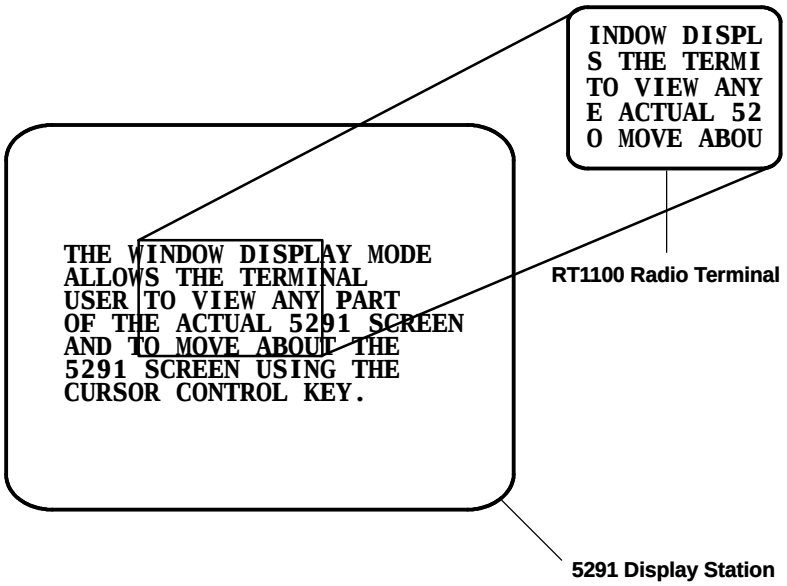


Figure 3-2
RT1100 Windowing Mode

Cursor location is not limited to the current window. All cursor movement keys (for example, Field Exit, New Line, and the cursor keys) respond just as they would on the 80x24 display. For example, when you press the [FIELD +] key and the next field is outside the current window, the window moves to the new location.

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
Move 8 spaces right	[BLACK]+[**"**]
Move 8 spaces left	[BLACK]+[**A**]
Move 8 spaces up	[BLACK]+[**Y**]
Move 8 spaces down	[BLACK]+[**B**]
Move 1 space right	[GOLD]+[**"**]
Move 1 space left	[GOLD]+[**A**]
Move 1 space up	[GOLD]+[**Y**]
Move 1 space down	[GOLD]+[**B**]

Field Exit Key

Field Exit clears to the end of the field and tabs to the next field. The key on the RT1100 keyboard is [FIELD EXIT], which is the brown-colored key in the lower left corner of the keyboard.

Signal Keys

Signal keys cause a Signal command to go from the controller to the host system. Signal keys are Attn and Help (Table 3-3).

Table 3-3
RT1100 Signal Keys

5291 Signal Key	Press	Description
Attn	[BLACK]+[3]	The operator presses this key to alert the host system that the function requested (for example, [ENTER]) is not being honored. Attn is valid when the keyboard is locked or unlocked. It does not change the keyboard state or the cursor location.
Help (from error state)	[BLACK]+[2]	The operator uses this key to request that the host system send data about the error to the display.

Special Control Keys

Use the special control keys (Table 3-4) to change operator-generated information in the radio terminal's display. The keys do not work when the keyboard is locked.

Table 3-4
RT1100 Special Control Keys

5291 Special Control Key	Press	Description
Del	[BLACK]+[←]	Deletes the character in the position where the cursor was located. All remaining characters in the field shift to the left to fill the column.
Display mode	(None)	You must set the radio terminal's display contrast through the firmware menus.

Table 3-4 (Continued)
RT1100 Special Control Keys

5291 Special Control Key	Press	Description
Erase Input	[BLACK]+[4]	Clears all fields to nulls, and the cursor moves to the first input field.
Error Reset	[RESET]	Restores the original data on the error line of the display and resets the state.
Hex	[BLACK]+[Z]	Enters hexadecimal codes from the keyboard to generate any EBCDIC characters needed for input or display.
Home	[BLACK]+[SP]	Moves the cursor to the position specified by the insert cursor (IC) address.
Insert	[BLACK]+[5]	Sets or turns off the insert mode for the input field the operator has the cursor in. The operator must reset the insert state before exiting it, by either pressing [RESET] or [Insert] again.
Shift Lock	[BLACK]+[GOLD]	Puts the keyboard into shift lock mode.
Alternate cursor	(None)	You must change the cursor type through the firmware menus.
Display cursor location	(None)	The radio terminal does not support this feature. On the 5291 keyboard, it displays the cursor location.

Special Host Keys

Special host keys are Sys Req and Test Request (Table 3-5).

Table 3-5
RT1100 Special Host Keys

5291 Special Host Key	Press	Description
Sys Req	[BLACK]+[7]	Data on the error line is saved, the error line is cleared, a column separator and underscore field attribute are supplied to column 1 of the error line, and the cursor is located under column 2 to begin polling keystrokes.
Test Request	(None)	The radio terminal does not support Test Request.

Other Keys

Table 3-6 lists other radio terminal keys and their operations.

Table 3-6
Other RT1100 Keys and Operations

Operation	Press	Description
Backspace	[←]	Moves cursor one space to the left.
Menu	[GOLD]+ [BLACK]	Brings up the radio terminal's main menu and firmware parameters.
Dup (duplicate enabled fields only)	[BLACK]+[0]	Controller repeats hex "1C" from the cursor position to the end of the field. This shows in the display as an overstruck asterisk.
↵ (New Line)	[BLACK]+[Y]	Moves cursor to beginning of next field.
Field–	[BLACK]+ [BROWN]	For numeric fields, makes the input a negative number.
Field+	[GOLD]+ [BROWN]	Advances cursor to the next input field. For numeric fields, makes the input a positive number.
Forward Tab	►	Forward tabs.
Reverse Tab	◄	Reverse tabs.
Backlight	[GOLD]+[0]	Toggles the display's backlight on and off.

You can also use the keyboard to 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.

System Messages

The radio terminal's display reserves a line for status information. The status line can display system (nonlocal) information such as a message waiting from the host computer, help messages in response to the [HELP] key, or the system request state of the radio terminal.

System codes can also appear on the status line. System messages and codes are described in Section 8, "Display Data Stream."

Section 4

RT1700 Radio Terminal

Overview

The RT1700 Radio Terminal is designed to appear to the host computer as an IBM 5291 Display Station. To help the system programmer 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 5250 data stream.

" NOTE: *Radio terminals in the RT1700 Series have UHF, 900 MHz, or WLIF 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 WLIF 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 9. 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 a 5291 Display Station 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 5291 Display Station's 80-character by 24-line display buffer. You can set the type of screen mode through the radio terminal's firmware menus.

The screen modes govern which portion of the larger 5291 Display Station'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 5291 Display Station. 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 5291 Display Station. 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. Locked mode also moves the error line to the last position in the display.

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.
Y	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.

A	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 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 either 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, special characters, special function keys, and keys that do other operations.

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 in its secondary plane, and the special character
" . " (period).

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.

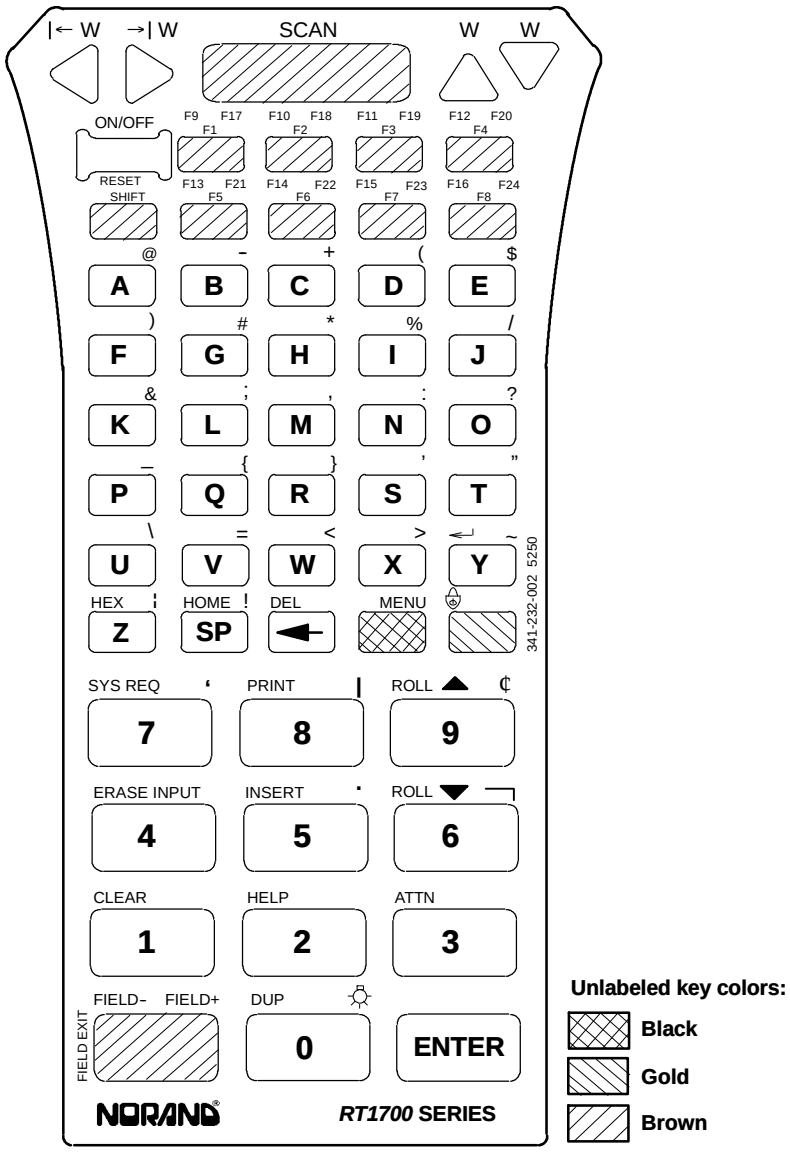


Figure 4-1
RT1700 57-Key Keyboard

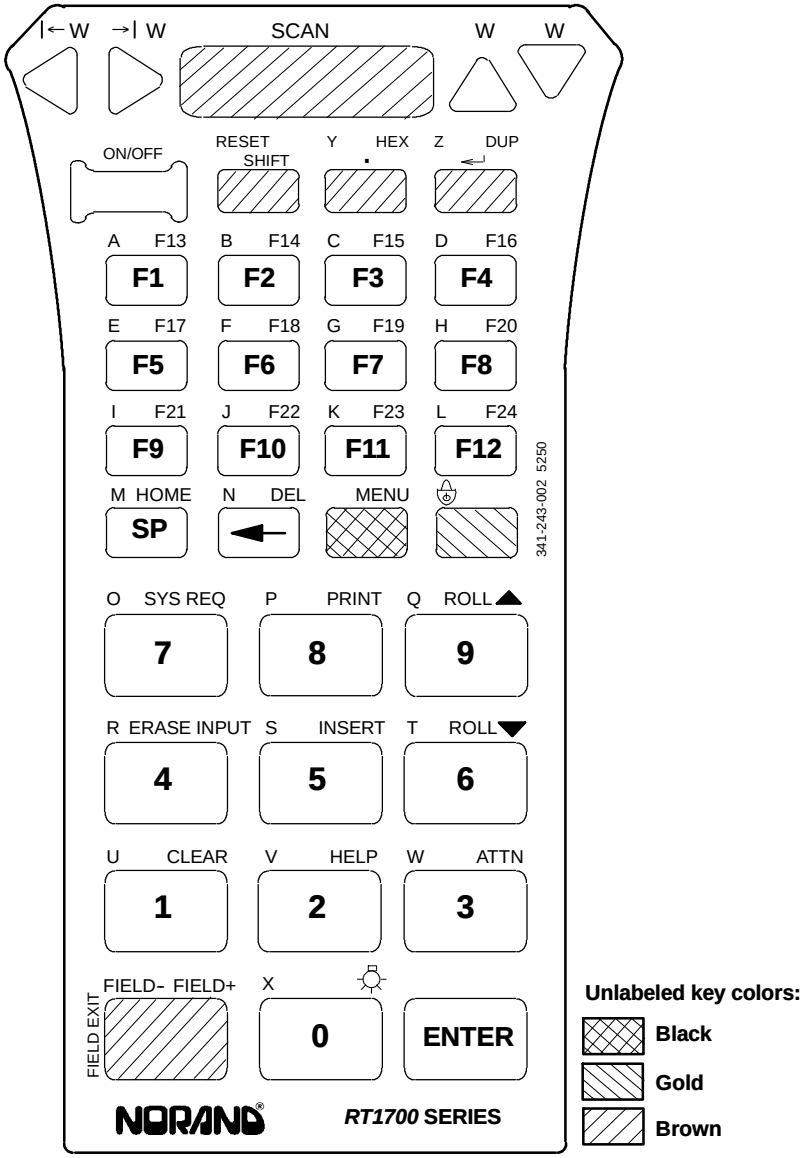


Figure 4-2
RT1700 37-Key Keyboard

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 [BLACK]+[F1] to do the F13 function (printed in black on the overlay).

The [FIELD EXIT] key has its operation printed to the left of it. The operation printed to the left is its *unshifted* value. The operations printed above [FIELD EXIT] 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	Press (37-Key Keyboard)
A–L	[SHIFT]+[F1] – [SHIFT]+[F12]
M	[SHIFT]+[SP]
N	[SHIFT]+[←]
O–W	[SHIFT]+[7] – [SHIFT]+[3]
X	[SHIFT]+[0]
Y	[SHIFT]+[.]
Z	[SHIFT]+[↵]
a–l	[BLACK]+[F1] – [BLACK]+[F12]
m	[BLACK]+[SP]
n	[BLACK]+[←]
o–w	[BLACK]+[7] – [BLACK]+[3]
x	[BLACK]+[0]
y	[BLACK]+[.]
z	[BLACK]+[↵]

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 keyboard. The special character available on the 37-key keyboard is a " . " (period).

Table 4-2
RT1700 Special Characters

Special Character	Press (57-Key Keyboard)
@ (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]
% (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]
{ (left brace)	[GOLD]+[Q]

Table 4-2 (Continued)
RT1700 Special Characters

Special Character	Press (57-Key Keyboard)
} (right brace)	[GOLD]+[R]
’ (single quote)	[GOLD]+[S]
” (double quote)	[GOLD]+[T]
\ (backslash)	[GOLD]+[U]
= (equal)	[GOLD]+[V]
< (left angle bracket)	[GOLD]+[W]
> (right angle bracket)	[GOLD]+[X]
~ (tilde)	[GOLD]+[Y]
¦ (vertical bar)	[GOLD]+[Z]
! (exclamation mark)	[GOLD]+[SP]
‘ (grave accent)	[GOLD]+[7]
| (piping symbol)	[GOLD]+[8]
¢ (cent)	[GOLD]+[9]
. (period)	[GOLD]+[5]
¬ (not symbol)	[GOLD]+[6]

Special Function Keys

Special function keys are:

- AID-generating keys
- Cursor movement keys
- Field Exit key
- Signal keys
- Special control keys
- Special host keys

The following pages briefly describe the special function keys on the RT1700 Radio Terminal. For complete descriptions, refer to the appropriate IBM 5250 functions reference manual.

AID-Generating Keys

AID-generating keys generate AID codes that go in the display data stream to the host system. They alert the host system that the controller requires some action. Table 4-3 shows key combinations.

Table 4-3
RT1700 AID-Generating Keys

5291 AID Key	57-Key Keyboard	37-Key Keyboard	Description
F1 – F8	[F1] – [F8]	[F1] – [F8]	User-defined function.
F9 – F12	[BLACK]+[F1] – [BLACK]+[F4]	[F9] – [F12]	User-defined function.
F13 – F16	[BLACK]+[F5] – [BLACK]+[F8]	[GOLD]+[F1] – [GOLD]+[F4]	User-defined function.
F17 – F24	[GOLD]+[F1] – [GOLD]+[F8]	[GOLD]+[F5] – [GOLD]+[F12]	User-defined function.
Clear	[BLACK]+[1]	[GOLD]+[1]	The system environment determines the results of this key. If the radio terminal is in session, it issues the AID code hex BD, which requests that the host system issue a Clear Unit command to the RT1700 to clear the display. If not in session, [CLEAR] clears the entire display regeneration buffer.

Table 4-3 (Continued)
RT1700 AID-Generating Keys

5291 AID Key	57-Key Keyboard	37-Key Keyboard	Description
Enter/Rec Adv	[ENTER]	[ENTER]	Enters information.
Help (nonerror state)	[BLACK]+[2]	[GOLD]+[2]	Issues a hex F3 AID byte to the host system.
Print	[BLACK]+[8]	[GOLD]+[8]	Tells the controller that the operator wants to print the contents of the present display. Issues hex F6 to the host system.
Record Backspace(Home)	[BLACK]+[SP]	[GOLD]+[SP]	When pressed with the cursor in the home position, a record backspace is requested. The AID code hex F8 and cursor address are sent to the host system.
Roll ↑ (Roll up/ Page down)	[BLACK]+[6]	[GOLD]+[6]	Rolls display down one page; issues AID code hex F5.
Roll ↓ (Roll down/ Page up)	[BLACK]+[9]	[GOLD]+[9]	Rolls display up one page; issues AID code hex F4.

Cursor Movement

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 5291 Display Station's 80-character by 24-line screen (Figure 4-3).

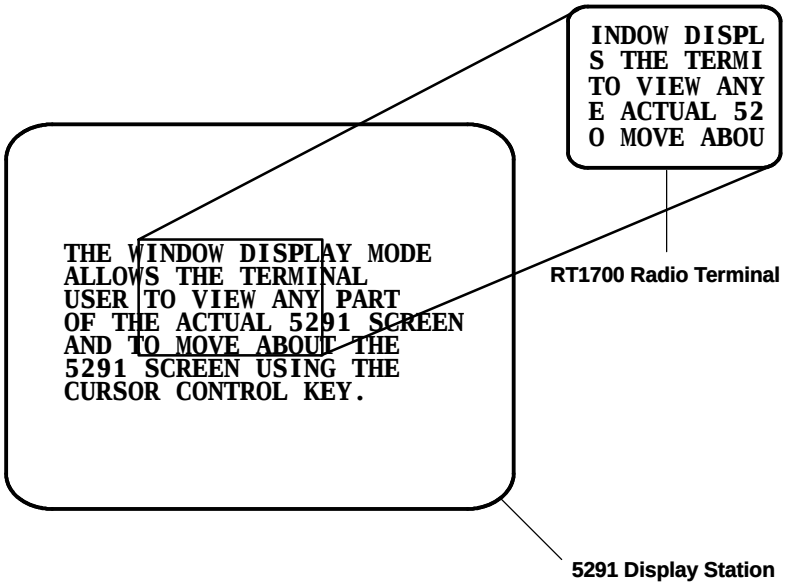


Figure 4-3
RT1700 Windowing Mode

Cursor location is not limited to the current window. All cursor movement keys (for example, Field Exit, New Line, and the cursor keys) respond just as they would on the 80x24 display. For example, when you press the [FIELD+] key and the next field is outside the current window, the window moves to the new location.

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]+[**A**]
Move 8 spaces right	[BLACK]+[**"**]
Move 8 spaces left	[BLACK]+[**A**]
Move 8 spaces up	[BLACK]+[**Y**]
Move 8 spaces down	[BLACK]+[**B**]
Move 1 space right	[GOLD]+[**"**]
Move 1 space left	[GOLD]+[**A**]
Move 1 space up	[GOLD]+[**Y**]
Move 1 space down	[GOLD]+[**B**]

Field Exit

Field Exit clears to the end of the field and tabs to the next field. The key on the RT1700 keyboard is [FIELD EXIT], which is the brown-colored key in the lower left corner of the 57- and 37-key keyboards.

Signal Keys

Signal keys cause a Signal command to go from the controller to the host system. Signal keys are Attn and Help. Table 4-4 shows key combinations.

Table 4-4
RT1700 Signal Keys

5291 Signal Key	57-Key Keyboard	37-Key Keyboard	Description
Attn	[BLACK]+[3]	[GOLD]+[3]	The operator presses this key to alert the host system that the function requested (for example, [ENTER]) is not being honored. Attn is valid when the keyboard is locked or unlocked. It does not change the keyboard state or the cursor location.
Help (from error state)	[BLACK]+[2]	[GOLD]+[2]	The operator uses this key to request that the host system send data about the error to the display.

Special Control Keys

Use the special control keys to change operator-generated information in the radio terminal's display. The keys do not work when the keyboard is locked. Table 4-5 shows key combinations.

Table 4-5
RT1700 Special Control Keys

5291 Special Control Key	57-Key Keyboard	37-Key Keyboard	Description
Del	[BLACK]+[←]	[GOLD]+[←]	Deletes the character in the position where the cursor was located. All remaining characters in the field shift to the left to fill the column.
Display Mode	None	None	You must set the radio terminal's display contrast through the firmware menus.
Erase Input	[BLACK]+[4]	[GOLD]+[4]	Clears all fields to nulls, and the cursor moves to the first input field.
Error Reset	[BLACK]+ [SHIFT]	[BLACK]+ [SHIFT]	Restores the original data on the error line of the display and resets the state.
Hex	[BLACK]+[Z]	[GOLD]+[.]	Enters hexadecimal codes from the keyboard to generate any EBCDIC characters needed for input or display.
Home	[BLACK]+[SP]	[GOLD]+[SP]	Moves the cursor to the position specified by the insert cursor (IC) address.
Insert	[BLACK]+[5]	[GOLD]+[5]	Sets or turns off the insert mode for the input field the operator has the cursor in. The operator must reset the insert state before exiting it, by either pressing [RESET] or [Insert] again.
Shift Lock	[BLACK]+ [GOLD]	[BLACK]+ [GOLD]	Puts the keyboard into shift lock mode.

Table 4-5 (Continued)
RT1700 Special Control Keys

5291 Special Control Key	57-Key Keyboard	37-Key Keyboard	Description
Alternate cursor	(None)	(None)	You must change the cursor type through the firmware menus.
Display cursor location	(None)	(None)	The radio terminal does not support this feature. On the 5291 keyboard, it displays the cursor location.

Special Host Keys

Special host keys are Sys Req and Test Request. Table 4-6 shows key combinations.

Table 4-6
RT1700 Special Host Keys

5291 Special Host Key	57-Key Keyboard	37-Key Keyboard	Description
Sys Req	[BLACK]+[7]	[GOLD]+[7]	Data on the error line is saved, the error line is cleared, a column separator and underscore field attribute are supplied to column 1 of the error line, and the cursor is located under column 2 to begin polling keystrokes.
Test Request	(None)	(None)	The radio terminal does not support Test Request.

Other Keys

Table 4-7 lists other radio terminal keys and their operations.

Table 4-7
Other RT1700 Keys and Operations

Operation	57-Key Keyboard	37-Key Keyboard	Description
Backspace	[←]	[←]	Moves cursor one space to the left.
Menu	[GOLD]+ [BLACK]	[GOLD]+ [BLACK]	Brings up the radio terminal's main menu and firmware parameters.
Dup (duplicate enabled fields only)	[BLACK]+[0]	[GOLD]+ [↵]	Controller repeats hex 1C from the cursor position to the end of the field. This shows in the display as an overstruck asterisk.
↵ (New Line)	[BLACK]+[Y]	[↵]	Moves cursor to beginning of next field.
Field–	[BLACK]+ [BROWN]	[BLACK]+ [BROWN]	For numeric fields, makes the input a negative number.
Field+	[GOLD]+ [BROWN]	[GOLD]+ [BROWN]	Advances cursor to the next input field. For numeric fields, makes the input a positive number.
Backlight	[GOLD]+[0]	[GOLD]+[0]	Toggles the 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 a 5291 Display Station. 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 4-8 shows which keys do and do not repeat.

Table 4-8
RT1700 Key Repeat

Repeating	Nonrepeating
Del	Attn
EBCDIC characters	Backlight
Forward Tab	Black Shift
New Line	Clear
Reverse Tab	Dup
Cursor control keys used with [BLACK] and [GOLD]	Enter/Rec Adv
	Erase Input
	Error Reset
	F1–F24
	Field Exit
	Field–
	Field+
	Gold Shift
	Help
	Hex
	Home
	Insert
	Menu
	Print
	Roll ↑ (Roll up/Page down)
	Roll ↓ (Roll down/Page up)
	Shift
	Shift Lock
	Sys Req

System Messages

The radio terminal's display reserves a line for status information. The status line can display system (nonlocal) information such as a message waiting from the host computer, help messages in response to the [HELP] key, or the system request state of the radio terminal.

System codes can also appear on the status line. System messages and codes are described in Section 8, "Display Data Stream."

Section 5

RT5900 Radio Terminal

Overview

The RT5900 Mobile Mount Radio Terminal is designed to appear to the host computer as an IBM 5291 Display Station. To help the system programmer 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 5250 data stream.

" NOTE: *Radio terminals in the RT5900 Series have UHF, 900 MHz, or WLIF radios.*

RT5900 Radio Terminals are compatible with RT3210 (UHF radio only), RT1100, and RT1700 Radio Terminals; and PEN*KEY® 6400 Computers (900 MHz and WLIF 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 9. 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, supertwist, 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 a 5291 Display Station has a screen size of 80 characters by 24 lines, the radio terminal presents a part of the information on the larger display station.

The RT5900 Radio Terminal is compatible with RT3210 Radio Terminals (UHF radio only), RT1100 Radio Terminals, and RT1700 Radio Terminals. This lets the RT5900 Radio Terminal work interchangeably with other radio terminals on a network. You do not need to modify your application program. The RT5900 Radio Terminal changes only its display for larger characters.

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 5291 Display Station's 80-character by 24-line display buffer. You can set the type of screen mode through the radio terminal's firmware menus.

The screen modes govern which portion of the larger 5291 Display Station'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 5291 Display Station, 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 5291 Display Station. 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 5291 Display Station. 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. Locked mode also moves the error line to the last position in the display.

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, or set the firmware so that the annunciators do not appear. Refer to the radio terminal's user guide for more information.

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.

Y 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.

A 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.

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.

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

Keyboard

The radio terminal's 47-key keyboard (Figure 5-1) has shift keys, alphabetic keys, numeric keys, special characters, special function keys, and keys that do other operations.

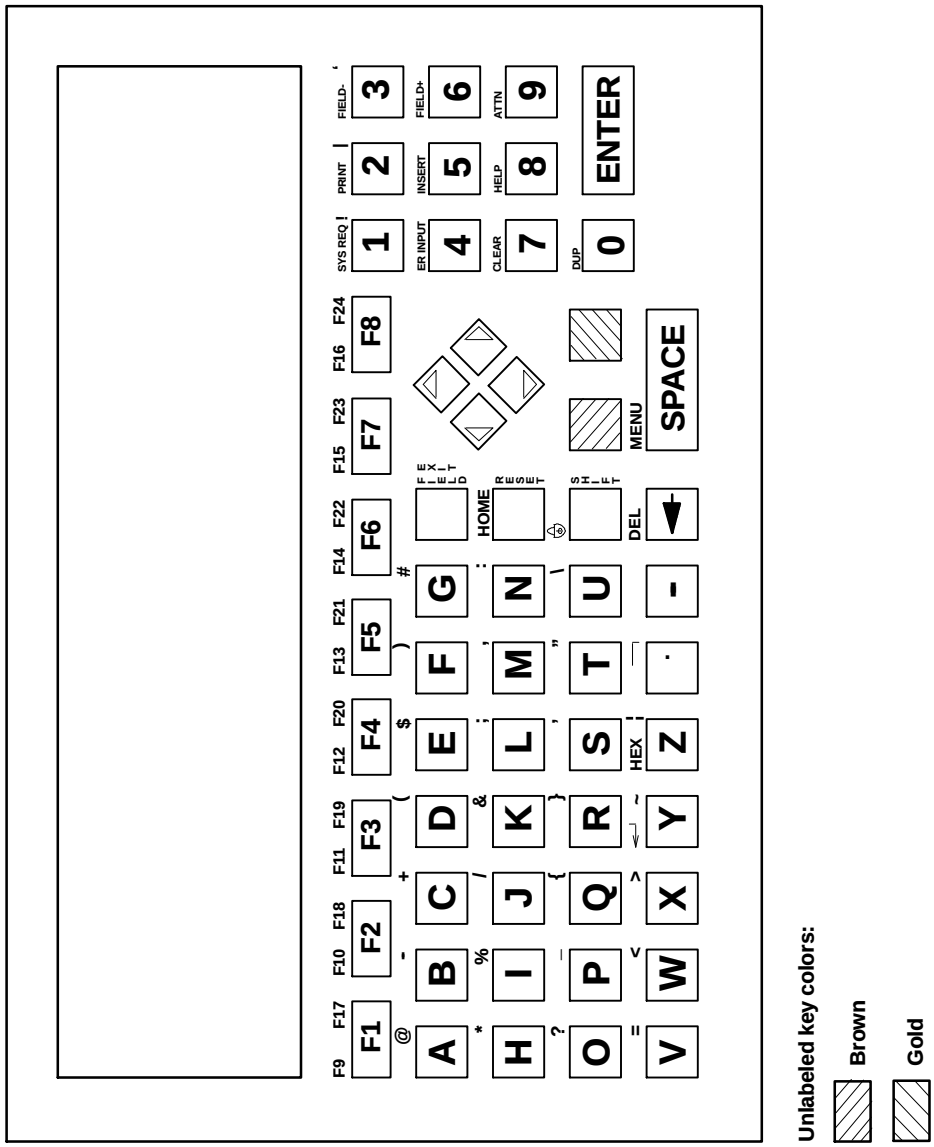


Figure 5-1
RT5900 Keyboard

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 [BROWN]+[F1] to do the [F9] function (printed in brown on the overlay).
- 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.

Three of the keys on the keyboard — [FIELD EXIT], [RESET], and [SHIFT] — have their operations printed to the right of them. The operations printed to the right are the *unshifted* values. The operations printed above [RESET] and [SHIFT] are the *shifted* values. [FIELD EXIT] does not have a 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 [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)	[GOLD]+[A]
– (minus)	[GOLD]+[B]
+ (plus)	[GOLD]+[C]
((left parenthesis)	[GOLD]+[D]
$ (dollar)	[GOLD]+[E]
) (right parenthesis)	[GOLD]+[F]

Table 5-1 (Continued)
RT5900 Special Characters

Special Character	Press
# (pound)	[GOLD]+[G]
* (asterisk)	[GOLD]+[H]
% (percent)	[GOLD]+[I]
/ (forward slash)	[GOLD]+[J]
& (ampersand)	[GOLD]+[K]
; (semicolon)	[GOLD]+[L]
, (comma)	[GOLD]+[M]
: (colon)	[GOLD]+[N]
? (question mark)	[GOLD]+[O]
_ (underscore)	[GOLD]+[P]
{ (left brace)	[GOLD]+[Q]
} (right brace)	[GOLD]+[R]
' (single quote)	[GOLD]+[S]
" (double quote)	[GOLD]+[T]
\ (backslash)	[GOLD]+[U]
= (equal)	[GOLD]+[V]
< (left angle bracket)	[GOLD]+[W]
> (right angle bracket)	[GOLD]+[X]
~ (tilde)	[GOLD]+[Y]
¦ (vertical bar)	[GOLD]+[Z]
¬ (not symbol)	[GOLD]+[.]
¢ (cent)	[GOLD]+[–]
! (exclamation mark)	[GOLD]+[1]
| (piping symbol)	[GOLD]+[2]
` (grave accent)	[GOLD]+[3]

Special Function Keys

Special function keys are:

- AID-generating keys
- Cursor movement keys
- Field Exit key
- Signal keys
- Special control keys
- Special host keys

The following pages describe special function keys on the RT5900 Radio Terminal. For complete descriptions, refer to the appropriate IBM 5250 functions reference manual.

AID-Generating Keys

AID-generating keys generate AID codes that go in the display data stream to the host system. They alert the host system that the controller requires some action.

The RT5900 Radio Terminal emulates all of the AID-generating keys on a 5291 Display Station. Table 5-2 lists key sequences.

Table 5-2
RT5900 AID-Generating Keys

5291 AID Key	Press	Description
Clear	[BROWN]+[7]	The system environment determines the results of this key. If the radio terminal is in session, it issues the AID code hex BD, which requests that the host system issue a Clear Unit command to the RT5900 to clear the display. If not in session, [CLEAR] clears the entire display regeneration buffer.
Enter/Rec Adv	[ENTER]	Enters information.
Help (nonerror state)	[BROWN]+[8]	Issues a hex F3 AID byte to the host system.
F1–F8	[F1]–[F8]	User-defined command functions.
F9–F16	[BROWN]+[F1] – [BROWN]+[F8]	User-defined command functions.
F17–F24	[GOLD]+[F1] – [GOLD]+[F8]	User-defined command functions.
Print	[BROWN]+[2]	Tells the controller that the operator wants to print the contents of the present display. Issues hex F6 to the host system.
Record Backspace (Home)	[BROWN]+[RESET]	When pressed with the cursor in the home position, a record backspace is requested. The AID code hex F8 and cursor address are sent to the host system.
Roll ↑ (Roll up/ Page down)	[**B**]	Rolls display down one page; issues AID code hex F5.
Roll ↓ (Roll down/ Page up)	[**Y**]	Rolls display up one page; issues AID code hex F4.

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 5291 Display Station's 80-character by 24-line screen (Figure 5-2).

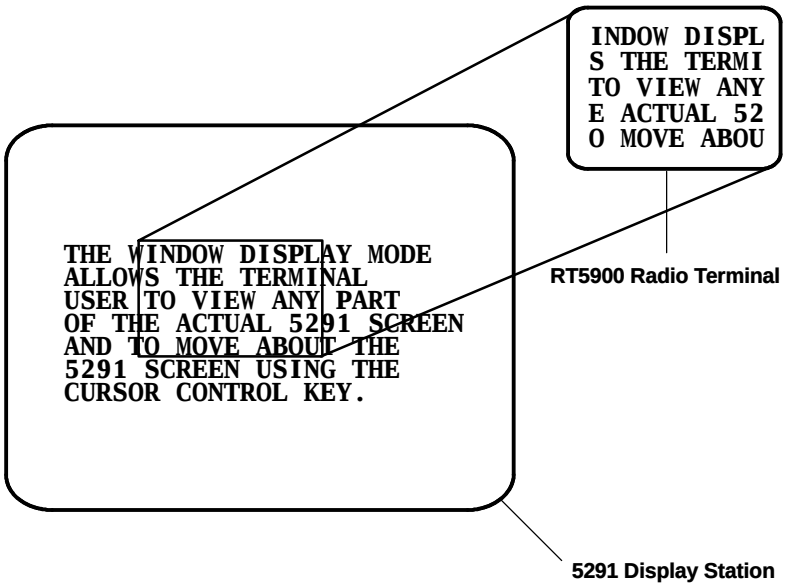


Figure 5-2
RT5900 Windowing Mode

Cursor location is not limited to the current window. All cursor movement keys (for example, Field Exit, New Line, and the arrow keys) respond just as they would on the 80x24 display. For example, when you press the [FIELD+] key and the next field is outside the current window, the window moves to the new location.

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	[**A**]
Move 8 spaces right	[GOLD]+[**"**]
Move 8 spaces left	[GOLD]+[**A**]
Move 8 spaces up	[GOLD]+[**Y**]
Move 8 spaces down	[GOLD]+[**B**]
Move 1 position right	[BROWN]+[**"**]
Move 1 position left	[BROWN]+[**A**]
Move 1 position up	[BROWN]+[**Y**]
Move 1 position down	[BROWN]+[**B**]

Field Exit Key

Field Exit clears to the end of the field and tabs to the next field. The key on the RT5900 keyboard is [FIELD EXIT], which is to the left of the cursor control keys.

Signal Keys

Signal keys cause a Signal command to go from the controller to the host system. Signal keys are Attn and Help (Table 5-3).

Table 5-3
RT5900 Signal Keys

5291 Signal Key	Press	Description
Attn	[BROWN]+[9]	The operator presses this key to alert the host system that the function requested (for example, [ENTER]) is not being honored. Attn is valid when the keyboard is locked or unlocked. It does not change the keyboard state or the cursor location.
Help (from error state)	[BROWN]+[8]	The operator uses this key to request that the host system send data about the error to the display.

Special Control Keys

Use the special control keys (Table 5-4) to change operator-generated information in the radio terminal's display. The keys do not work when the keyboard is locked.

Table 5-4
RT5900 Special Control Keys

5291 Special Control Key	Press	Description
Del	[BROWN]+[←]	Deletes the character in the position where the cursor was located. All remaining characters in the field shift to the left to fill the column.
Display mode	(None)	You must set the radio terminal's display contrast through the firmware menus.
Erase Input	[BROWN]+[4]	Clears all fields to nulls, and the cursor moves to the first input field.
Error Reset	[RESET]	Restores the original data on the error line of the display and resets the state.
Hex	[BROWN]+[Z]	Enters hexadecimal codes from the keyboard to generate any EBCDIC characters needed for input or display.
Home	[BROWN]+[INSERT]	Moves the cursor to the position specified by the insert cursor (IC) address.
Insert	[BROWN]+[5]	Sets or turns off the insert mode for the input field the operator has the cursor in. The operator must reset the insert state before exiting it, by either pressing [RESET] or [INSERT] again.
Shift Lock	[BROWN]+[SHIFT]	Puts the keyboard into shift lock mode.
Alternate cursor	(None)	You must change the cursor type through the firmware menus.
Display cursor location	(None)	The radio terminal does not support this feature. On the 5291 keyboard, it displays the cursor location.

Special Host Keys

Special host keys are Sys Req and Test Request (Table 5-5).

Table 5-5
RT5900 Special Host Keys

5291 Special Host Key	Press	Description
Sys Req	[BROWN]+[1]	Data on the error line is saved, the error line is cleared, a column separator and underscore field attribute are supplied to column 1 of the error line, and the cursor is located under column 2 to begin polling keystrokes.
Test Request	(None)	The radio terminal does not support Test Request.

Other Keys

Table 5-6 lists other radio terminal keys and their operations.

Table 5-6
Other RT5900 Keys and Operations

Operation	Press	Description
Backspace	[←]	Moves cursor one space to the left.
Menu	[BROWN]+ [SPACE]	Brings up the radio terminal's main menu and firmware parameters.

Table 5-6 (Continued)
Other RT5900 Keys and Operations

Operation	Press	Description
Alternate character size	[YELLOW]+ [SPACE]	Switches to the alternate character size.
Dup (duplicate enabled fields only)	[BROWN]+[0]	Controller repeats hex "1C" from the cursor position to the end of the field. This shows in the display as an overstruck asterisk.
↵ (New Line)	[BROWN]+[Y]	Moves cursor to beginning of next line.
Field–	[BROWN]+[3]	For numeric fields, makes the input a negative number.
Field+	[BROWN]+[6]	Advances cursor to the next input field. For numeric fields, makes the input a positive number.

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 a 5291 Display Station. 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 5-7 shows which keys do and do not repeat.

Table 5-7
RT5900 Key Repeat

Repeating	Nonrepeating
Del	Attn
EBCDIC characters	Brown Shift
Forward Tab	Clear
New Line	Dup
Reverse Tab	Enter/Rec Adv
Cursor control keys used with [BROWN] and [GOLD]	Erase Input
	Error Reset
	F1–F24
	Field Exit

Table 5-7 (Continued)
RT5900 Key Repeat

Repeating	Nonrepeating
	Field–
	Field+
	Gold Shift
	Help
	Hex
	Home
	Insert
	Menu
	Print
	Roll ↑ (Roll up/Page down)
	Roll ↓ (Roll down/Page up)
	Shift
	Shift Lock
	Sys Req

System Messages

The radio terminal's display reserves a line for status information. The status line can display system (nonlocal) information such as a message waiting from the host computer, help messages in response to the [HELP] key, or the system request state of the radio terminal.

System codes can also appear on the status line. System messages and codes are described in Section 8, "Display Data Stream."

Section 6

PEN*KEY® 6400 Computer

Overview

The PEN*KEY 6400 Computer appears to the host computer as an IBM 5291 Display Station. To help you design interfaces to the PEN*KEY 6400, this section describes the screen size, screen modes, annunciators, keyboards, and IBM display emulation for the PEN*KEY 6400 as part of the 5250 data stream.

" NOTE: *PEN*KEY 6400 Computers have 900 MHz or WLIF radios.*

The PEN*KEY computer is compatible with RT1100, RT1700, and RT5900 Radio Terminals (900 MHz and WLIF radios only). This lets the PEN*KEY 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 9. For more 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 a 5291 Display Station 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 5291 Display Station's 80-character by 24-line display buffer. You can set the type of screen mode through the PEN*KEY computer's firmware menus.

The screen modes govern which portion of the larger 5291 Display Station'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 5250 data stream's 80-character by 24-line logical display. In this mode, the cursor remains in the center of the PEN*KEY computer's window.

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

Corner Mode

Corner mode begins with the window in the upper left corner of the larger 5291 Display Station. It keeps the cursor in the lower right corner of the display. Corner mode works best for applications that use the upper left corner of the logical screen.

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

Page Mode

Page mode provides predefined pages within the larger 5291 Display Station. The size of these pages depends on the number of rows and columns selected for display. The PEN*KEY computer moves the window by a multiple of the page size. As the cursor moves off the edge of the PEN*KEY computer's display, the window changes to the next page.

Lazy Mode

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

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. Locked mode also moves the error line to the last position in the display.

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, special characters, special function keys, and keys that do other operations.

41-Key Keyboard

The 41-key keyboard (Figure 6-2) has standard numeric keys, an [ENTER] key, and user-defined function keys in its primary plane. It has alphabetic 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 [SHFT]+[BLUE]+[3] (a “C”) and then [SHFT]+[BLUE]+ [F8] (an “R”). Then press the correct numbers, which are 52401.
- To initiate the COLD START? menu option, press [BLUE]+ [F11]+[RST] to answer “yes.”

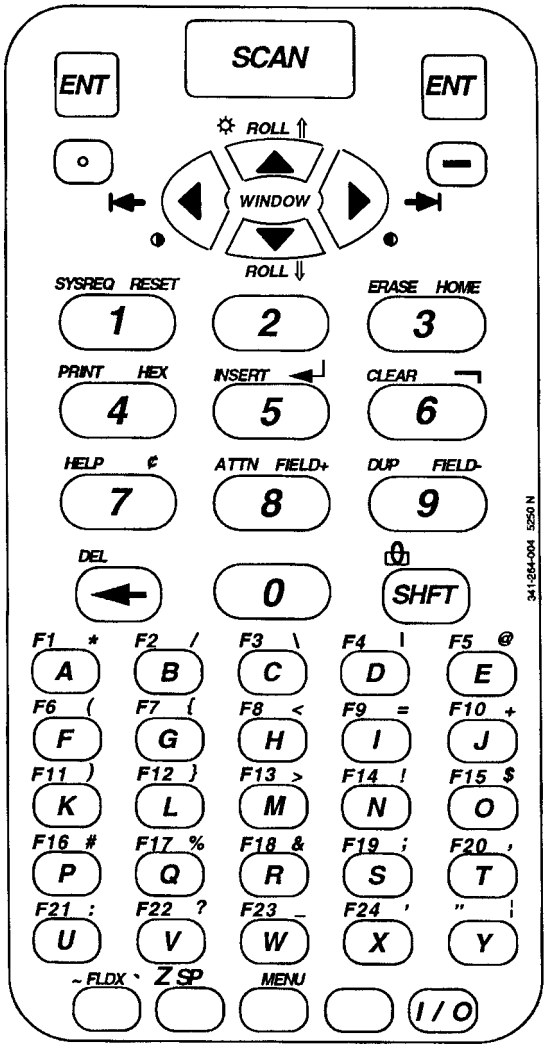


Figure 6-1
PEN*KEY 6400 51-Key Keyboard

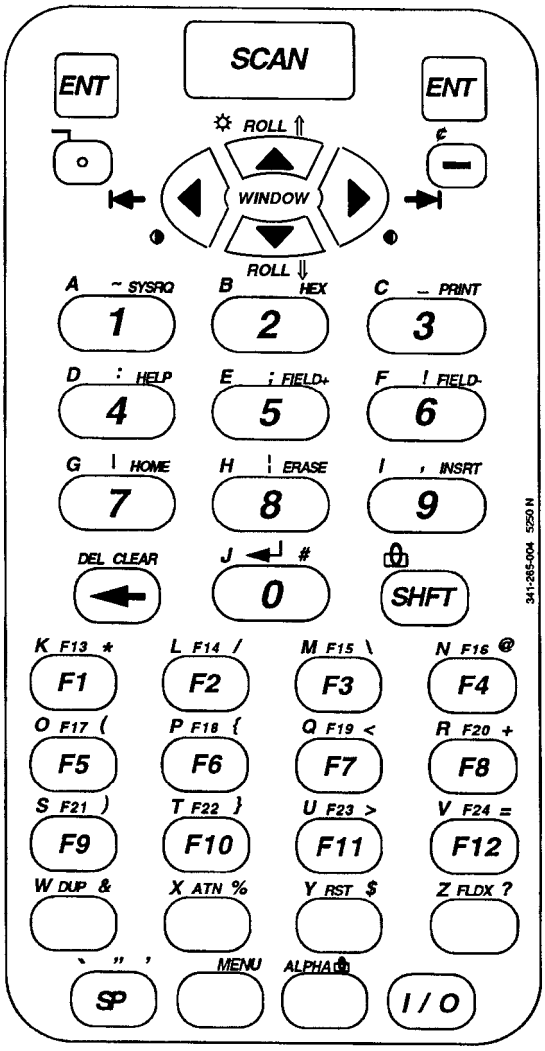


Figure 6-2
PEN*KEY 6400 41-Key Keyboard

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-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.
[BLUE]	The blue-colored 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 "FLDX" printed above it is the Field Exit key.
- 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 primary plane:

- The key with “DUP” printed above it is the Duplicate key.
- The key with “ATN” printed above it is the Attention key.
- The key with “RST” printed above it is the Error Reset key.
- The key with “FLDX” printed above it is the Field Exit key.

Alphabetic Keys

51-Key Keyboard

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

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

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

41-Key Keyboard

You can use one of two methods to type letters on the 41-key keyboard: standard blue shift 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 standard [BLUE] plane to the primary plane. It moves uppercase alphabetic keys from their standard [SHFT]+[BLUE] plane to the [SHFT] plane. Alpha lock provides a faster way to type a series of letters because it reduces the number of key presses.

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

Table 6-2 describes how to type letters on the 41-key keyboard in standard blue shift 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]+[DUP]	[DUP]
x	[BLUE]+[ATN]	[ATN]
y	[BLUE]+[RST]	[RST]
z	[BLUE]+[FLDX]	[FLDX]
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]

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

To Type	Standard Mode	Alpha Lock Mode
W	[SHFT]+[BLUE]+[DUP]	[SHFT]+[DUP]
X	[SHFT]+[BLUE]+[ATN]	[SHFT]+[ATN]
Y	[SHFT]+[BLUE]+[RST]	[SHFT]+[RST]
Z	[SHFT]+[BLUE]+[FLDX]	[SHFT]+[FLDX]

Numeric Keys

Numeric keys are arranged in a 10-key format in the middle section 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 keyboard, and the 41-key keyboard when not in alpha lock mode.

Table 6-3
PEN*KEY 6400 Special Characters

Special Character	51-Key	41-Key
* (asterisk)	[GOLD]+[A]	[GOLD]+[F1]
/ (forward slash)	[GOLD]+[B]	[GOLD]+[F2]
\ (backslash)	[GOLD]+[C]	[GOLD]+[F3]
| (vertical bar)	[GOLD]+[D]	[SHFT]+[7]
@ (at)	[GOLD]+[E]	[GOLD]+[F4]
((left parenthesis)	[GOLD]+[F]	[GOLD]+[F5]
{ (left brace)	[GOLD]+[G]	[GOLD]+[F6]
< (left angle bracket)	[GOLD]+[H]	[GOLD]+[F7]

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

Special Character	51-Key	41-Key
= (equal)	[GOLD]+[I]	[GOLD]+[12]
+ (plus)	[GOLD]+[J]	[GOLD]+[F8]
) (right parenthesis)	[GOLD]+[K]	[GOLD]+[F9]
} (right brace)	[GOLD]+[L]	[GOLD]+[F10]
> (right angle bracket)	[GOLD]+[M]	[GOLD]+[F11]
! (exclamation mark)	[GOLD]+[N]	[SHFT]+[6]
$ (dollar)	[GOLD]+[O]	[GOLD]+[RST]
# (pound)	[GOLD]+[P]	[GOLD]+[0]
% (percent)	[GOLD]+[Q]	[GOLD]+[ATN]
& (ampersand)	[GOLD]+[R]	[GOLD]+[DUP]
; (semicolon)	[GOLD]+[S]	[SHFT]+[5]
, (comma)	[GOLD]+[T]	[SHFT]+[9]
: (colon)	[GOLD]+[U]	[SHFT]+[4]
? (question mark)	[GOLD]+[V]	[GOLD]+[FLDX]
_ (underscore)	[GOLD]+[W]	Not applicable
' (left single quote)	[GOLD]+[X]	[GOLD]+[SP]
¦ (piping symbol)	[GOLD]+[Y]	[GOLD]+[Y]
` (grave accent)	[GOLD]+[FLDX]	[BLUE]+[SP]
¢ (cent)	[GOLD]+[7]	[BLUE]+[–]
¬ (not symbol)	[GOLD]+[6]	[BLUE]+[.]
~ (tilde)	[BLUE]+[FLDX]	[SHFT]+[1]
" (double quote)	[BLUE]+[Y]	[SHFT]+[SP]

You can type some special characters when the 41-key keyboard is in alpha lock mode. (Press [BLUE]+[GOLD] to put the keyboard into alpha lock mode.) Table 6-4 shows how to type the characters when the keyboard is in alpha lock mode.

Table 6-4
PEN*KEY 6400 Special Characters, Alpha Lock Mode

Special Character	41-Key Keyboard
~ (tilde)	[SHFT]+[BLUE]+[1]
– (hyphen)	[SHFT]+[BLUE]+[3]
: (colon)	[SHFT]+[BLUE]+[4]
; (semicolon)	[SHFT]+[BLUE]+[5]
! (exclamation mark)	[SHFT]+[BLUE]+[6]
| (vertical bar)	[SHFT]+[BLUE]+[7]
¦ (piping symbol)	[SHFT]+[BLUE]+[8]
, (comma)	[SHFT]+[BLUE]+[9]

Special Function Keys

Special function keys are:

- AID-generating keys
- Cursor movement keys
- Field Exit key
- Signal keys
- Special control keys
- Special host keys

The following pages briefly describe the special function keys on the PEN*KEY computer. For complete descriptions, refer to the appropriate IBM 5250 functions reference manual.

AID-Generating Keys

AID-generating keys generate AID codes that go in the display data stream to the host system. They alert the host system that the controller requires some action. Table 6-5 shows key combinations for the 51-key keyboard, and the 41-key keyboard when not in alpha lock mode.

Table 6-5
PEN*KEY 6400 AID-Generating Keys

5291 AID Key	51-Key Keyboard	41-Key Keyboard	Description
F1–F12	[BLUE]+[A] – [BLUE]+[L]	[F1] – [F12]	User-defined function.
F13–F24	[BLUE]+[M] – [BLUE]+[X]	[SHFT]+[F1] – [SHFT]+[F12]	User-defined function.
Enter/Rec Adv	[ENTER]	[ENTER]	Enters information.
Help (nonerror state)	[BLUE]+[7]	[GOLD]+[4]	Issues a hex F3 AID byte to the host system.
Print	[BLUE]+[4]	[GOLD]+[3]	Tells the controller that the operator wants to print the contents of the present display. Issues hex F6 to the host system.
Clear	[BLUE]+[6]	[GOLD]+[←]	The system environment determines the results of this key. If the PEN*KEY computer is in session, it issues the AID code hex BD, which requests that the host system issue a Clear Unit command to the computer to clear the display. If not in session, [CLEAR] clears the entire display regeneration buffer.

Table 6-5 (Continued)
PEN*KEY 6400 AID-Generating Keys

5291 AID Key	51-Key Keyboard	41-Key Keyboard	Description
Record Backspace (Home)	[GOLD]+[3]	[GOLD]+[7]	When pressed with the cursor in the home position, a record backspace is requested. The AID code hex F8 and cursor address are sent to the host system.
Roll ↑ (Roll up/ Page down)	[GOLD]+[**Y**]	[GOLD]+[**Y**]	Rolls display down one page; issues AID code hex F5.
Roll ↓ (Roll down/ Page up)	[GOLD]+[**B**]	[GOLD]+[**B**]	Rolls display up one page; issues AID code hex F4.

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 alpha lock mode.

Table 6-6
PEN*KEY 6400 Function Keys, Alpha Lock Mode

Function	Press
F1-F12	[BLUE]+[F1] - [BLUE]+[F12]
F13-F24	[SHFT]+[BLUE]+[F1] - [SHFT]+[BLUE]+[F12]

Cursor Movement

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 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 5291 Display Station's 80-character by 24-line screen (Figure 6-3).

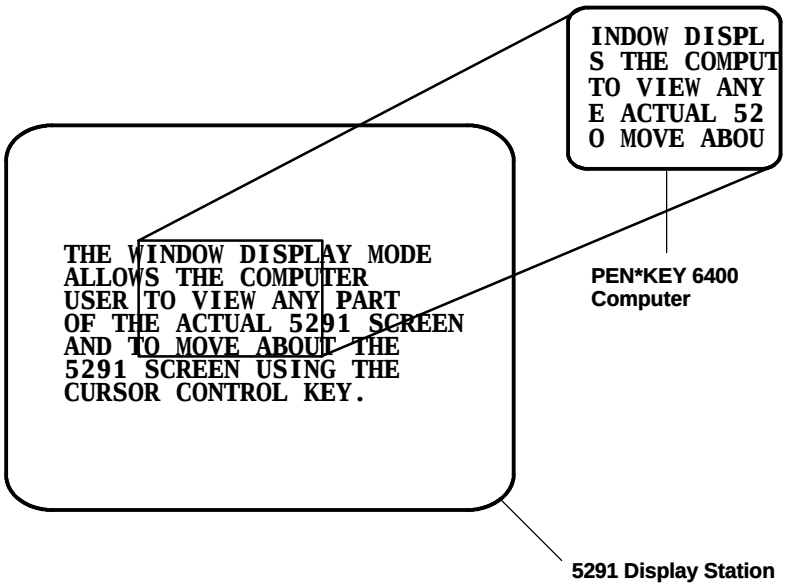


Figure 6-3
PEN*KEY 6400 Windowing Mode

Cursor location is not limited to the current window. All cursor movement keys (for example, Field Exit, New Line, and the cursor keys) respond just as they would on the 80x24 display. For example, when you press the [FIELD+] key and the next field is outside the current window, the window moves to the new location.

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]+[**A**]
Move 1 space right	[GOLD]+[**"**]
Move 1 space left	[GOLD]+[**A**]
Move 1 space up	[GOLD]+[**Y**]
Move 1 space down	[GOLD]+[**B**]
Move 8 spaces right	[BLUE]+[**"**]
Move 8 spaces left	[BLUE]+[**A**]
Move 8 spaces up	[BLUE]+[**Y**]
Move 8 spaces down	[BLUE]+[**B**]

Field Exit

Field Exit clears to the end of the field and tabs to the next field. The key on the 51- and 41-key keyboards is [FLDX].

Signal Keys

Signal keys cause a Signal command to go from the controller to the host system. Signal keys are Attn and Help. Table 6-7 shows key combinations.

Table 6-7
PEN*KEY 6400 Signal Keys

5291 Signal Key	51-Key Keyboard	41-Key Keyboard	Description
Attn	[BLUE]+[8]	[ATN]	The operator presses this key to alert the host system that the function requested (for example, [ENTER]) is not being honored. Attn is valid when the keyboard is locked or unlocked. It does not change the keyboard state or the cursor location.
Help (from error state)	[BLUE]+[7]	[GOLD]+[4]	The operator uses this key to request that the host system send, to the display, data about the error.

Special Control Keys

Use the special control keys to change operator-generated information in the PEN*KEY computer's display. The keys do not work when the keyboard is locked. Table 6-8 shows key combinations.

Table 6-8
PEN*KEY 6400 Special Control Keys

5291 Special Control Key	51-Key Keyboard	41-Key Keyboard	Description
Del	[BLUE]+[←]	[BLUE]+[←]	Deletes the character in the position where the cursor was located. All remaining characters in the field shift to the left to fill the column.
Display Mode	None	None	You must set the PEN*KEY computer's display contrast through the firmware menus.
Erase Input	[BLUE]+[3]	[GOLD]+[8]	Clears all fields to nulls, and the cursor moves to the first input field.
Error Reset	[GOLD]+[1]	[RST]	Restores the original data on the error line of the display and resets the state.
Hex	[GOLD]+[4]	[GOLD]+[2]	Enters hexadecimal codes from the keyboard to generate any EBCDIC characters needed for input or display.
Home	[GOLD]+[3]	[GOLD]+[7]	Moves the cursor to the position specified by the insert cursor (IC) address.
Insert	[BLUE]+[5]	[GOLD]+[9]	Sets or turns off the insert mode for the input field the operator has the cursor in. The operator must reset the insert state before exiting it, by either pressing [RESET] or [Insert] again.
Shift Lock	[BLUE]+[SHFT]	[BLUE]+[SHFT]	Puts the keyboard into shift lock mode. Press the sequence again to unlock.

Table 6-8 (Continued)
PEN*KEY 6400 Special Control Keys

5291 Special Control Key	51-Key Keyboard	41-Key Keyboard	Description
Alternate cursor	(None)	(None)	You must change the cursor type through the firmware menus.
Display cursor location	(None)	(None)	The PEN*KEY computer does not support this feature. On the 5291 keyboard, it displays the cursor location.

Special Host Keys

Special host keys are Sys Req and Test Request. Table 6-9 shows key combinations.

Table 6-9
PEN*KEY 6400 Special Host Keys

5291 Special Host Key	51Key Keyboard	41Key Keyboard	Description
Sys Req	[BLUE]+[1]	[GOLD]+[1]	Data on the error line is saved, the error line is cleared, an underscore field attribute is supplied to column 1 of the error line, and the cursor is located under column 2 to begin polling keystrokes.
Test Request	(None)	(None)	The PEN*KEY computer does not support Test Request.

Other Keys

Table 6-10 lists other PEN*KEY computer keys and their operations.

Table 6-10
Other PEN*KEY 6400 Keys and Operations

Operation	51-Key Keyboard	41-Key Keyboard	Description
Backspace	[←]	[←]	Moves cursor one space to the left.
Menu	[GOLD]+ [BLUE]	[GOLD]+ [BLUE]	Brings up the PEN*KEY computer's main menu and firmware parameters.
Dup (duplicate enabled fields only)	[BLUE]+[9]	[DUP]	Controller repeats hex 1C from the cursor position to the end of the field. This shows in the display as an overstruck asterisk.
↵ (New Line)	[GOLD]+[5]	[SHFT]+[0]	Moves cursor to beginning of next field.
Field–	[GOLD]+[9]	[GOLD]+[6]	For numeric fields, makes the input a negative number.
Field+	[GOLD]+[8]	[GOLD]+[5]	Advances cursor to the next input field. For numeric fields, makes the input a positive number.
Backlight	[SHFT]+[**Y**]	[SHFT]+[**Y**]	Toggles the 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 a 5291 Display Station. 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 6-11 shows which keys do and do not repeat.

Table 6-11
PEN*KEY 6400 Key Repeat

Repeating	Non-repeating
Del	Attn
EBCDIC characters	Backlight
Forward Tab	Blue shift
New Line	Clear
Reverse Tab	Dup
Cursor control keys used with [BLUE] and [GOLD]	Enter/Rec Adv
	Erase Input
	Error Reset
	F1–F24
	Field Exit
	Field–
	Field+
	Gold shift
	Help
	Hex
	Home
	Insert
	Menu
	Print
	Roll ↑ (Roll up/Page down)
	Roll ↓ (Roll down/Page up)
	Shift
	Shift Lock
	Sys Req

System Messages

The PEN*KEY computer's display reserves a line for status information. The status line can display system (nonlocal) information such as a message waiting from the host computer, help messages in response to the [HELP] key, or the system request state of the PEN*KEY computer.

System codes can also appear on the status line. System messages and codes are described in Section 8, "Display Data Stream."

Section 7

PEN*KEY® 6500 Computer

Overview

The PEN*KEY 6500 Computer appears to the host computer as an IBM 5291 Display Station. 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 5250 data stream.

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

The PEN*KEY computer is compatible with RT1100, RT1700, and RT5900 Radio Terminals, 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 9. For more 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 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 a 5291 Display Station 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 5291 Display Station's 80-character by 24-line display buffer. You can set the type of screen mode through the PEN*KEY computer's firmware menus.

The screen modes govern which portion of the larger 5291 Display Station'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 5250 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 5291 Display Station, 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 5291 Display Station. 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 5291 Display Station. 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. Locked mode also moves the error line to the last position in the display.

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 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. These 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, special characters, special function keys, and keys that do other operations. Note that these keys are not supported: Fn, Setup, Pause, Break, End, and ScrLk.

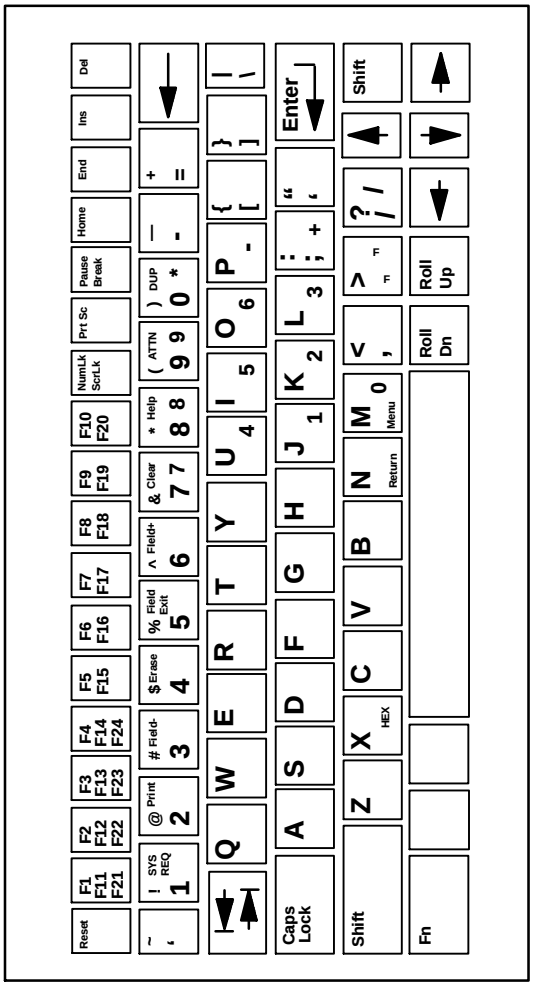


Figure 7-1
PEN*KEY 6500 Keyboard

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

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

- Press [Blue]+[F1] to do the [F11] function (printed in blue on the key).
- Press [Gold]+[F1] to do the [F21] function (printed in gold on the key).

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

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)	[`]

Special Function Keys

Special function keys are:

- AID-generating keys
- Cursor movement keys
- Field Exit key
- Signal keys
- Special control keys
- Special host keys

The following pages describe special function keys on the PEN*KEY 6500 Computer. For complete descriptions, refer to the appropriate IBM 5250 functions reference manual.

AID-Generating Keys

AID-generating keys generate AID codes that go in the display data stream to the host system. They alert the host system that the controller requires some action. The PEN*KEY 6500 Computer emulates all of the AID-generating keys on a 5291 Display Station. Table 7-2 lists key sequences.

Table 7-2
PEN*KEY 6500 AID-Generating Keys

5291 AID Key	Press	Description
F1–F10	[F1] – [F10]	User-defined command functions.
F11–F20	[Blue]+[F1] – [Blue]+[F10]	User-defined command functions.
F21–F24	[Gold]+[F1] – [Gold]+[F10]	User-defined command functions.
Enter/Rec Adv	[Enter]	Enters information.
Help (nonerror state)	[Gold]+[8]	Issues a hex F3 AID byte to the host system.
Print	[Gold]+[2]	Tells the controller that the operator wants to print the contents of the present display. Issues hex F6 to the host system.
Clear	[Gold]+[7]	The system environment determines the results of this key. If the PEN*KEY computer is in session, it issues the AID code hex BD, which requests that the host system issue a Clear Unit command to the PEN*KEY 6500 to clear the display. If not in session, [CLEAR] clears the entire display regeneration buffer.
Record Backspace (Home)	[Home]	When pressed with the cursor in the home position, a record backspace is requested. The AID code hex F8 and cursor address are sent to the host system.
Roll Down/Page Up	[Roll Dn]	Rolls display down one page; issues AID code hex F5.
Roll Up/Page Down	[Roll Up]	Rolls display up one page; issues AID code hex F4.

Cursor Movement

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 5291 Display Station's 80-character by 24-line screen (Figure 7-2).

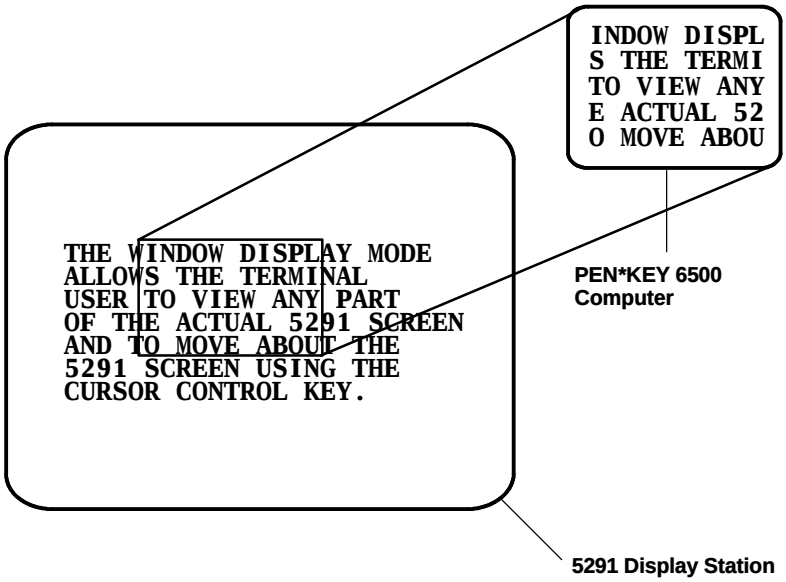


Figure 7-2
PEN*KEY 6500 Windowing Mode

Cursor location is not limited to the current window. All cursor movement keys (for example, Field Exit, New Line, and the arrow keys) respond just as they would on the 80x24 display. For example, when you press the [FIELD+] key and the next field is outside the current window, the window moves to the new location.

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]+↓

Field Exit Key

Field Exit clears to the end of the field and tabs to the next field. The key combination on the PEN*KEY 6500 keyboard is [Gold]+[5].

Signal Keys

Signal keys cause a Signal command to go from the controller to the host system. Signal keys are Attn and Help (Table 7-3).

Table 7-3
PEN*KEY 6500 Signal Keys

5291 Signal Key	Press	Description
Attn	[Gold]+[9]	The operator presses this key to alert the host system that the function requested (for example, [ENTER]) is not being honored. Attn is valid when the keyboard is locked or unlocked. It does not change the keyboard state or the cursor location.
Help (from error state)	[Gold]+[8]	The operator uses this key to request that the host system send data about the error to the display.

Special Control Keys

Use the special control keys to change operator-generated information in the PEN*KEY computer's display. The keys do not work when the keyboard is locked. Table 7-4 shows key combinations.

Table 7-4
PEN*KEY 6500 Special Control Keys

5291 Special Control Key	Press	Description
Del	[Del]	Deletes the character in the position where the cursor was located. All remaining characters in the field shift to the left to fill the column.
Display mode	(None)	You must set the PEN*KEY computer's display contrast through the firmware menus.
Erase Input	[Gold]+[4]	Clears all fields to nulls, and the cursor moves to the first input field.
Error Reset	[Reset]	Restores the original data on the error line of the display and resets the state.
Hex	[Gold]+[Z]	Enters hexadecimal codes from the keyboard to generate any EBCDIC characters needed for input or display.
Home	[Home]	Moves the cursor to the position specified by the insert cursor (IC) address.
Insert	[Ins]	Sets or turns off the insert mode for the input field the operator has the cursor in. The operator must reset the insert state before exiting it, by either pressing [Reset] or [Ins] again.
Shift Lock	[Caps Lock]	Puts the keyboard into shift lock mode.
Alternate cursor	(None)	You must change the cursor type through the firmware menus.
Display cursor location	(None)	The PEN*KEY computer does not support this feature. On the 5291 keyboard, it displays the cursor location.

Special Host Keys

Special host keys are Sys Req and Test Request. Table 7-5 shows key combinations.

Table 7-5
PEN*KEY 6500 Special Host Keys

5291 Special Host Key	Press	Description
Sys Req	[Gold]+[1]	Data on the error line is saved, the error line is cleared, a column separator and underscore field attribute are supplied to column 1 of the error line, and the cursor is located under column 2 to begin polling keystrokes.
Test Request	(None)	The PEN*KEY computer does not support Test Request.

Other Keys

Table 7-6 lists other PEN*KEY computer keys and their operations.

Table 7-6
Other PEN*KEY 6500 Keys and Operations

Operation	Press	Description
Backspace	←	Moves cursor one space to the left.
Menu	[Gold]+[M]	Brings up the PEN*KEY computer's main menu and firmware parameters.

Table 7-6 (Continued)
Other PEN*KEY 6500 Keys and Operations

Operation	Press	Description
New line (Return)	[Gold]+[N]	Moves cursor to beginning of next line.
Dup (duplicate enabled fields only)	[Gold]+[0]	Controller repeats hex "1C" from the cursor position to the end of the field. This shows in the display as an overstruck asterisk.
Field–	[Gold]+[3]	For numeric fields, makes the input a negative number.
Field+	[Gold]+[6]	Advances cursor to the next input field. For numeric fields, makes the input a positive number.

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 a 5291 Display Station. 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 7-7 shows which keys do and do not repeat.

Table 7-7
PEN*KEY 6500 Key Repeat

Repeating	Nonrepeating
Del	Attn
EBCDIC characters	Blue shift
Forward Tab	Caps Lock
New Line ([Return])	Clear
Reverse Tab	Dup
Cursor control keys used with [Blue] and [Gold]	Enter/Rec Adv
	Erase
	Reset
	F1–F24
	Field Exit
	Field–
	Field+
	Gold shift

Table 7-7 (Continued)
PEN*KEY 6500 Key Repeat

Repeating	Nonrepeating
	Help
	Hex
	Home
	Insert
	Menu
	NumLk
	Print
	Roll Down/Page Up
	Roll Up/Page Down
	Shift
	Sys Req

System Messages

The PEN*KEY computer's display reserves a line for status information. The status line can display system (nonlocal) information such as a message waiting from the host computer, help messages in response to the [Help] key, or the system request state of the PEN*KEY computer.

System codes can also appear on the status line. System messages and codes are described in Section 8, "Display Data Stream."

Section 8

Display Data Stream

Overview

This section describes the following:

- The host 5250 display data stream commands the host application can send to wireless stations.
- The host 5250 data stream orders that the host can send to wireless stations. Orders govern format and data expectations within the Write to Display command.
- Asynchronous 5250 prefixes.
- System messages and parameter errors that can appear in the wireless station's display.

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 the 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 5250 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 9, which describes the extended commands you can use to do operations beyond the capability of the 5291 Display Station.

Applications

If you need to write applications specifically for the wireless station, it is recommended that you use the corner mode window onto the IBM 5291 Display Station 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.

Data Stream Command Structure

The 5250 command structure lets the wireless stations display prompts and accept keyboard or scanner input. A second kind of command, called an order, works with the Write To Display command to define radio display characteristics, buffer sizes, and acceptable data types.

Display data stream commands form two categories: the input commands and the output commands. Table 8-1 lists input commands and hex codes.

Table 8-1
Input Commands and Hex Codes

Input Commands	Hex Code
Read Immediate	72
Read Modified Immediate Alternate	83
Read Input Fields	42
Read MDT Fields	52
Read MDT Alternate	82
Read Screen	62
Save Screen	02
Write Structured Field	(Not supported)

Table 8-2 lists output commands and hex codes.

Table 8-2
Output Commands and Hex Codes

Output Commands	Hex Code
Clear Format Table	50
Clear Unit	40
Clear Unit Alternate	(Not supported)
Restore Screen	12
Roll	23
Write Error Code	21
Write to Display	11

Input and output commands are described on the following pages. The *IBM 5250 Information Display System Functions Reference Manual* (IBM part number SA21-9247-6 provides more detailed descriptions than those presented in this programmer's guide).

Input Commands

Input commands consist of immediate and AID-associated Read commands. Immediate commands are executed when the controller receives the command. AID-associated commands are queued until the operator presses an AID-generating key such as Enter/Rec Adv. Other AID-generating keys are listed in the section for each wireless station.

Read Immediate (Immediate) Command

Function. The Read Immediate command is similar to the Read Screen command, except the data comes from the format table rather than the display.

The command sends back the contents of all the input fields on the display.

Restrictions. This command must be the last command in the chain and the controller must have change of direction (CD). The command is rejected if the wireless station is in an error, system request, or SS message state.

" NOTE: *If the display supports a separate message line, and the message line is selected, the command is rejected only for the system request and SS message states. The command is processed with the display in error state.*

Format. The command takes the following form:

ESC	Read Immediate Command
Hex 04	Hex 72

Results. Information associated with this command returns to the user in the LU-LU nonexpedited flow. What the user receives when they issue this command depends on the condition of the master modified data tag (MDT) bit:

- If the MDT bit is not set, the user receives:

  Cursor Address AID Code

- If the master MDT bit is set, the user receives:

  Cursor Address AID Code Field Data

The field data consists of the contents of all input fields as they appear on the display, unless resequencing has been specified. Any attributes contained in a field are treated as data and returned as such. Field boundary attributes are not considered part of the field. All nulls are converted to blanks. If the specified field is a signed numeric field, the last character is not sent.

If that same field is negative, the zone position of the next-to-the-last character is changed to hex D. In each case, the returned cursor address indicates the current location of the cursor and the AID code is hex 00.

" **NOTE:** *Queued Read commands and pending AID codes are not cleared. The format table, display annunciators, insert mode keying history, and display contents are not affected.*

Read Modified Immediate Alternate Command

Read Modified Immediate Alternate command enables the host to read data from modified input fields without depending on the operator to press an AID request key.

Format. The command takes the following form:

ESC	Read Modified Immediate Alternate Command
Hex 04	Hex 83

Results. This command is processed the same as the Read Immediate command, except for these differences in the format of data sent to host:

- Controller only returns data from those fields in the format table that have the MDT bit on.
- Data field is delimited by Set Buffer Address (SBA) orders in the same way as the response data field for the Read MDT Fields command.
- Leading and imbedded nulls within each field's data are not converted to blanks.
- Trailing nulls within each field's data are suppressed.

Read Input Fields Command

Function. The Read Input Fields command causes the wireless station to wait for the operator to press an active AID-generating key, then sends the contents of all fields defined in the format table to the host.

Restrictions. The operator must press an AID-generating key to execute this command. Also, CD in the Request/Response Header (RH) must be on before the AID byte can be serviced. This command is cleared if:

- The host system issues a session control request (such as Unbind).
- The host system issues a Clear Unit command and the controller executes it.
- The host system sends another Read command to the same LU and overlays this command.
- The Read command is executed.

Format. The command takes the following form:

ESC	Read Input Fields Command	CC Byte 1	CC Byte 2
Hex 04	Hex 42	Hex 00	Hex 13

Results. Information associated with this command returns to the user in the LU-LU nonexpedited flow. Note that the host system cannot receive this information until the operator presses an AID-generating key. What the user receives when they issue this command depends on the condition of the master MDT bit:

- If the master MDT bit is not set, the user receives:

  Cursor Address AID Code

  - Cursor Address: Position of the cursor when the AID-generating key was pressed.
  - AID Code: Code for the AID-generating key the operator used.

- The user receives the cursor address and AID code if any of the following keys are pressed:

  Clear
  Help
  Print
  Record Backspace in home position

- If the master MDT bit is on, the user receives:

  Cursor Address AID Code Field Data

  - Cursor Address: Position of the cursor when the AID-generating key was pressed.
  - AID Code: Code for the AID-generating key the operator used.
  - Field Data: Returned only when one of the following AID-generating keys is used:

    Roll up/Page down
    Roll down/Page up
    Enter/Rec Adv
    An unmasked function key

    When it is returned, the field data consists of the contents of all input fields as they appear on the display unless resequencing has been specified.

Any attributes in a field are treated as data and returned as such. Field attributes are not considered part of the field. All nulls are converted to blanks. All pending AID request bytes are cleared. If the specified field is signed numeric, the first character is not sent; if that same field is negative, the zone position of the next-to-the-last character is changed to hex D. Though data is not sent, the CC bytes are processed.

To determine the appropriate codes for the control character (CC) bytes, see Table 8-3 and Table 8-4 under the Write To Display topic (page 8-22).

Format of Returned Data. The format of the returned data is:

Bytes 1 and 2	Byte 3	Byte 4	Byte 5
Cursor address	AID code	Field data	Field data

Byte 6 and all that follow contain the remaining field data from the format table. The wireless station returns complete contents of each field, with nulls converted to blanks.

Read MDT Fields Command

Function. The Read MDT Fields command causes the wireless station to wait for the operator to press an active AID-generating key, then sends all fields that have their MDT bit set. The bit could have been set by the operator entering data in the field or by the Write to Display (WTD) command.

Restrictions. The operator must press an AID-generating key to execute this command. In addition, the CD in the RH for the requested LU must be on before any information can be sent back to the host system in response to the command. The command is cleared if:

- A session control request (such as Unbind) is issued by the host.
- A Clear Unit command is issued.
- The host system sends another Read command to the same LU and overlays this command.
- The Read command is serviced.

Format. The command take the following form:

ESC	Read MDT Command	CC Byte 1	CC Byte 2
Hex 04	Hex 52	00	13

Format of Returned Data. The format of the returned data is:

Byte 1 and 2	Byte 3	Byte 4	Byte 5	Byte 6
Cursor address	AID code	{SBA	Field address	Field data}

" **NOTE:** *The {} brackets around the last three fields indicate these fields may be repeated as a unit.*

The cursor address gives the cursor location on the display. The SBA fields are formatted as Set Buffer Address orders. The field address comes from the address portion of the order and gives the address of the modified field (excluding the attribute).

Results. The contents of each field that has an MDT bit on are returned to the host system in the order that the fields appear in the format table, if one of the following AID-generating keys is used:

Roll up/Page down
Roll down/Page up
Enter/Rec Adv
Unmasked function keys

If no MDT bits are on, or if the operator does not use one of the acceptable AID-generating keys (Clear, Help, Print, or Record Backspace), only the cursor and AID code are returned to the host system.

The host system can use field control words (FCWs) to rearrange the sequence in which the fields are returned. If data is returned, the following formatting is done. If the field is not a transparent data field, the following occurs:

- Trailing nulls are stripped. If the field consists of all nulls, only the Set Buffer Address, row, and column are returned.
- Leading and embedded nulls are converted to blanks.

If the field is signed numeric, the last character is not sent. If that same field is negative, the zone position of the next-to-the-last character is changed to hex D.

Hex 10 and hex 11 are control data. Therefore, avoid writing hex 10 and hex 11 to the display as data unless they are written in transparent data fields.

Read MDT Alternate Command

Read MDT Alternate is similar to the Read MDT Fields command with these exceptions:

- Leading and embedded nulls within the fields remain nulls. Trailing nulls are stripped.
- For fields that are nulls but have their MDT bit on, the controller returns an SBA order followed by the field's address.

Read Screen (Immediate) Command

Function. The Read Screen command sends the contents of the display to the host in the same order information appears on the screen. For example, row 1 goes first.

Restrictions. This command must be the last command in the SNA chain, and CD must be on. The wireless station rejects the command when it is in the prehelp error, post-help error, system request, or SS message state. During transmission the keyboard is locked, but pending AID requests or Read commands are retained.

" **NOTE:** *If the display supports a separate message line, and the message line is selected, the command is rejected only for the system request and SS message states. The command is processed with the display in error state.*

Format. The command takes the following form:

ESC	Read Screen Command
Hex 04	Hex 62

Results. The contents of the entire display, including the attributes, is sent to the host system just as it appears in the regeneration buffer (no formatting or conversion is done). Cursor address and AID are not returned. This command does not clear either pending Read commands or AID requests. The keyboard is temporarily locked. The following are unaltered:

- Annunciators
- Cursor location
- Modes
- Keying history
- Display contents
- Format table

Save Screen (Immediate) Command

Function. The Save Screen command sends the state of the wireless station to the host. Information sent to the host includes:

- Format table
- Display buffer
- Keyboard state
- Cursor location
- Code returned in response to the Help key
- Any outstanding AID requests
- Any outstanding Read commands

Restrictions. This command must be the last command in the SNA chain and CD must be on. The command is rejected if the addressed LU is in either the system request or SS message state.

Format. The command takes the following form:

ESC	Save Screen Command
Hex 04	Hex 02

Format of Returned Data. The format of the returned data is:

Byte 1	Byte 2	Byte 3	Byte 4
Escape	Restore Screen	<terminal state>	<terminal state>

Byte 5 and all remaining bytes contain the save screen information.

Results. All data required for restoring the display are sent to the host system. It must not be modified by the host system if the result of the Restore Screen command is to have integrity.

Output Commands

Some of the output commands have associated data and control information (write characters and orders). The Write commands are executed immediately.

Clear Format Table Command

Function. The Clear Format Table command clears the format table without erasing data in the display buffer.

Restrictions. The wireless station rejects the command when in an error, system request, or SS message state.

" **NOTE:** *If the display supports a separate message line, and the message line is selected, the command is rejected only for the system request and SS message states. The command is processed with the display in error state.*

Format. The command takes the following form:

ESC	Clear Format Table Command
Hex 04	Hex 50

Results. The following list describes what happens when this command is executed.

- The keyboard is locked.
  - The keyboard clicker is turned off.
  - The Input Inhibited annunciator is turned on.
  - The insert mode is cleared (as is the annunciator).
- The format table is cleared. The format table header formats like this:

Item	Value
Format ID	Hex 00
First field transmitted to host system	0 (Resequencing is disabled)
Error line	Bottom line of display

- The system insert cursor address is set to row 1, column 1. This clears a previous Insert Cursor order.
- Any pending AID request is cleared.
- All keying history is cleared.
- The master MDT bit is cleared.
- A blinking cursor caused by waiting for a required Field Exit key is reset.

" **NOTE:** *Operator-selected reverse image and the Message Waiting annunciator are not affected by this command.*

Clear Unit Command

Function. This command clears the display and format table.

Restrictions. The wireless station rejects the command when it is in the SS message state.

Format. The command takes the following form:

ESC	Clear Unit Command
Hex 04	Hex 40

Results. When the wireless station receives the Clear Unit command, the following occurs:

- The keyboard locks.
  - The Input Inhibited annunciator is turned on.
  - The error state (or system request state) is cleared.
  - The shift, alternate, function, and insert modes are cleared.
- The format table is cleared. Because this is not format level 0, a default header is assumed.
- The MDT bit is cleared.
- All function keys are set up to return data.
- The display is cleared by writing nulls to the display buffer.
- A normal attribute is written byte to row 1, column 1 of the display.
- The cursor is placed at row 1, column 2; this makes the insert cursor address.
- Any AID requests and pending Read Input Fields or Read MDT Fields commands are cleared.

" **NOTE:** *Operated-selected reverse image and the Message Waiting annunciator are not affected by this command.*

Restore Screen Command

Function. The Restore Screen command restores all data stored by the last Save Screen command.

Restrictions. The wireless station rejects this command when it is in a system request or SS message state.

Format. The command takes the following form:

ESC	Restore Screen Command	Data From Last Save Command
Hex 04	Hex 12	<saved data>

Results. The following describes what happens when this command is executed.

These are restored:

- Contents of the display.
- Contents of the format table.
- State of the keyboard, including the insert mode with the annunciators.
- Location of the cursor and the way it was displayed.
- System insert cursor address.
- State of the master MDT bit.
- Error code and any explanatory information provided by the host system in the Write Error Code command, if the wireless station was in an error state. The error code and any information are returned via the operator's use of the Help key.
- Requirements to send LU-LU Lustat when error line is available.
- Any Read command that was pending at the time.
- Any AID requests that were outstanding at the time of the Save Screen command.

These conditions from the previous save are not restored:

- Condition of the Shift key and the associated annunciator.
- Status of the Message Waiting annunciator.
- The current status of the hex mode is reset.

The following conditions cause parameter errors:

- Invalid data is detected.
- The required amount of data is not received.

" **NOTE:** *A Clear Unit command is executed if an error is detected.*

Roll Command

Function. The Roll command causes the image presented in the wireless station display to roll up or down across the larger image area available on the 5291 Display Station.

Restrictions. The command is rejected if the display is in the prehelp error, posthelp error, system request, or SS message state.

" NOTE: *If the display supports a separate message line, and the message line is selected, the command is rejected only for system request and SS message states. The command is processed with the display in error state.*

Format. The command consists of 5 bytes in the following form:

			Row Number	
ESC	**Command**	**Direction**	**Top**	**Bottom**
Hex 04	Hex 23	Hex 08	Hex 01	Hex 23

Bits in the direction byte define the direction and number of lines to roll. See the following chart for the bit meanings. Bit 7 is the most significant bit.

Bit	Description
7	0 = Roll up 1 = Roll down
6 through 0	Number of lines to roll

The top row number tells the first line for inclusion in the roll. Bottom row number tells the last row number to include. Top and bottom row numbers together define the number of lines presented on the display for the roll.

Results. The following conditions govern the Roll command:

- Lines vacated due to the Roll are not cleared to nulls.
- Format table is not changed (could cause bizarre results).

" NOTE: *If display does not conform to the format table, roll should not be done.*

- Rolled over data is lost.
- The lines rolled out of the area are lost (cannot be rolled back onto the screen).
- The state of the keyboard is not affected.
- Pending AID bytes are not affected.
- The following conditions cause parameter errors:
  - A top line of zero.
  - A top line greater than or equal to the display length.
  - A bottom line of zero.
  - A bottom line greater than the display length.
  - A top line greater than or equal to the bottom line.
  - A roll area greater than the bottom line minus the top line.

A scroll distance of zero has no effect on the display.

Write Error Code Command

Function. The Write Error Code command forces the wireless station into the prehelp state (the same state the wireless station enters when the operator makes a keying error).

Restrictions. A Write Error Code clears any outstanding AID requests. The wireless station rejects the Write Error Code command if it is in the prehelp, system request, or SS messages state.

Format. The command may take any of the following forms:

" **NOTE:** *Headings in brackets indicate you can omit the individual field. However, you may not omit both fields. You must provide either an Insert Cursor order or error message to avoid an error condition.*

ESC	Write Error Code Command	Insert Cursor Order
Hex 04	Hex 21	Position cursor

ESC	Write Error Code Command	Error Message
Hex 04	Hex 21	<message text>

ESC	Write Error Code Command	Insert Cursor Order	Error Message
Hex 04	Hex 21	Position cursor	<message text>

The Insert Cursor (IC) order may also be embedded in the error message.

Results. You can use the IC order to place the cursor at the beginning of the field where the error occurred. This helps the operator find the source of the error. The IC order does not affect where the error message is written.

The wireless station writes only the first 78 bytes of the error message to the error line. If the error line is already used for error presentation, the wireless station saves data on the error line and restores it after the operator presses the Reset key.

When the operator presses the Help key (prehelp error state only) in response to the error condition, characters from columns 2, 3, 4, and 5 of the error line are returned to the host system in a packed form and sent as a Signal command.

These characters form an index code that elicits a user-generated description of the error for the operator.

- Prehelp error state is selected for the keyboard.
- Input Inhibited annunciator is on.
- Insert mode and Insert annunciator are cleared.
- Command, dead key diacritic, and hex modes are cleared.
- Cursor is blinking.
- The line in the format table header defined as an error line is saved.
- Cursor moves to the location specified by the IC order. If no IC order is given, the cursor does not move.
- All characters (except IC order) found between the command byte and the end of the chain or next ESC are written on the error line. If the data exceeds 80 characters, an error occurs.
- All outstanding AID bytes are cleared.
- When the operator presses [HELP], the controller places a nonblink high intensity attribute in column 1 of the error line, replacing anything that was previously there.
- The locked state of the keyboard is cleared if the keyboard was locked and the wireless station was not in a posthelp error state. This allows the operator to release the keyboard by pressing the Reset key.

The following conditions cause parameter errors:

- Neither an IC order nor data follows the command.
- Invalid IC order.
- More data than 80 bytes is specified.

Write to Display (WTD) Command

Function. The WTD command does the following:

- Modifies the format table and display buffer contents.
- Governs modified data tag (MDT) flags and Message Waiting annunciator.
- Nulls nonbypass fields.
- Controls keyboard lock and cursor blink.

Restrictions. This command is rejected if the display is in a prehelp error, posthelp error, system request, or SS message state.

If the display supports a separate message line, and the message line is selected, then only system request or SS message state result in a contention state error. If the error line is in use, however, and the WTD attempts to redefine the error line (using Start of Header byte 4), a negative response is generated.

Format. The WTD command takes either of the following forms.

ESC	WTD Command	CC Byte 1	CC Byte 2	Orders or Data
Hex 04	Hex 11	Hex 00	Hex 13	<orders>
Hex 04	Hex 11	Hex 00	Hex 13	<data>

Notes. CC Byte 1 and CC Byte 2 are the write control characters. CC Byte 1 may do the following:

- Clear the master MDT flag and reset the MDT flags.
- Null all appropriate nonbypass fields.

CC Byte 2 sets the following:

- Cursor blink
- Keyboard lock

- Alarm
- Message Waiting annunciator

Orders are described in detail later in this section. Any character that is not an order and not associated with an order is considered data, and is written on the screen at the current display address. The address is then incremented by 1 for each character written. These characters should be hex 00, hex 1C, or above hex 1F, so there is no conflict with the codes reserved for orders.

Results. If the WTD command changes the format table, the keyboard remains locked until specifically unlocked by CC Byte 1 or a subsequent WTD command.

See Table 8-3 to determine the appropriate command for your particular combination of needs. To select a command, check the body of the table for the row showing the desired combination of conditions. Then refer to the left-most column to find the corresponding hex code.

Table 8-3
Write to Display Control Byte 1

Hex Code	Reset Pending AID, & Lock Keyboard	Clear Master MDT & Reset MDT Flags		Null All Appropriate Nonbypass Fields	
		Nonbypass Fields	All	Field with MDT On	All
00					
20	•				
40	•	•			
60	•		•		
80	•			•	
A0	•	•			•
C0	•	•		•	
E0	•		•		•

Table 8-4 describes bit positions for CC byte 2. The most significant bit is 7; the least significant bit is 0.

Table 8-4
Write to Display Control Byte 2

Bit Position	Description
7	Always 00
6	0 = Cursor moves to default or IC order position when keyboard unlocks.* 1 = Cursor does not move when keyboard unlocks.
5	0 = No action, 1 = Reset blinking cursor
4	0 = No action, 1 = Set blinking cursor (if reset bit also = 1)
3	0 = No action, 1 = Unlock keyboard, reset pending AID bytes
2	0 = No action, 1 = Sound alarm
1	0 = No action, 1 = Reset Message Waiting annunciator
0	0 = No action, 1 = Set Message Waiting annunciator (even if bit 5 is set to 1)

* Exception: When a WTD is received when the keyboard is unlocked and the WTD does not modify the keyboard state.

The following conditions cause parameter errors:

- Invalid orders.
- No data, orders, or CC follow the command byte.

Orders

The following pages describe the host 5250 data stream orders the host can send to wireless stations on the radio data network. Orders govern format and data expectations within the WTD command (page 8-22).

The host application can include wireless station orders in the WTD command, either alone or intermixed with display data. The wireless station executes orders sequentially. The wireless station does **not** store orders in the display buffer with other data in the data stream.

Five buffer control orders position, define, and format data written into the buffer, erase selected unprotected data in the buffer, and reposition the cursor. A sixth order, Transparent Data, provides a way to write transparent data to the display. Table 8-5 lists orders and their hex codes.

Table 8-5
Write to Display Command Orders

Command	Hex Code
Insert Cursor	13
Move Cursor	14
Repeat to Address	02
Set Buffer Address	11
Start of Field	1D
Start of Header	01
Transparent Data	10

Insert Cursor (IC) Order

Function. The IC order:

- Sets the system insert cursor (IC) address to the location specified by the 2 bytes that follow the order when it is included in the WTD command, or
- Moves the cursor to the specified address without affecting the system IC address when it is included in the Write Error Code command. Byte 1 gives the row address and byte 2 gives the cursor address.

" **NOTE:** *If multiple IC orders appear in the Write data stream, the last one encountered is used in subsequent operations.*

Restrictions. A parameter error is posted when:

- There are fewer than 2 bytes following the order.
- The row address equals 0 or is greater than 24.
- The column address equals 0 or is greater than 80.

Format. The order takes the following form:

Insert Cursor Order	Row Address	Column Address
Hex 13	Hex 01	Hex 01

Results. When the order is used in the WTD command, the cursor is not immediately moved; the address is saved for later use. The cursor is moved when the entire WTD is completed.

When the order is used in the Write Error Code command, the cursor is moved to the address given in the IC order and does not affect the system IC address. The cursor exits the field regardless of the type and does not perform any field checks. For example, it does not check for a filled field for a field specified as mandatory fill.

You can use the IC order in the Write Error Code command to tell the wireless station operator where an error has occurred. Maximum row and column addresses are determined by the character size selected through the wireless station's firmware.

Move Cursor (MC) Order

MC order enables the host to move the cursor to a specified position without modifying the home address, and without regard to the keyboard's state.

Format. The order takes the following form:

MC Order	Row Address	Column Address
Hex 14	1 byte	1 byte

If the WTD data stream contains multiple IC or MC orders, the last IC or MC order determines the cursor position. The IC order negates any previously coded MC orders and the MC order negates any previously coded IC orders, with the exception that the last IC order establishes home position. To set the home position and then move the cursor, code the IC order, and then the MC order.

WTD control character values do not affect the MC order, including the move cursor flag. See Table 8-4 on page 8-24 for more information.

Repeat to Address (RA) Order

Function. The RA order stores a specified alphanumeric or null character in all buffer locations starting at the current buffer address and ending on the specified stop address. This stop address and the character to repeat are identified by the 3 bytes immediately following the RA order in the Write data stream. You can use RA orders to fill an area of the display.

Restrictions. A parameter error is posted when:

- Fewer than 3 bytes follow the order.
- A row address equals 0 or is greater than 24.
- The specified ending address is less than the current display address.

" NOTE: *Although any character can be repeated, avoid using hex 11 (Set Buffer Address order), because this value is used as the delimiter between the fields sent in response to the Read MDT Fields command.*

Results. The character is repeated from the current display address through the ending display address specified. The current display address is then updated to the value of the last position +1.

Set Buffer Address (SBA) Order

Function. The SBA order specifies a new buffer address from which operations are to start or continue. You can use the SBA order to:

- Write data into various areas of the buffer.
- Precede another order in the data stream to specify the starting address for a Repeat to Address.
- Specify the address at which an attribute byte is stored by a Start of Field order.

Restrictions. A parameter error is posted when:

- Fewer than 2 bytes follow the order.
- The row address is equal to 0 or greater than 24.
- The column size equals 0 or is greater than 80.

Default. When the SBA is not specified in the Write To Display (WTD) command, the data starts at row 1, column 1. This is where the WTD command initialized it.

Format. The SBA order takes the following form:

SBA Order	Row Address	Column Address
Hex 11	Hex 01	Hex 01

Row addresses begin with 1, as do column addresses. However, the wireless station accepts column address hex 00 and translates it to column 1.

Start of Field (SF) Order

Function. The SF order defines input and output fields. If an input field is being defined, it also resets any pending AID byte and locks the keyboard.

" **NOTE:** *Although this order can be used for output fields, it is not recommended because it degrades performance. Use the SBA order instead.*

Format. SF order takes the following form with minimal information:

SF Order	Attribute	Length
Hex 1D	Hex 01	Hex 0012

You may also include format and control information in the SF order. In these cases it takes one of the following forms:

" **NOTE:** *Brackets around "format" and "control" headings indicate these fields are optional.*

SF Order	[Format]	Attribute	Length
Hex 1D	Hex 4000	Hex 01	Hex 0012

SF Order	[Format]	[Control]]	Attribute	Length
Hex 1D	Hex 4000	Hex 8102	Hex 01	Hex 0012

You can only include the control word after you have provided a format word. You can also insert several control words between the format and attribute portions of the SF order, but these control words are not required.

Table 8-6 describes the format portion, Table 8-8 the control portion, and Table 8-9 the attribute portion of the SF order. The 2-byte Field Format Word (FFW) contains the information described in Table 8-8.

The two most significant bits (15 and 14) must always be hex 01. See Table 8-6 for descriptions of bits 13 through 0.

Table 8-6
Field Format Word for Start of Field Order

Bit 15 is the most significant bit.

Bit Number	Description
14–15	Always 01 (reserved)
13	0 = Nonbypass field 1 = Bypass field
12	0 = Duplication not allowed 1 = Duplication allowed
11	0 = Field has not been modified (MDT) bit 1 = Field has been modified
10–8	000 = Alpha shift 001 = Alpha only 010 = Numeric shift 011 = Numeric only 100 = Katakana shift (not supported) 101 = Digits only 110 = I/O (feature input field) 111 = Signed numeric
7	0 = Auto enter disabled 1 = Auto enter when field is exited
6	0 = Field Exit key is not required 1 = Field Exit key is required.
5	0 = Accept lower case letters 1 = Translate lower case to upper case
4	Reserved
3	0 = No mandatory entry 1 = Mandatory entry
2–0	000 = No adjustment 001 = Reserved 010 = Reserved 011 = Reserved 100 = Reserved 101 = Right adjust, zero fill 110 = Right adjust, blank fill 111 = Mandatory fill

FCWs (2 bytes each) are optional. The user program can use the WTD command to send FCWs to the controller. When FCWs are used, they should follow the FFW of the SF order. An FCW encountered during modification of an existing format table entry is ignored. The LU does not accept an FCS of hex FFxx.

Table 8-7 lists valid FCWs and functions supported by the wireless stations.

Table 8-7
Field Control Words

Value (Hex)	Function
80nn	Entry field resequencing. The "nn" specifies the next entry field in the sequence (hex 00 to 80).
8101	Magnetic stripe reader (MSR) entry field.
8103	MSR and selector light pen (SLP) entry field.
84nn	Transparency entry field. The "nn" is any two digits.
B140	Self-check modulus 11 entry field.
B1A0	Self-check modulus 10 entry field.

The first FCW of any type is used; subsequent FCWs of the same type are ignored. The controller does not check to see if the FCWs are formatted correctly or if the requested function is installed. During subsequent command and keystroke processing, the controller detects and reports these errors to the host if the FCW is required.

FCWs types are as follows.

- *Resequencing.* Resequencing enables the controller to send the input fields to the host in any specified order. Resequencing is done by chaining input fields with FCWs that specify the desired order of transmission. The resequencing FCW takes the following format:

Bits	Description
0–1	B 10
2–7	B 000000
8–15	The normal sequence position of the next field to be returned to the host. (The first field on the screen is number 1. Field numbers progress sequentially, left to right and top to bottom.)

Bit 3 of the Start of header (SOH) order contains the number of the field to be sent. If the first field identifier in the SOH is zero, resequencing does not occur. That is, all resequencing FCWs are ignored. Fields are sent to the host in the order defined in the format table. If resequencing occurs, the last field to be sent to the host must contain this FCW:

Bits	Description
0–1	B 10
2–7	B 000000
8–15	B 11111111

Notes. The following apply:

- If FCWs create a closed loop, the controller detects the error and stops the transmission.
- An FCW for each field is not required. An FCW pointing to the next sequential field is assumed if no resequencing FCW is specified. The last field in the format table must have a resequencing FCW.

- *MSR.* MSR enables the scanner for an input field.
- *SLP.* SLP is accepted, but ignored.
- *Transparency.* Transparency defines a field that can contain data of any value.

- *Self-Check*. Self-check on the controller provides additional integrity for data entry. All field types can be specified for self-checking. The following requirements must be met when specifying a field for self-checking:
  - An FCW must be defined for the field. Hex B1A0 selects Modulus 10 checking, and hex B140 selects Modulus 11.
  - Field lengths for checking are restricted to 33 positions. For signed numeric fields, only 32 positions can contain digits and the sign is not checked. If more than 33 characters are given a LUSTAT parameter error results.

  Self-check resolves fields and conditions as follows:
  - The function converts nonnumeric characters (including nulls and blanks) by using the four low-order bits from their EBCDIC representation when the low-order bits are in the range 0–9. For example, A in EBCDIC is C1, thus A = 1. R in EBCDIC is D9, thus R = 9.

    A "0" replaces all other characters with the four low-order bits in the range of A through F. For example, % is EBCDIC 6C, thus % = 0.

    Null and blank characters also convert to 0. All high-order nulls, zeros, and blanks in a field are converted to 0 and do not affect the value of the check number.
  - An all-null field checks correctly. This field can result when the operator unsuccessfully tried to enter digits into a field and checking fails. The controller enables the operator to exit the field from the first position by using the Field Exit key.

Following are field descriptions.

Field Type	Description
Alpha only	Accepts only the characters A–Z (uppercase and lowercase) and the , . – and blank space.
Alpha shift	Accepts all data keys. The shift keys are acknowledged.
Auto enter	When the operator uses [FIELD EXIT] key to leave this field or puts the last character in the field, the wireless station treats the action as if the operator pressed [ENTER].
Bypass	Operator cannot put entries in this field. Attempts to enter data cause a keying error.
Digits only	Operator can only put the characters 0–9 in this field. The [DUP] key is allowed if enabled.
Duplication	Allows operator to use the [DUP] key. When the operator presses [DUP], the controller fills the field from the cursor to the end of the field with "1C." (Typically the host program uses this to place data from a previous record into the field when it receives the data.) An overstruck asterisk is displayed for the "1C" characters.
Field Exit key required	Operator can only exit the field by pressing a non-data key such as [FIELD EXIT] or other cursor-moving key.
I/O	Only the scanner can put data in this field.
Mandatory entry	The operator must put data in this field before pressing [ENTER] or another AID-generating key.
Mandatory fill	When the operator begins putting data into this field, they must completely fill it before exiting from it.
Modified	Marks this field as modified.
Numeric only	Accepts only the characters 0–9 and the symbols + , . – and blank. [FIELD+] exits the field with a positive number; [FIELD–] with a negative number. [FIELD EXIT] exits the field as entered with the sign specified by the host. The controller marks a minus field by changing the high nibble of the last byte to "B" unless a + , . – or blank is in that byte. These characters cause an error to occur.

Field Type	Description
Numeric shift	Accepts any data characters.
Right- adjust	When the operator exits the field, the controller shifts the contents to the right and fills on the left with zeros or blank spaces, as specified. Bits 13–15 can be 0. This allows the operator to make entries into any part of the field without any subsequent position adjustment. When the controller sends the field to the host, it also sends whatever is in the field (nulls if a Clear Unit command was received).
Self-check	Modulus 10 self-check fields perform a mod 10 check on the input. Modulus 11 self-check fields perform a mod 11 check on the input. The controller performs these checks when the operator exits the field. If the checks fail, an input error is indicated and the Input Inhibited annunciator is turned on. The operator must press the [RESET] key to clear the condition. The radio data network checks data by doing the appropriate modus on the low four bits of the characters in the field. If the low four bits are within the range "A" through "F," zero is used in the modulus calculation.
Signed numeric	Only the characters 0–9 are allowed. The last byte of the field is reserved for the sign character. The operator cannot place data in this location. If the operator presses [FIELD–] to exit the field, the last character is set to "–" and the field is right adjusted. The high nibble of the last digit input is set to "B." If the operator uses [FIELD+] or [FIELD EXIT] to exit the field, the last character is set to blank and the field is right-adjusted. The "–" or "blank" is sent in response to Read Input Fields or Read MDT Fields commands.

Table 8-8 describes the control portions of the SF order.

Table 8-8
Start of Field Control Word

Hex Code	Description
80XX	Resequencing, "xx " defines next field number
80FF	Resequencing, terminator
8101	Enable scanner (extended 5250); this is IBM's MSR option
8102	Reserved (extended 5250)
B1A0	Modulus 10 self-check
B140	Modulus 11 self-check

Table 8-9 describes the attribute portions of the SF order.

Table 8-9
Start of Field Attributes

Hex Code	Description
20	Normal (dark characters on light background)
21	Reverse image (light characters on dark background)
24	Underscore
28	Blink (RT1700 Series and RT5900 Series only)
2F	Nondisplay
30	Column separator

Results. The SF order does the following:

- The display address is set to the end-of-field address (as specified by the last SF order + 1). This does not happen if this is the first SF order or if an SBA order precedes it (the SBA points at the field starting attribute).

- The screen attribute in the SF order is written into the location defined by the display address.
- The start-of-field address is set to the display address +1.
- The end-of-field address is set to the display address + the field length specified by the SF order. The ending screen attribute is written to the end-of-field +1. This is a "20."
- The display address is incremented by 1.
- If this is an input field (one in which a field format word has been specified), a format table entry consisting of the field format and the FCWs is generated. In addition, if the SF order is rejected, the keyboard is locked and any outstanding AID byte is cleared.
- The format table is modified if the display address +1 is equal to the starting address of an input field that was previously defined. This happens as follows:
  - The field format word of the previously defined field is overlaid with the new one.
  - All FCWs and length parameters that were specified are ignored. Two bytes, however, are still required for the length even though no value check is performed on them.
  - The field ending address is set equal to the field's original ending address.
  - The screen ending address is not rewritten.
  - The defined field is not null filled. If any data characters follow the length field, they are written into the defined field.

Start of Header (SOH) Order

Function. The SOH order notifies the wireless station that the next byte in the Write data steam contains a header order. The order specifies header information for the format table. When the controller receives this order, it first clears the format table, then inserts the contents of the SOH order.

Restrictions. A parameter error is posted when the output data stream ends before the number of bytes needed have been sent or when the first byte of the order is not between 1 and 254.

Format. The SOH order takes the following form:

Function	Hex Code
Order	01
Length	07
Reserved	00
Reserved	00
Resequence	00
Error row	00
F keys	000000

Results. Because the length of this order varies, the first byte after the order code contains the number of bytes included. Length may range from 0 through 7 bytes.

A length of 7 bytes enables or disables selected function keys designated by the bits in bytes 5 through 7. When bits are enabled, function keys return AID codes with input data. When bits are inhibited, or length is less than 7, function keys return AID codes but without input data.

Table 8-10 shows the data-included switches for the function keys. In the table: 0 = enable, 1 = inhibit, and bit 0 is the most significant bit.

Table 8-10
Function Key Bit Switches

Byte 5		Byte 6		Byte 7	
Bit #	**Function Key**	**Bit #**	**Function Key**	**Bit #**	**Function Key**
0	F24	0	F16	0	F8
1	F23	1	F15	1	F7
2	F22	2	F14	2	F6
3	F21	3	F13	3	F5
4	F20	4	F12	4	F4
5	F19	5	F11	5	F3
6	F18	6	F10	6	F2
7	F17	7	F9	7	F1

You can use *resequencing* to point to a field, other than the first, as the field you want sent to the host in response to a Read Input Fields or Read MDT Fields command (Table 8-11). If not zero, the FCW of the field is checked as each field is sent to see whether resequencing is enabled. If so, the FCW points to the next field to send. If the FCW has resequencing disabled (or no FCW exists for the field), the next defined field is sent and checked for resequencing.

Table 8-11
Resequencing

Bits	Description
0000 0000	Disable resequencing
XXXX XXXX	Number of first field to be transmitted to the host, in response to a Read Input Fields or Read MDT Fields Command

The error row may vary from 0 to 24. Row “00” signifies the default row, which is the last line for most 5250 devices. You can use other values to override the default row.

Transparent Data (TD) Order

Function. The TD order lets you send data with any value to the wireless station display.

Format. The order takes the following form:

TD Order	Length (2 Bytes)	Data
Hex 10	Hex 0020	<data>

The 2-byte length field after the order tells how many bytes of data follow.

Asynchronous 5250 Prefixes

Each asynchronous 5250 data stream command is preceded by a variable-length prefix. The first byte of the prefix contains the number of bytes in the prefix, not including the length byte. The length may be zero, which indicates an empty prefix.

The second byte of the prefix (if the length is non-zero) must be either hex 40 or C0.

- Hex 40 indicates that the data in the rest of the message is LU-LU (normal 5250 commands).
- C0 indicates that the rest of the message is SS-LU data (an SS message). SS messages cause the wireless station to enter the SS message state, where the only allowable keystroke is Reset. The SS message is a one-line message that is displayed on the wireless station's status line until the Reset key is pressed.

After hex 40 or C0, the 5250 prefix may contain one 5250 signal. A signal is a sequence of 5 bytes that tells the wireless station to perform a special operation.

The wireless station supports the Signal command formats in the following chart.

Hex Code	Description
C9 00 00 00 01	Signal operator (turns on the Message Waiting annunciator and sounds the audible alarm)
C9 00 00 00 05	Resets the Message Waiting annunciator

A parameter error is posted when less data is in the message than indicated by the length byte. This causes a parameter error of "21." If the wireless station encounters data it does not understand, it ignores the rest of the prefix.

System Messages and Parameter Errors

The wireless station's display reserves a line for status information. The status line can display system (non-local) information such as a message waiting from the host computer, help messages in response to the Help key, or the system request state of the wireless station. You can program the location of the status line through the Start of Header order.

System codes can also appear on the status line. On RT1700 and RT5900 Radio Terminals, the system codes will blink. Table 8-12 lists the codes displayed when the stated condition occurs. Unless otherwise noted in the table, the wireless station's Reset key restores the status line and returns to the keying mode in effect when the problem occurred.

Table 8-12
System Codes and Descriptions

Code	Description
0005	Attempt to enter data when not in a field.
0006	A key other than a data key or [ENTER] was pressed in the system request state.
0007	A mandatory entry field has not had data put into it.
0008	The field is alpha only, and an invalid key was pressed.
0009	The field is numeric only, and an invalid key was pressed.
0010	The field is signed numeric, and an invalid key was pressed.
0011	Data cannot be entered into the last byte of a signed numeric field.
0012	No room in field for insert. The field is full or on the last byte.
0013	Cannot leave field while in insert mode.
0014	Field is mandatory fill and cannot be exited until filled.
0015	Mod 10 or Mod 11 check has failed on field.
0016	Field error: Cannot be used in field that is not signed numeric.
0017	Attempt to use [FIELD EXIT] key in unfilled, mandatory fill field.
0018	Only a nondata key can be used to exit this field; for example, [FIELD EXIT].
0019	[DUP] key not allowed in this field.
0020	Cannot use AID-generating key to exit signed numeric or right-adjusted field. Must use [FIELD EXIT].

Table 8-12 (Continued)
System Codes and Descriptions

Code	Description
0021	Cannot exit a mandatory enter field without entering data.
0023	Invalid hex value entered.
0026	The [FIELD–] key was pressed, but the last character of the field was not 0–9.
0099	An invalid key was pressed before the wireless station was in session. Only [SYS REQ] is allowed.
C00	An invalid 5250 command was received. This sequence of bytes is sent to the host: 01 10 03 01 01.
PXX	System code where "XX" is the parameter error (described below).

When a 5250 command contains invalid parameters, system code "PXX" appears on the bottom line of the display. On RT1700 and RT5900 Radio Terminals, the system code will blink. The "XX" in the system code indicates the type of parameter error.

The message sent to the host is: 01 10 05 01 XX, where "XX" is the same parameter error that was put in the wireless station's display.

The parameter errors are a subset of the 5250 data stream command set. Those errors supported by the wireless stations are listed in Table 8-13.

Table 8-13
Parameter Errors

Parameter Error	Description
P21	Premature end of data stream.
P22	A row or column specification is out of range.
P23	The ending address of the Repeat to Address order is less than the start address.
P25	A signed input field had a length of 1. It must be at least 2.
P26	An input field start address was less than a previously-defined input field start address.
P27	An invalid Restore Screen command was received.
P28	An attempt was made to define an input field past the end of the display.
P29	Format table overflow (too many input fields were defined).
P2A	An attempt was made to write data past the end of the display.
P2C	Invalid roll up or roll down parameters were received.
P30	An invalid attribute was received as part of a Start of Field order.
P87	A Mod 10 or Mod 11 input field was defined with a length greater than 33.

Section 9

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 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 9-1 describes the line and columns where characters must appear, and their meanings.

Table 9-1
Transmit and Receive Characters

Line 1, Columns 2-24

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

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

Table 9-1 (Continued)
Transmit and Receive Characters

Line 1, Columns 2-24

Column	Character *	Description
9		DTR flow control.
	0	Disable
	1	Enable
		To avoid improper operation of the RT3210 Radio Terminal and the remote display, DTR flow control should be set to Disable when a remote display is in use.
10		XON/XOFF flow control.
	0	Disable.
	1	Enable.
11–12		Flow control timeout value.
	XX	Number of seconds.
13		Return AID key.
	(Space)	AID key is Enter (default).
	X	AID key character. See Table 9-2 (page 9-7) 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 9-1 (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 9-2 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 9-2
Return AID Keys

AID Key	Character
Enter	(Space)
Help	)
Roll down/Page up	*
Roll up/Page down	+
Print	,

Table 9-2 (Continued)
Return AID Keys

AID Key	Character
Home	.
Clear	7
F1	A
F2	B
F3	C
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

Return Codes for Transmit and Receive

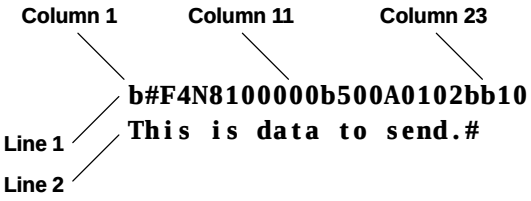
Line 24, Column 1 has the return status field. The code returned in this position tells the host the status of the extended command. The following chart lists the codes.

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 9-3 describes the line and columns where characters must appear, and their meanings.

" **NOTE:** *Line and column information refers to a 24-line by 80-column display station.*

Table 9-3
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 9-3 (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 9-2 (page 9-7) 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.

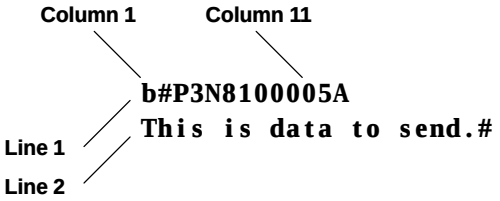
Use the Start Field order to return a code for this operation. The following chart lists return codes.

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 9-4 describes the line and columns where characters must appear, and their meanings.

Table 9-4
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 9-4 (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	(Space)	Reserved (ignored by wireless station).
9	(Space)	Reserved (ignored by wireless station).
10	(Space)	Reserved (ignored by wireless station).
11–12	(Spaces)	Reserved (ignored by wireless station).
13		Return AID key.
	(Space)	AID key is Enter (default).
	X	AID key character. See Table 9-2 (page 9-7) 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 9-4 (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

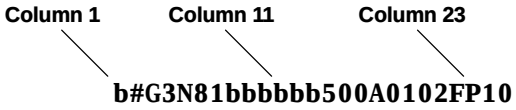
Line 24, Column 1 is the return status byte. The host application defines the 1-byte return status field location. The following chart lists return status codes.

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	(Space)	Reserved.
9	(Space)	Reserved.
10	(Space)	Reserved.
11–12	(Spaces)	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 5 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 9-5 lists columns in which characters must appear.

Table 9-5
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 9-5
Set Parameters Characters

Line 1, Columns 2–36

Column	Character *	Description
11		Screen mode.
	(Space)	No change from current setting.
	1	Center cursor.
	2	Corner mode.
	3	Page mode.
12		Remote display for RT3210.
	(Space)	No change from current setting.
	0	Not attached.
	1	Attached.
13		Stream scanning.
	(Space)	No change from current setting.
	0	Disable.
	1	Enable.
14		Scan all fields.
	(Space)	No change from current setting.
	0	Disable.
	1	Enable.
15		Operator error mode.
	(Space)	No change from current setting.
	0	Disable beep on keyboard error. Operator must press [RESET] after an error.
	1	Enable beep on keyboard error. Sounds the wireless station's error tone, then automatically resets the wireless station so that the operator can correct the error.

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

Table 9-5
Set Parameters Characters

Line 1, Columns 2–36

Column	Character *	Description
16–18		Beeper volume.
	(Spaces)	No change from current setting.
	000–255	Range of volume; default is 255. The larger the number, the louder the volume.
19–21		Beeper frequency setting.
	(Spaces)	No change from current setting.
	000–030	Frequency range; the larger the number, the higher the frequency.
22–24		Beeper length.
	(Spaces)	No change from current setting.
	000–255	Duration in seconds.
25–27		Screen size.
	(Spaces)	No change from current setting.
	000–255	Number of rows per display screen.
28–30		Screen size.
	(Spaces)	No change from current setting.
	000–255	Number of columns per display screen.
31–33		Alternate screen size.
	(Spaces)	No change from current setting.
	000–255	Number of rows per display screen.
34–36		Alternate screen size.
	(Spaces)	No change from current setting.
	000–255	Number of columns per display screen.

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

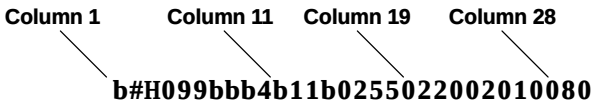
Return Codes for Set Parameters

The Set Parameters return code is the status sent to the host computer. The following chart lists return codes.

Code	Description	Column
0	Good status, transaction complete.	(None)
1	Reserved.	(None)
2	Backlight timer parameter invalid.	4–6
3	Sleep mode timer parameter invalid.	7–9
4	Cursor set parameter invalid.	10
5	Screen mode parameter invalid.	11
6	Reserved.	(None)
7	Remote display parameter invalid.	12
8	Beeper volume parameter invalid.	16–18
9	Beeper frequency parameter invalid.	19–21
A	Beeper length parameter invalid.	22–24
B	Stream scan parameter invalid.	13
C	Scan all fields parameter invalid.	14
D	Error mode parameter invalid.	15
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.
10	4	Cursor is in block blink mode.
11	(Space)	No change from current setting.
12	1	A remote display is in use.
13	1	Stream scanning is enabled.
14	(Space)	No change from current setting.
15	0	Beep is disabled on keyboard error.
16–18	255	Beeper volume is set at 255.
19–21	022	Beeper frequency setting is set at 22.
22–24	002	Beeper length is 2 seconds.
25–27	010	Number of rows in primary screen size is 10.
28–30	080	Number of columns in primary screen size is 10.

Return Version (#V)

The Return Version extended command returns the current firmware name and version to the host computer. Table 9-6 lists columns in which characters must appear.

Table 9-6
Return Version Characters

Line 1, Columns 2-3

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

The wireless station returns data and the extended command's status to the host computer in the following format:

tttK//rrccfl <program name><version>#s

"ttt" is the wireless station number.

"rr" is the row.

"cc" is the column.

"fl" is the AID key return value.

"s" is the status.

Tone (#T)

The Tone extended command causes the wireless station to make a tone of a specified volume, frequency, and length (Table 9-7).

Table 9-7
Tone Options

Line 1, Columns 2-12

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

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

\\X<CR>

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

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

Scan Bar Code Parameters (#S)

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

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

Table 9-8 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 9-8
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

Dots in Table 9-9 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 9-9
Control Byte 1 Characters

Line 1, Column 4

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

Control Character Byte 2

The dots in Table 9-10 indicate the CC Byte 2 options the characters support.

Table 9-10
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 9-11 indicate the CC Byte 3 options the characters support.

Table 9-11
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 9-12). 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 9-12
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 9-13. (The PEN*KEY 6400 Computer's internal engine does not support UPC-E Number System 1.)

Table 9-13
UPC Bar Code Characters

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

EAN Algorithms

Use EAN Algorithms to select combinations of EAN options (Table 9-14).

Table 9-14
EAN Algorithms

Line 1, Column 12

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

Code 39

Code 39 (Table 9-15) 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 9-43.

Table 9-15
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 9-16) according to your requirements. See the manufacturer's bar code specifications for more information on check digits.

The dots in Table 9-18 indicate the Plessey check digits the characters support. (The PEN*KEY 6400 Computer's internal engine does not support Plessey alpha characters.)

Table 9-16
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 9-17
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 9-18
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 9-19 lists Code 11 characters. (The PEN*KEY 6400 Computer's internal engine does not support Code 11.)

Table 9-19
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

Both Code 39 and Code 128 options can be enabled for scanning. (The PEN*KEY 6400 Computer's internal engine does not support Code 93.)

Table 9-20
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 9-21 lists Code 128 characters.

Table 9-21
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 Straight or Computer Identics bar code is enabled, select the maximum and minimum lengths and 1st and 2nd fixed bar code lengths (Table 9-22). (The PEN*KEY 6400 Computer's internal engine does not support Straight or Computer Identics 2of5.)

Table 9-22
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 9-23).

Table 9-23
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:

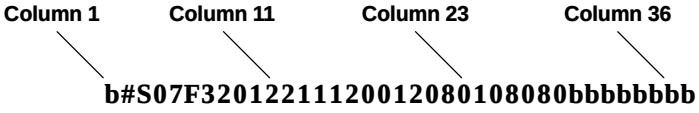
\\X<CR>

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 9-24 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.

Table 9-24
Key Press Sequences for Encoded Code 39

Sequence	Key
$A	New Line
$B	Del
$C	Forward Tab
$D	Forward Tab
$E	Reverse Tab
$F	Roll ↑ (Roll up/Page down)
$G	Roll ↓ (Roll down/Page up)
$H	Backspace
$I	Field+
$J	Field–
$K	Insert
$L	Home
$M	Enter/Rec Adv (t)
$N	Field Exit
$O	Erase Input
$P	Attn
$Q	F1 (t)
$R	F2 (t)
$S	F3 (t)
$T	F4 (t)
$U	F5 (t)
$V	F6 (t)
$W	F7 (t)
$X	F8 (t)
$Y	F9 (t)
$Z	F10 (t)

Table 9-24 (Continued)
Key Press Sequences for Encoded Code 39

Sequence	Key
%A	Clear
%B	F11 (t)
%C	F12 (t)
%D	Error Reset
%E	Help
%F	; (semicolon)
%G	< (less than)
%H	= (equal)
%I	> (greater than)
%J	? (question mark)
%K	¬ (not symbol)
%L	\ (backslash)
%M	¢ (cent)
%N	| (piping symbol)
%O	_ (underscore)
%P	{ (left brace)
%Q	¦ (vertical bar)
%R	} (right brace)
%S	~ (tilde)
%T	Del
%U	Dup
%V	@ (at)
%W	‘ (grave accent)
%X	Sys Req
%Y	Print
%Z	F13 (t)

Table 9-24 (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 9-24 (Continued)
Key Press Sequences for Encoded Code 39

Sequence	Key
/A	! (exclamation mark)
/B	” (double quote)
/C	$ (dollar)
/D	# (pound)
/E	% (percent)
/F	& (ampersand)
/G	’ (single quote)
/H	((left parenthesis)
/I	) (right parenthesis)
/J	* (asterisk)
/K	+ (plus)
/L	, (comma)
/M	– (minus)
/N	F14 (t)
/O	/ (forward slash)
/P	F15 (t)
/Q	F16 (t)
/R	F17 (t)
/S	F18 (t)
/T	F19 (t)
/U	F20 (t)
/V	F21 (t)
/W	F22 (t)
/X	F23 (t)
/Y	F24 (t)
/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 station transmission. The wireless station ignores data in the bar code buffer following these keys once a transmission takes place.

For example, the wireless station interprets this sequence:

123$V456

as

123F6

The wireless station will not send "456" to the host computer, because it follows terminating key F6.

ASCII sequences can be used any time before a terminating key. For example, the wireless station interprets

+H+E+L+L+O$M

as

hello<Enter>

Escape Characters

The four escape characters in Table 9-24 yield a 5250 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 "/C" 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, it is recommended that 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 5250 data stream is nearly identical with the 3270 data stream. The exceptions include some "escape sequences." For full details of these changes refer to bar code parameters for Encoded Code 39 in Section 9, "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 9, "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	nddddddcaaaaa	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	**I**	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	**E**
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		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

System/36 Line Generations

Overview

This appendix contains an example of interactive line generation for an IBM System/36 host computer.

Line Generations

The following pages are line configuration guides. The images are screen prints made after each appropriate field on a screen has been completed. The member name “Norand” is a variable you name. You can use any name that is suitable.

```
                                    MAIN

                          Main System/36 help menu

Select one of the following:
   1. Display a user menu
   2. Perform general system activities
   3. Use and control printers, diskettes, or tape
   4. Work with files, libraries, or folders
   5. Use programming languages and utilities
   6. Communicate with another system or user
   7. Define the system and its users
   8. Use problem determination and service
   9. Use office products
  10. Sign off the system


Cmd3-Previous menu      Cmd7-End    Cmd12-How to use help
Home-Sign on menu

Ready for option number or command
CNFIGSSP
```

```
1.0                    CNFIGSSP  -  MAIN MENU

Select one of the following:

   1. How to use CNFIGSSP
   2. Create, change, or delete a configuration member
   3. Review a configuration
   4. Print a configuration

  10. Configuration support aids

  12. Apply change to the master configuration record
  13. Rebuild the master configuration record (update to next
      release)
  14. End CNFIGSSP

Option:  2




Cmd3-Previous menu

      Help text is available throughout the CNFIGSSP
      procedure by pressing the help key
```

```
3.0              CONFIGURATION MEMBER DEFINITION                  W3

Select one of the following:
   1. Change an existing configuration member
   2. Create a new configuration member
   3. Delete a configuration member




Option . . . . . .2
Member name . . . . . NORAND
Library name . . . . . .#CNFGLIB




Cmd3-Previous menu
```

```
6.0              CONFIGURATION MEMBER DESCRIPTION NORAND          W3

   1. Describe the configuration member (up to 60 characters):
      Norand
   2. Specify main storage size in K-bytes  .  . 0128-7168  1024
   3. Specify disk storage size in M-bytes  .  . 0030-1432  0133

Cmd3-Previous menu
```

```
5.0                  CONFIGURATION MEMBER MENU          NORAND   W3


Select one of the following:

    1. Work with display stations and printers
    2. Add or delete program products, optional SSP, and features
    3. Define base SSP values
    4. Specify sizes for disk VTOC, history file, and task work
       area

If no more changes are to be made to your configuration member
select the following option:

    5. Save configuration member and return to main menu for
       CNFIGSSP

Option:  1



Cmd3-Previous menu          Cmd19-Cancel
```

```
10.0      CNFIGSSP - COMMUNICATIONS LINE DEFINITION    NORAND   W3
                     FOR REMOTE WORK STATIONS

The following lines have been defined:        1

   1. Which line is being defined? . . . . . 1-10       1
```

" **NOTE:** *The line being defined is the physical port on the host computer to which the controller is attached.*

```
Cmd3-Previous menu       Cmd9-Drop line       Cmd19-Cancel
```

```
10.0      CNFIGSSP - COMMUNICATIONS LINE DEFINITION    NORAND   W3
                       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  . . . . .


Cmd3-Previous menu      Cmd9-Drop line      Cmd19-Cancel
```

```
27.0  CONFIGURATION - DISPLAY STATION AND PRINTER MENU  NORAND W3


Select one of the following:

   1. Add or delete local display stations and printers
   2. Add or delete remote line characteristics
   3. Add or delete remote controllers, display stations, and
      printers
   4. Assign default printers to display stations
   5. Assign display station control (subconsoles) for printers
   6. Change display station or printer work station IDs
   7. Change display station or printer characteristics
   8. Select the system printer
   9. Add remote service device definition
  10. Delete remote service device definition
  11. Return to previous menu

Option:        3


Cmd3-Previous menu              Cmd19-Cancel
```

```
13.0      CNFIGSSP - REMOTE CONTROLLER DEFINITION      NORAND   W3

                          ADD            Controller:  C01

   1. Describe the remote controller . . .
                                 L15394

   2. Controller type . . . . . . . . . . . . .  2
      1. 5251 Model 12        2. 5294        3. 3274

   3. Controller station address . . . . . . 01-FD   01
```

" **NOTE:** *The controller station address must match the controller's SDLC address.*

```
   4. Communications line . . . . . . . . . 1-10   1

   5. For a switched line, optionally specify
      1 to 3 alternative lines . . . . . . . . . .


Cmd2-Scan              Cmd3-Previous menu
Cmd6-Restart
```

```
12.0  CNFIGSSP - WORK STATION DEFINITION     REMOTE   NORAND   W3

Specify the arrangement of your display stations and printers.
The positions correspond to the work station address.

   Displays:  01. 5251 Model 11  02. 5251 Model 12       10. 5291

      0  1  2  3  4  5  6     <--Work station address
      10 10 10 10 10             0 -- P   J ------ J
                                 1 -- O   J  C01   J
                                 2 -- R   J        J
                                 3 -- T   J 5294   J
                                          J ------ J

Cmd3-Previous menu   Cmd5-Display device codes  Cmd19-Cancel
```

```
5.0                 CONFIGURATION MEMBER MENU              NORAND   W3

Select one of the following:

   1. Work with display stations and printers
   2. Add or delete program products, optional SSP, and features
   3. Define base SSP values
   4. Specify sizes for disk VTOC, history file, and task work
      area

If no more changes are to be made to your configuration member
select the following option:

   5. Save configuration member and return to main menu for
      CNFIGSSP

Option:     5

Cmd3-Previous menu          Cmd19-Cancel
```

```
1.0                    CNFIGSSP - MAIN MENU                    W3

Select one of the following:

   1. How to use CNFIGSSP
   2. Create, change, or delete a configuration member
   3. Review a configuration
   4. Print a configuration

  10. Configuration support aids

  12. Apply change to the master configuration record
  13. Rebuild the master configuration record (update to
      next release)
  14. End CNFIGSSP

Option:        12




Cmd3-Previous menu
  Configuration member has been saved.
```

```
3.0              CONFIGURATION MEMBER DEFINITION              W3



Member name . . . . . .  NORAND
Library name  . . . . . .  #CNFGLIB



Cmd3-Previous menu
```

```
7.0          CNFIGSSP - CHANGE MASTER CONFIGURATION     NORAND   W3

Specify area to be updated . . . . . . . . . . . . . . 3
   1. Entire configuration
   2. Additional programming support
   3. Display stations and printers
   4. Base SSP values and system area sizes
```

" **NOTE:** *Exiting from this screen causes an initial program load (IPL).*

```
Cmd3-Previous menu
```

```
                        MAIN                         W3
                  Main System/36 help menu

Select one of the following:

   1. Display a user menu
   2. Perform general system activities
   3. Use and control printers, diskettes, or tape
   4. Work with files, libraries, or folders
   5. Use programming languages and utilities
   6. Communicate with another system or user
   7. Define the system and its users
   8. Use problem determination and service
   9. User office products
  10. Sign off the system


Cmd3-Previous menu     Cmd7-End    Cmd12-How to use help
Home-Sign on menu

Ready for option number or command
SETCOMM
                                     COPR IBM Corp. 1985
```

```
                    SETCOMM PROCEDURE                Optional-*

          Sets the communications configuration parameters

Line number . . . . . . . . . . . . . 1-10          1
Line type . .SHM,MULTCONT,MULTTRIB,NONSWTCH,SWITCHED NONSWTCH  *
Use system clocking facility . .     CLOCK,NOCLOCK   NOCLOCK   *
NRZI data encoding . . . . . . . . . NRZI,NONRZI     NONRZI    *
Use continuous carrier feature . .  CONCAR,NONNONCAR           *
Use non-U.S. answer tone . . . . . . TONE,NOTONE               *
Use autocall separator characters . . . SEP,NOSEP              *
Use autocall end-of-number characters . .EON,NOEON             *
Primary SDLC time-out value . . . . . . . 05-80                *
Number of primary SDLC error retries . . . . 1-5               *
Modem . . . . . . . . . IBMLPDA,IBMWRAP,NONIBM                 *
X.25 support . . . . . . . . . . . .X25,NOX25                  *
DDSA line speed . . .2400BPS,4800BPS,9600BPS,56KBPS            *
Secondary SDLC inactivity time-out value . . 0-20              *
IBM Token-Ring Network adapter address
  override . . . . 400000000000 - 7FFFFFFFFFFF,R               *

Cmd3-Previous menu                          COPR IBM Corp. 1987
```

" **NOTE:** *Use NONSWTCH when defining up to 8 LUs (radio terminals) for the controller emulating a 5294 Control Unit. Use MULTCONT or MULTTRIB when defining two or more SDLC addresses for the controller.*

" **NOTE:** *The NRZI data encoding setting must match the controller's NRZI setting.*

Appendix D

System/38 Line Generations

Overview

This appendix contains an example of interactive line generation for an IBM System/38 host computer. The images are screen prints made after each appropriate field on a screen has been completed.

The page and sequence number for line, control, and device descriptions are listed on the next page.

Subject	Page Number	Sequence Number
Line	2	2
Control	3	1
Device	8	2
	10	2

```
SEQNBR*...+...1...+...2...+...3...+...4...+...5...+...6...+
 /01/07/98 16:02:57   LINE DESCRIPTION
Status- ACTIVE
Line description name-          LIND       L63SPP
OU number of line port-         LINNBR     63
Line type-                      TYPE       *SDLCP
Connection type-                CNN        *PP
```

" **NOTE:** *Set the connection type to PP (point to point) when defining only one physical controller. Use MP (multipoint) for two or more SDLC addresses.*

```
Data rate-                      RATE       009600
Switched network backup-        SWNBKU     *NO
Activate swt network backup-    ACTSWNBKU
Speed select feature            SELECT     *YES


NRZI decoding-                  NONRTNZ    *NO
```

" **NOTE:** *The setting for NRZI decoding must match the NRZI setting for the controller.*

```
S/38 provided clock-            CLOCK      *NO
```

```
 01/07/98 15:40:40          CONTROL UNIT DESCRIPTION
Autocall feature-                        AUTOCALL     *NO
Autoanswer                               AUTOANS      *NO
S/38 answer tone feature-                ANSTONE      *NO
Wire link type-                          WIRE         4 2
Data comm equipment group-               DCEGRP       *A
Non-IBM modem-                           OEMMDM       *YES
Switched connection type-                SWTCNN
Speed rate type-                         RATETYPE     *FULL
Dial mode-                               DIALMODE     *MANUAL
Answer mode-                             ANSMODE      *MANUAL
Data terminal ready delay-               DTRDLY       0000
Idle detection time-                     IDLETIME     0000
BSC receive timeout timer-               RCVTMR
Nonproductive receive time-              NONPRDRCV    000
Number of error retries-                 RETRY        0001
Online at CPF start-                     ONLINE       *YES
Attached switched control unit-
Attached nonswitched ctrl units-         CTLU         C163SS6A
BSC switched control units-              SWTCTLU
S/38 station address-                    STNADR
S/38 exchange identifier                 EXCHID       02249EF3
Line code-                               CODE         *EBCDIC
```

```
 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
Text description                      TEXT
  Store System, Norand 5250
```

```
  01/07/98 15:40:40        CONTROL UNIT DESCRIPTION
Status- ACTIVE
Devices varied on- 001        Devices active- 001
Control unit description name-      CUD         C163SS6A
Control unit type-                  TYPE        5294
Model number-                       MODEL       001
Control unit address-               CTLADR      6A63
Switched line-                      SWITCHED    *NO
Nonswitched line name-              LINE        L63SPP
Speed select feature-               SELECT      *NO
Telephone number-                   TELNBR      *NONE

Switched initial connection-        INLCNN
Exchange identifier-                EXCHID      0450006A
```

" **NOTE:** *6A is the SDLC address. The exchange identifier applies only to switched-line environments.*

```
BSC local identifier-               LCLID

BSC remote identifier-              RMTID

SSCP identifier-                    SSCPID
SSCP identifier checking-           SSCPIDCHK
Online at CPF start-                ONLINE      *YES
Current switched line-
Switched network backup             SWNBKU      *NO
Activate swt network backup-        ACTSWNBKU
Allow delayed connection-           DLYFEAT     *NO
```

```
 01/07/98 15:40:40      CONTROL UNIT DESCRIPTION
Attached device names-              DEV
   R94HH4400
   R94HH4401
BSC device delay in sec-            DEVDLY
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
Link type-                          LINKTYPE    *SDLCSEC
Controller code-                    CODE
X.25 address                        X25ADR
X.25 packet size-                   DFTPKTSIZE
X.25 window size-                   DFTWDWSIZE
X.25 LCC protocol-                  NETPCL
X.25 response time-                 NETRSPTMR
X.25 reverse charging-              NETRVSCRG
   Incoming calls-
   Outgoing calls-
X.25 closed usergroup ID-           NETCUGID
X.25 connection password-           NETCNNPWD
X.25 user facilities                NETUSRFCL
```

```
01/07/98 15:40:40          CONTROL UNIT DESCRIPTION


Text description-                        TEXT
    NORAND
```

```
 01/07/98 15:40:40          DEVICE DESCRIPTION
Status- ACTIVE
Device description name-                  DEVD        R94HH4400
Device address-                           DEVADR      006A63
Device type code-                         DEVTYPE     5291
Model number-                             MODEL       001
Control unit description name-            CTLU        C163SS6A
Online at CPF start-                      ONLINE      *NO
Drop line at sign off-                    DROP        *YES
Associated work stn printer-              PRINTER     *NONE
Associated message queue-                 MSGQ
      Library name-
   Print image name-                      PRTIMG
      Library name-
   Printer device file name-              PRTFILE     QSYSPRT
      Library name-                                   *LIBL
```

```
 01/07/98 15:40:40         DEVICE DESCRIPTION
Work stn controller address-           WSCADR
Work stn controller keyboard-             WSCKBD
Allow blinking cursor-                    ALWBLN       *YES
BSC contention resolution                 CONTN
Local LU name-                            LCLLU
Remote LU name-                           RMTLU
Secure LU-                                SECURELU
Printer font-                             FONT
Feed mode-                                FORMFEED
3270 emulation device type-               EMLDEVTYP
3270 emulation keyboard type-             EMLKBDTYP
Maximum length RU-                        MAXLENRU
Auxiliary device-                         AUXDEV
   (No auxiliary devices)
Network device address-                   NETDEVADR
Character identifier-                     CHRID
   Graphic character set-                              *SYSVAL
   Code page-
Text description-                         TEXT
   Norand 5250
```

```
 01/07/98 15:40:40          DEVICE DESCRIPTION
Status- ACTIVE
Device description name-                  DEVD        R94HH4401
Device address-                           DEVADR      016A63
Device type code-                         DEVTYPE     5291
Model number-                             MODEL       001
Control unit description name-            CTLU        C163SS6A
Online at CPF start-                      ONLINE      *NO
Drop line at sign off-                    DROP        *YES
Associated work stn printer-              PRINTER     *NONE
Associated message queue-                 MSGQ
      Library name-
   Print image name-                      PRTIMG
      Library name-
   Printer device file name-              PRTFILE     QSYSPRT
      Library name-                                   *LIBL
```

```
 01/07/98 15:40:40         DEVICE DESCRIPTION
Work stn controller address-          WSCADR
Work stn controller keyboard-         WSCKBD
Allow blinking cursor-                ALWBLN      *YES
BSC contention resolution             CONTN
Local LU name-                        LCLLU
Remote LU name-                       RMTLU
Secure LU-                            SECURELU
Printer font-                         FONT
Feed mode-                            FORMFEED
3270 emulation device type-           EMLDEVTYP
3270 emulation keyboard type-         EMLKBDTYP
Maximum length RU-                    MAXLENRU
Auxiliary device-                     AUXDEV
   (No auxiliary devices)
Network device address-               NETDEVADR
Character identifier-                 CHRID
   Graphic character set-                         *SYSVAL
   Code page-
Text description-                     TEXT
   Norand 5250
```

```
 01/07/98 15:40:40       DEVICE DESCRIPTION

***** END OF SOURCE *****
```

Appendix E

AS/400 Line Generations

Overview

This appendix contains these examples:

- Multipoint line configuration example
- 5394 description example
- Device description example
- Sample configuration for an RC3250 Controller

Multipoint Line Configuration Example

The next page shows an example of a multipoint line configuration running an RS-232/V24 interface from the AS/400.

- The left column is the description of the parameter.
- The ">" symbol means this value was changed from the default value supplied by IBM.
- The far right column shows the possible values for the parameter. When the dots continue past the last entry, this means there are more values for this parameter than can fit on the display. To display the remaining values and a short description, place a "?" in the first position of the field and press enter.

The following chart contains helpful comments about some parameters.

Parameter	Comments
Resource name	You need to supply the resource name. The name varies with each system installed.
Data link role	The setting must be *PRI (primary).
Connection type	The type can be *NONSWTPP if you wish. This will limit you to only 16 LUs without changing the line description. There is no advantage to making the line a *NONSWTPP; the AS/400 will allocate the same amount of resources.
NRZI	The setting for NRZI must match the parameter set for the controller. Disabled = *NO and Enabled = *YES.
Maximum frame size	The maximum frame size should be 521. The line description works at the data link level, so this will include the 4 bytes of SDLC information.

A similar device description must be provided for each radio terminal. Comments on specific screen lines are in the following chart.

Line	Description
3	The name following "LIND" uniquely describes the line and enables links to it from "CRTCTLRWS" and "CRTDEVDSP." Note the same number appearing after "CTLD" in line 16, "LINE" in line 18, and "CTL" in lines 24 and 28.
3	The name following "RSRCNAME" names the physical line.
5	The number following "EXCHID" specifies the device type and serial number for the host computer.
8	"MAXFRAMES" can be "521" or "261," but must match the number set on the controller.
16	The number following "CTLD" links the controller to the line defined beginning with line 3.
18	The number following "LINE" links the controller to the line defined beginning with line 3.
19	The number following "STNADR" is a number assigned by the programmer.
23	The number following "DEVD" links the device to the controller defined beginning with line 3.
24	The number following "CTL" links the device to the controller defined beginning with line 3.
28	"LOCADR" is the unique local address for the device.

```
MAIN                    AS/400 Main Menu              System:  S1010535

Select one of the following:

   1. User tasks
   2. Office tasks
   3. General system tasks
   4. Files, libraries, and folders
   5. Programming
   6. Communications
   7. Define or change the system
   8. Problem handling
   9. Display a menu
  10. User support and education
  11. PC Support tasks

  90. Sign off

Selection or command
===> crtlinsdlc
F3=Exit   F4=Prompt   F9=Retrieve   F12=Cancel   F13=User support
F23=Set initial menu
(C) COPYRIGHT IBM CORP. 1980, 1990.
```

Create Line Desc (SDLC) (CRTLINSDLC)

" **NOTE:** *The line description describes the local system and its link characteristics.*

```
Type choices, press Enter

Line description ..................  >  RFLINE     Name
Resource Name .....................  >  LIN011     Name
             + for more values
Online at IPL .....................     *YES       *YES, *NO
Data link role ..... ..... ..... ..  >  *PRI       *NEG, *PRI, *SEC
Physical interface ................     *RS232V24  *RS232V24, *V35, *X21, ...
Connection type ...................  >  *MP        *NONSWTPP, SWTPP, *MP, SHM, ...
Switched network backup ..........     *NO        *YES, *NO
Exchange identifier ..............     *SYSGEN    05600000-056FFFFF, *SYSGEN
NRZI data encoding ...............     *YES       *YES, *NO
Number of attached controllers ..  >  4        .. 1-256
Line Speed ........................  >  19200      600, 1200, 2400, 4800, ...
Modem type supported ..............    *NORMAL    *NORMAL, *V35, *IBMWRAP ...
Maximum frame size ................    521        265, 521, 1033, 2057
Duplex ............................    *HALF      *HALF, *FULL
Nonproductive receive timer ......     320        160-4200 (0.1 seconds)
Idle timer ........................    30         5-300 (0.1 seconds)
                                                                    More ...

F3=Exit  F4=Prompt  F5=Refresh    F12=Cancel   F13=How to use this display
F24=More keys
```

5394 Description Example

The next page shows an example of a 5394 Control Unit description used on an AS/400.

- The left column is the description of the parameter.
- The ">" symbol means this value was changed from the default value supplied by IBM.
- The far right column shows the possible values for the parameter. When the dots continue past the last entry, this means there are more values for this parameter than can fit on the display. To display the remaining values and a short description, place a "?" in the first position of the field and press enter.

Note that the value for "Attached nonswitched line" is the name of the line description entered on page E-5. The controller type is a 5394, but can also be a 5294.

The frame size is the same as on the controller. Also, because the example is connecting to a nonswitched line, the exchange identifier is not required.

" **NOTE:** *A control unit description is required for each SDLC address.*

```
MAIN                  AS/400 Main Menu            System:  S1010535

Select one of the following:

   1. User tasks
   2. Office tasks
   3. General system tasks
   4. Files, libraries, and folders
   5. Programming
   6. Communications
   7. Define or change the system
   8. Problem handling
   9. Display a menu
  10. User support and education
  11. PC Support tasks

  90. Sign off

Selection or command
===> crtctlrws
F3=Exit   F4=Prompt   F9=Retrieve   F12=Cancel   F13=User support
F23=Set initial menu
(C) COPYRIGHT IBM CORP. 1980, 1990.
```

Create Ctl Desc (Remote WS) (CRTCTLRWS)

" **NOTE:** *The controller description describes the remote system and its link characteristics. One description is required for each SDLC address.*

```
Type choices, and press Enter.
Controller description ........ >  RFCTL01    Name
Controller type ............... >  5394       3174, 3274, 5251, 5294 ...
Controller model .............. >  1          0, 1, 0001, 2, 0002, 12, 0012 ...
Link type ..................... >  *SDLC      *IDLC, *LAN, *NONE, *SDLC ...
Online at IPL ..................... *YES      *YES, *NO
Switched connection ..............  *NO       *NO, *YES
Switched network backup ..........  *NO       *NO, *YES
Attached nonswitched line .... >  RFLINE     Name
Maximum frame size ............ >  517        265-1994, 261, 265, 517 ...
Exchange identifier ..............  00100000-FFFFFFFF
Station address ...................  01        01-FE
Text 'description' ..............  Norand controller address 01
                                                                      Bottom

F3=Exit    F4=Prompt    F5=Refresh    F10=Additional parameters    F12=Cancel
F13=How to use this display        F24=More keys
```

Device Description Example

The next page shows an example of a device description used on the AS/400.

- The left column is the description of the parameter.
- The ">" symbol means this value was changed from the default value supplied by IBM.
- The far right column shows the possible values for the parameter. When the dots continue past the last entry, this means there are more values for this parameter than can fit on the display. To display the remaining values and a short description, place a "?" in the first position of the field and press enter.

This device description would communicate with radio terminal #0 if it was attached to the first address in the RC3250 Controller or RC3240 Controller. This is determined by the "Local location address" field in this device description. The address is in hexadecimal form.

The following chart contains helpful comments about some other parameters.

Parameter	Comments
Attached controller	The "Attached controller" field is the name of the controller that we just created.
Device type	The device type is always the same for every device.
Device model	The device model is always the same for every device.

" **NOTE:** *One device description is required for each radio terminal.*

```
MAIN                    AS/400 Main Menu              System:  S1010535

Select one of the following:

   1. User tasks
   2. Office tasks
   3. General system tasks
   4. Files, libraries, and folders
   5. Programming
   6. Communications
   7. Define or change the system
   8. Problem handling
   9. Display a menu
  10. User support and education
  11. PC Support tasks

  90. Sign off

Selection or command
===> crtdevdsp
F3=Exit   F4=Prompt   F9=Retrieve   F12=Cancel   F13=User support
F23=Set initial menu
(C) COPYRIGHT IBM CORP. 1980, 1990.
```

Create Device Desc (Display) (CRTDEVDSP)

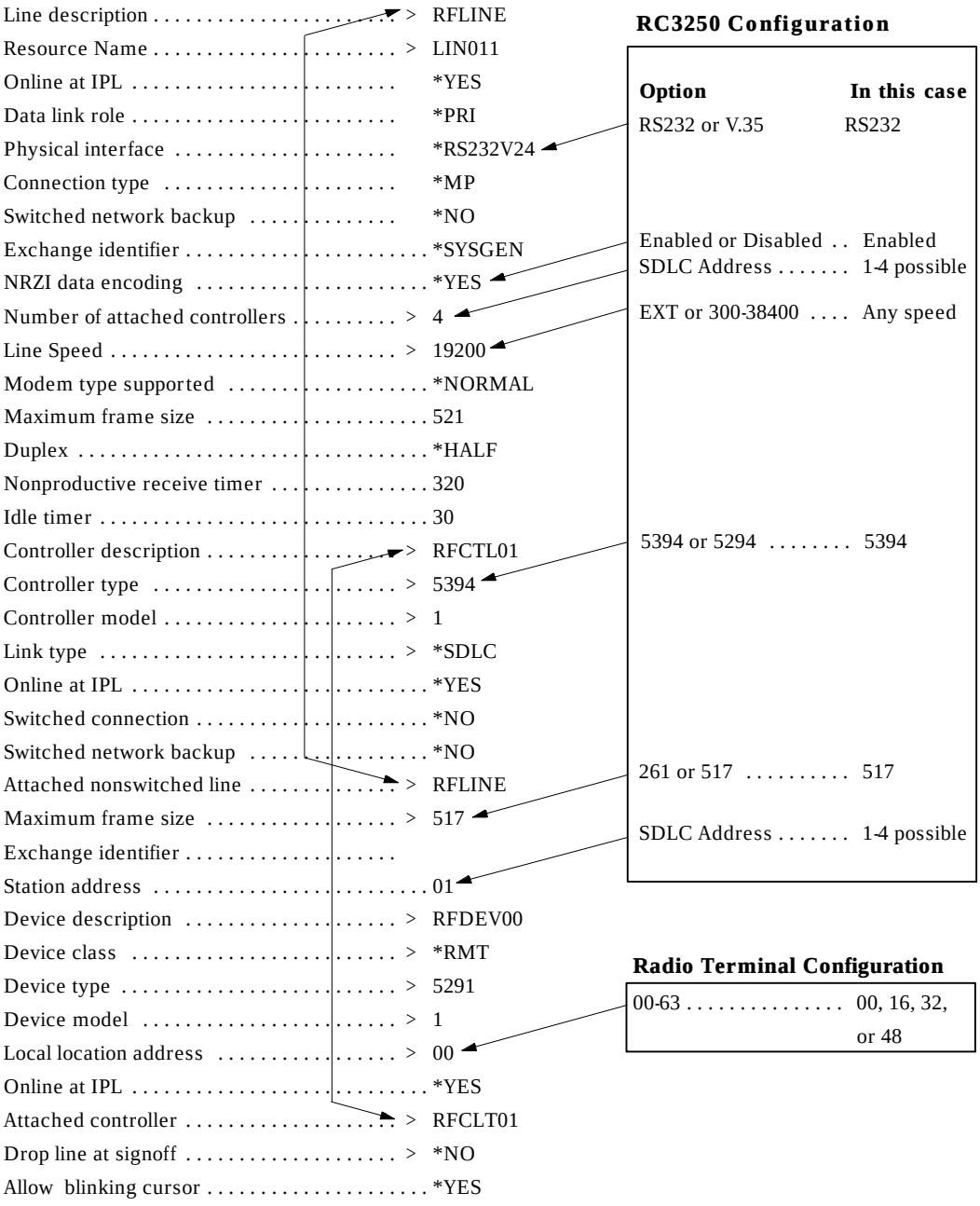
```
Type choices, press Enter.
Device description ..... >  RFDEV00  Name
Device class ..... >  *RMT     *LCL, *RMT, *VRT
Device type ..... >  5291     3101, 3151, 3161, 3162 ...
Device model ..... >  1        0, 1, 2, 4, 11, 12, 23 ...
Local location address ..... >  00       00-FE
Online at IPL .....    *YES     *YES, *NO
Attached controller ..... >  RFCLT01  Name
Drop line at signoff ..... >  *NO      *YES, *NO
Allow blinking cursor .....    *YES     *YES, *NO
Printer .....    Name
Text 'description' .....    *BLANK
                                                              More...

F3=Exit  F4=Prompt  F5=Refresh  F12=Cancel  F13=How to use this display
F24=More keys
```

```
MAIN                    AS/400 Main Menu              System:  S1010535

Select one of the following:

   1. User tasks
   2. Office tasks
   3. General system tasks
   4. Files, libraries, and folders
   5. Programming
   6. Communications
   7. Define or change the system
   8. Problem handling
   9. Display a menu
  10. User support and education
  11. PC Support tasks

  90. Sign off

Selection or command
===> wrkcfgsts *lin rfline
F3=Exit   F4=Prompt   F9=Retrieve   F12=Cancel   F13=User support
F23=Set initial menu
(C) COPYRIGHT IBM CORP. 1980, 1990.
```

```
                    Work with Configuration Status
                                                    System:   S1010535
Position to . . . .                  Starting characters

Type options, press Enter.
  1=Vary on  2=Vary off  5=Work with job  8=Work with description
  9=Display mode status . . .

Opt   Lin/Ctl/Dev/Mod   Status      -------------Job------------
1     L15394            VARIED OFF
         L15394         VARIED OFF
            L152910     VARIED OFF




Parameters or command                                        Bottom
===>
F3=Exit  F4=Prompt  F5=Refresh  F12=Cancel  F23=More options
F24=More keys
(C) COPYRIGHT IBM CORP. 1980, 1990.
```

Sample Configuration

Following is an example of the matching parameters for an AS/400 5250 configuration with an RC3250 Controller.


Line description . . . . . > RFLINE
Resource Name . . . . . > LIN011
Online at IPL . . . . . *YES
Data link role . . . . . *PRI
Physical interface *RS232V24
Connection type . . . . . *MP
Switched network backup . . . . . *NO
Exchange identifier . . . . . *SYSGEN
NRZI data encoding . . . . . *YES
Number of attached controllers . . . . . > 4
Line Speed . . . . . > 19200
Modem type supported . . . . . *NORMAL
Maximum frame size 521
Duplex . . . . . *HALF
Nonproductive receive timer 320
Idle timer 30
Controller description . . . . . > RFCTL01
Controller type . . . . . > 5394
Controller model . . . . . > 1
Link type . . . . . > *SDLC
Online at IPL . . . . . *YES
Switched connection . . . . . *NO
Switched network backup . . . . . *NO
Attached nonswitched line . . . . . > RFLINE
Maximum frame size . . . . . > 517
Exchange identifier . . . . . .
Station address 01
Device description . . . . . > RFDEV00
Device class . . . . . > *RMT
Device type . . . . . > 5291
Device model . . . . . > 1
Local location address . . . . . > 00
Online at IPL . . . . . *YES
Attached controller . . . . . > RFCLT01
Drop line at signoff . . . . . > *NO
Allow blinking cursor . . . . . *YES
RC3250 Configuration
Option
In this case
RS232 or V.35 RS232
Enabled or Disabled . . Enabled
SDLC Address . . . . . 1-4 possible
EXT or 300-38400 . . . . Any speed
5394 or 5294 5394
261 or 517 517
SDLC Address . . . . . 1-4 possible
Radio Terminal Configuration
00-63 . . . . . 00, 16, 32, or 48

INDEX

SYMBOLS

NUMBERS

A

B

C

D

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H

I

K

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M

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O

P

R

S

T

U

W

X