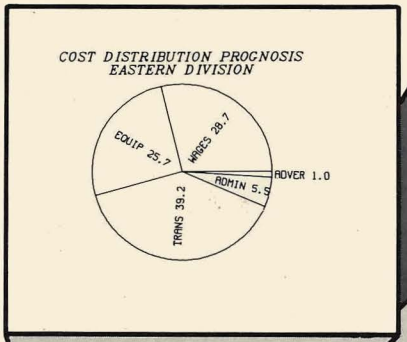
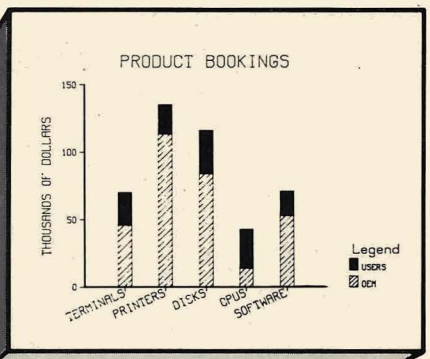
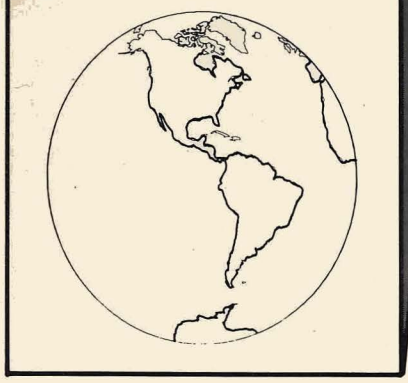
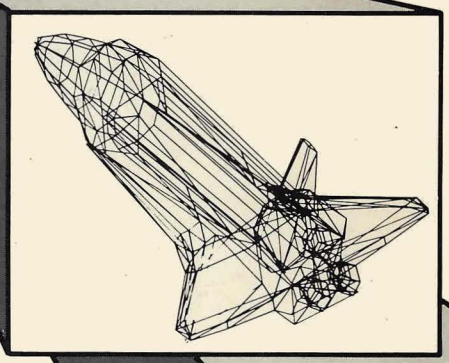
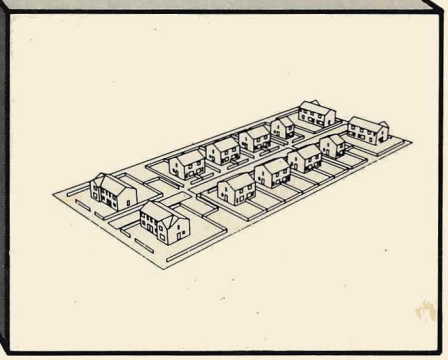
# SELANAR
GRAPHICS







# HIREZ 100XL MANUAL

# HIREZ 100XL
# Operator's Manual

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# CHAPTER 1

# Introduction

Figure 1-1 HiREZ 100XL terminal

The SELANAR HiREZ 100XL is a medium cost combination alpha-numeric and high resolution graphic terminal. For alpha-numeric mode SELANAR has emulated the DEC VT102. For graphics mode SELANAR has emulated the TEKTRONIX 4014. In addition to these 2 basic emulation modes, SELANAR has implemented native commands within 4014 mode, local vector storage, local pan-zoom, and a plotter/printer interface.

## 1.1 Alpha/graphics screens

Since the HiREZ 100XL is both an advanced alphanumeric and high resolution graphics terminal, 2 planes of display memory are used. The first is used for ANSI and VT52 modes. It displays character data only. The second is a dot addressable graphics memory plane. In this memory plane each dot can be individually turned off and on under program control. The video from the 2 planes is OR'ed together to produce a composite alpha/graphic picture. Thus ANSI or VT52 mode data can be overlaid over graphics data.

## 1.2 Manual conventions

### 1.2.1 Decimal numbers

All numbers in this book are assumed to be decimal unless the number is followed by an h. The h indicates that the number is hexadecimal.

### 1.2.2 ASCII characters

When specific characters from the ASCII code are used within a body of text they will be followed by the hexadecimal value.

### 1.2.3 ASCII control characters

ASCII control characters are always referred to by their ASCII mnemonic in upper case. For example, if you see the word ESC within the manual it refers to the ASCII character whose value is 1Bh, not the three ASCII characters E, S, and C. See the ASCII code chart for the entire list of ASCII codes and their mnemonics.

## 1.3 Examples

Whenever possible examples have been included to illustrate the current topic. All examples assume that you have selected the correct mode (i.e. 4014 examples don't work if you are in ANSI mode), LOCAL mode is selected, the parameters have been saved in non-volatile memory, and a power up reset has been executed. The experienced user will find that he can avoid this tedious process by executing the correct mode switching sequences while in LOCAL mode. However, if you have problems with the examples please go back to square one (power up reset) just to make sure you are not in a strange submode. This will be assumed for the rest of the manual and will not be mentioned again.

### 1.3.1 Example format

Each example is presented in 2 columns. The left hand column is a series of ASCII characters to be typed seperated by a space. The right hand column begins with a semicolon and gives a short comment on what was just typed.

## 1.4 Indexing

All topics, subtopics, and sequence names are indexed. If you wish to quickly find the discussion on a particular sequence look up it's name in the sequence summary for the mode of interest, find the name in the index, and go to the page specified by the index. The index is the last appendix in the manual.

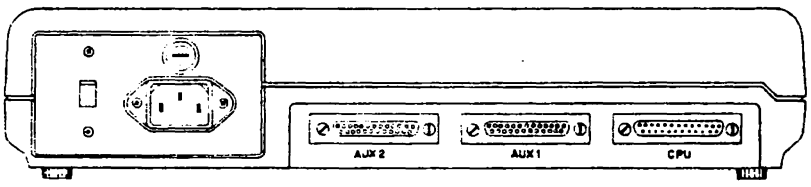
# CHAPTER 2

# Installation

It is highly recommended to read the sections on the keyboard and SETUP mode before going through the installation testing to familiarize yourself with basic keyboard operation and terminology.

## 2.1 Physical locations

Figure 2-1 HiREZ 100XL base, rear view



### 2.1.1 ON/OFF rocker switch

When facing front of the terminal the ON/OFF rocker switch is located in the far right corner of the base.

### 2.1.2 Power cord

When facing the rear of the terminal the power cord is located at the left hand corder of the base.

### 2.1.3 Fuse

When facing the rear of the terminal the fuse is located just to the right of the power cord. If this fuse blows, please replace it with a fuse of the same voltage and current rating.

### 2.1.4 AUX connector

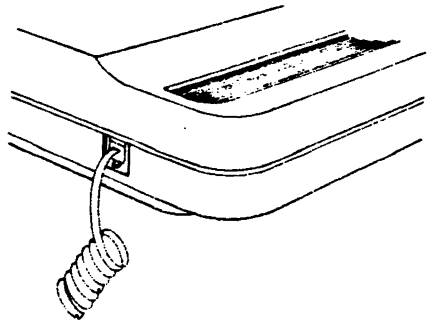
HiREZ 100XL has 2 auxillary ports, AUX 1 and AUX 2. When facing the rear of the terminal the AUX 1 RS-232 connector is located next to the CPU connector at the center of the base. The AUX 2 RS-232 connector is located to the left of the AUX 1 connector.

### 2.1.5 CPU connector

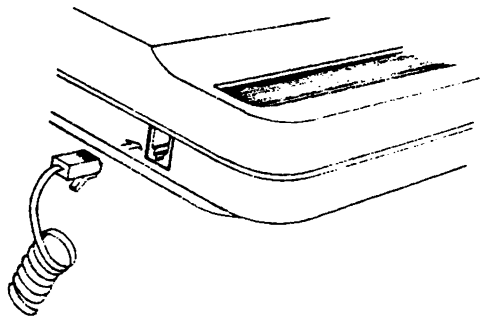
When facing the rear of the terminal the CPU connector is located in the lower right hand corner of the base. It is labeled "CPU".

### 2.1.6 Keyboard connector

**Figure 2-2 Keyboard connection**



When facing the front of the terminal the keyboard connector is located on the left side of the base.



## 2.2 Setting up the terminal

Make sure the ON/OFF rocker switch is in the OFF position. Plug the coiled cable that comes from the keyboard into the keyboard connector. Plug in the 120 VAC power cable. Turn the ON/OFF rocker switch to the ON position. After about 10 seconds the screen will flash, the keyboard will beep, and the alpha mode cursor will appear at the upper left hand corner of the screen.

## 2.3 Local testing

### 2.3.1 Entering local mode

Enter SETUP mode by depressing the SETUP key. Depress the F4 key until the word LOCAL appears on the left hand side of the screeen. Exit SETUP mode by depressing the SETUP key.

### 2.3.2 Alpha mode

Enter SETUP mode. Enter SHIFT M until either the word ANSI or the word VT52 appears in the lower center of the screen. Exit SETUP mode.

Type some characters and make sure they appear on the screen. Move the cursor around with the arrow keys. Use the SHIFT and CAPS LOCK keys to change the case of characters. Press HOME and watch the cursor home to the upper left hand corner of the screen. Press SHIFT HOME and the alpha mode screen should clear.

### 2.3.3 Graphics mode

Enter SETUP mode. Enter SHIFT M until the word 4014 appears in the lower center of the screen. Exit SETUP mode.

Notice that the alpha mode cursor is turned off and the graphics mode cursor is now visible. Type some characters. Notice how the characters differ between alpha mode and graphics mode. Type a GS (1Dh) and watch the cursor disappear. Type SP (20h) ` (60h) SP (20h) @ (40h) 8 (38h) k (6Bh) ? (3Fh) _ (5Fh) and a line running from the lower left hand corner of the screen to the upper right hand corner of the screen should appear. Type a US (1Fh) and the graphics cursor should reappear just below and to the right of the upper endpoint of the previous line. Type the backspace key BS (08h) to view the graphics cursor.

## 2.4 On-line testing

Be sure to set the correct serial line parameters for the CPU port before attempting to use the HiREZ 100XL ONLINE with any system. The parameters of interest are data bits, stop bits, baud rate, and parity. If you don't know what these parameters are for your system, please ask your system programmer.

Since on-line testing requires co-operation on the part of both your system software and the SELANAR HiREZ 100XL you may need to change the factory default SETUP parameters in order for on-line testing to work. For example, when using 4014 GIN mode the response from the HiREZ 100XL can be terminated by nothing, a CR, or a CR EOT pair. Your software will be expecting one of the above and if it recieves the wrong one it will probably beep at you (best case), die (worst case), or anything in between.

### 2.4.1 Connection

Connect a serial line from your system to the CPU connector on the HiREZ 100XL.

### 2.4.2 Alpha mode

Enter SETUP and select ANSI or VT52 mode (whichever your system software requires). Exit SETUP mode. Log into your system and use whatever system utilities you have that are compatible with a DEC VT102. Response should be identical to that of a DEC VT102.

### 2.4.3 Graphics mode

Enter SETUP and select 4014 mode. Exit SETUP. Use whatever programs you have that are designed to work with a TEKTRONIX 4014. Response should be identical to that of a TEKTRONIX 4014. If it is not, please see the section in the chapter on 4014 mode for the minor differences between the HiREZ 100XL and a 4014.

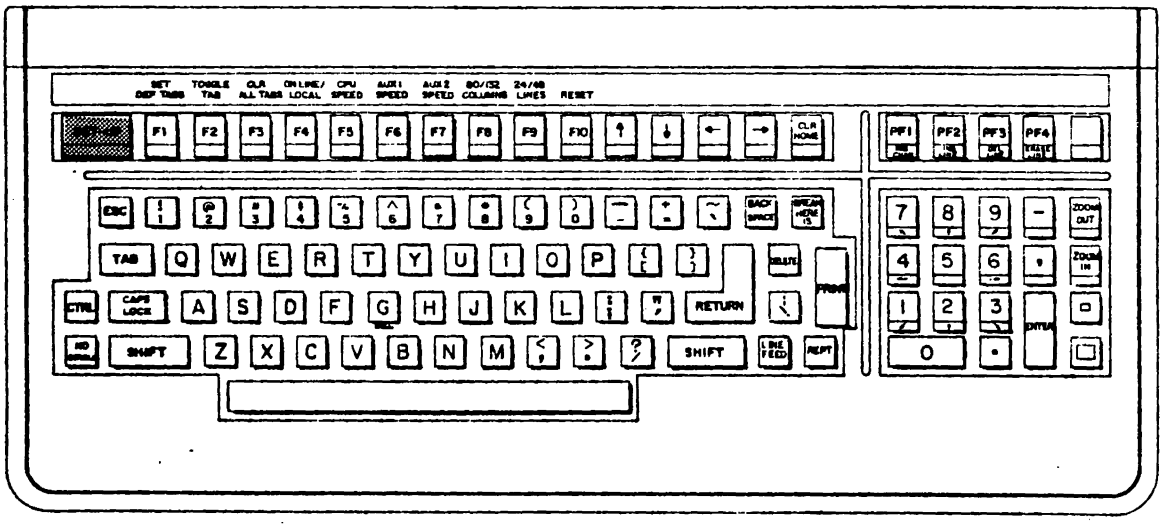
# CHAPTER 3

## Keyboard

The keyboard is the HiREZ 100XL's interface to the user. It is laid out in 2 major sections. The main keyboard contains the standard alphanumeric keys plus several special function keys. The numeric keypad (located on the right of the keyboard) contains digits, common punctuation, PF keys, and the zoom function keys.

## 3.1 SETUP key

Figure 3-1 SETUP key



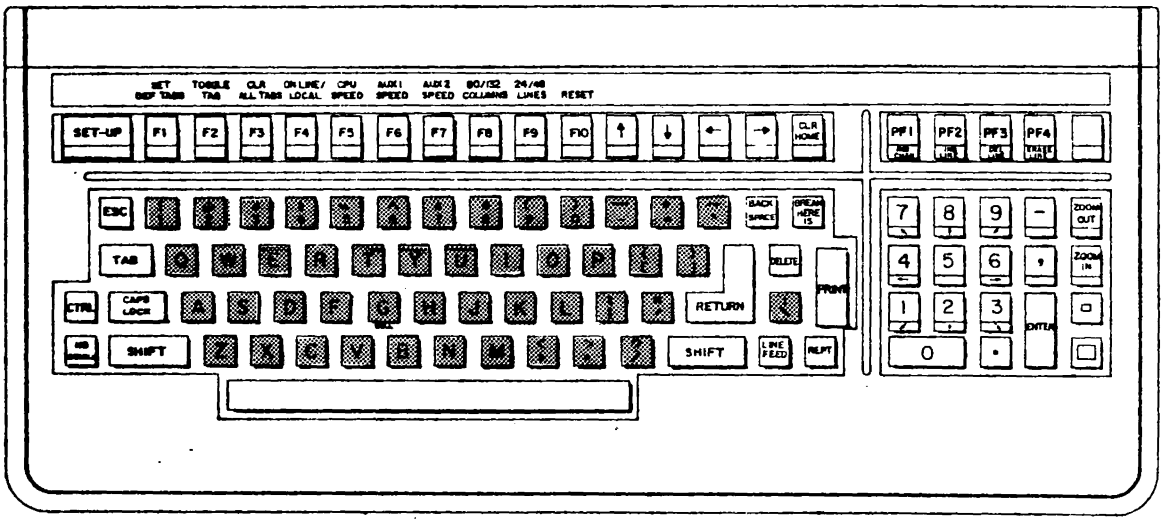
The SETUP key allows the user to enter HiREZ 100XL SETUP mode. From SETUP mode, the user can change the terminal parameters. See the chapter on SETUP for more information on individual parameters.

Depressing the SETUP key again will exit the user from SETUP mode.

A side effect of the SETUP key is to abort any printer/plotter operation.

## 3.2 Standard QWERTY keys

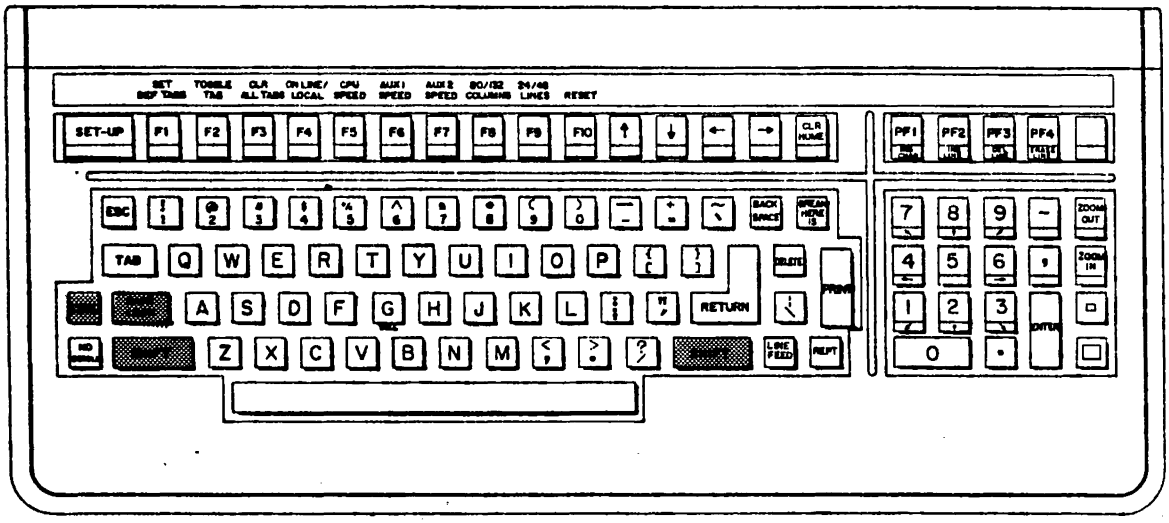
Figure 3-2 Standard QWERTY keys




The SELANAR HiREZ 100XL's main keyboard is laid out in the standard QWERTY configuration. When the terminal is ONLINE, these keys (possibly modified in some way) allow the user to generate the entire ASCII character set.

## 3.3 Modifier keys

Figure 3-3 Modifier keys




### 3.3.1 CTRL

The CTRL key shifts the QWERTY keys in the range from @ (40h) to _ (5Fh) to the range from NUL (00h) to US (1Fh). For special action keys, the CTRL key will produce up to three alternate states in conjuction with the SHIFT key.

### 3.3.2 SHIFT

The SHIFT key shifts the QWERTY keys in the range from a (61h) to z (7Ah) to the range from A (41h) to Z (5Ah). On any key that has 2 symbols printed on it, SHIFT selects the upper of the 2 symbols. For secial action keys, the SHIFT key will produce up to three alternate states in conjuction with the CTRL key.

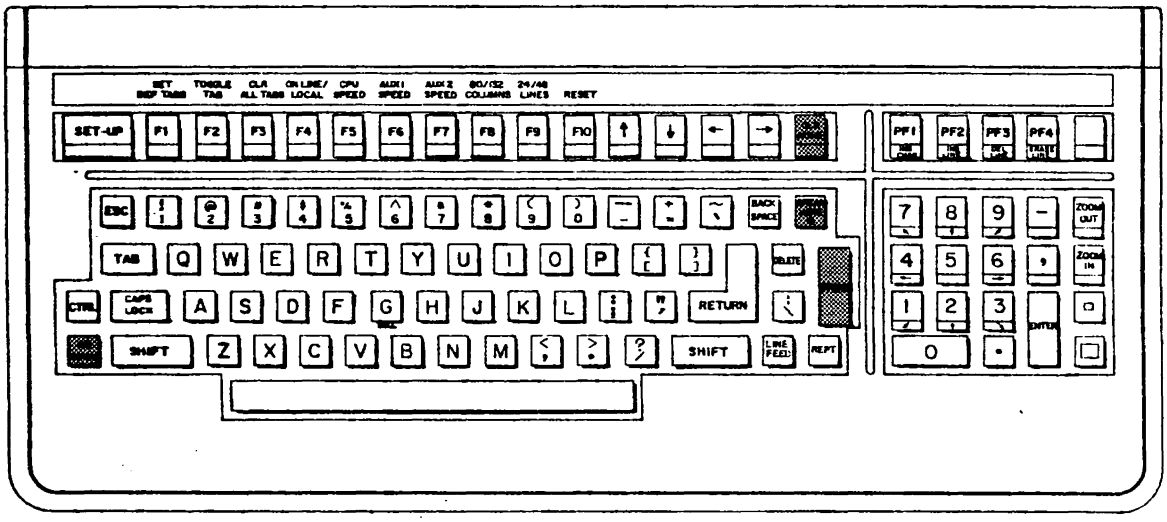
There are 2 SHIFT keys located at the right and left bottom of the main keyboard. A large uparrow is printed on each one.

### 3.3.3 CAPS LOCK

The CAPS LOCK key toggles caps lock mode. When in caps lock mode, the QWERTY keys in the range from a (61h) to z (7Ah) are always mapped to the range from from A (41h) to Z (5Ah).

## 3.4 Special action keys

**Figure 3-4 Special action keys**



### 3.4.1 BREAK

The BREAK key will transmit a serial communication line break if BREAK ENABLED is selected from SETUP.

### 3.4.2 DISCONNECT

DISCONNECT (SHIFT BREAK) will transmit a serial communication modem disconnect if BREAK ENABLED is selected from SETUP.

### 3.4.3 ANSWERBACK

ANSWERBACK (CTRL BREAK) will transmit the answerback message to the host.

### 3.4.4 NO SCROLL

NO SCROLL allows the user to freeze the current screen image. While the image is frozen, no processing occurs within the HiREZ 100XL except for asynchronous communications. Depressing NO SCROLL a second time will unfreeze the screen image.

### 3.4.5 HOME

The HOME key will force the alpha mode cursor to the upper left hand corner of the screen.

### 3.4.6 CLEAR

CLEAR (SHIFT HOME) will clear the alpha mode screen and home the cursor.

### 3.4.7 CLEAR GRAPHICS

CLEAR GRAPHICS (CTRL HOME) will clear the graphics screen. Please note that this also erases any text that was displayed in graphics mode.

### 3.4.8 PRINT

The PRINT key dumps the full alpha screen or just the scrolling region (depends on current SETUP) through the AUX 1 port.

### 3.4.9 PRINT GRAPHICS

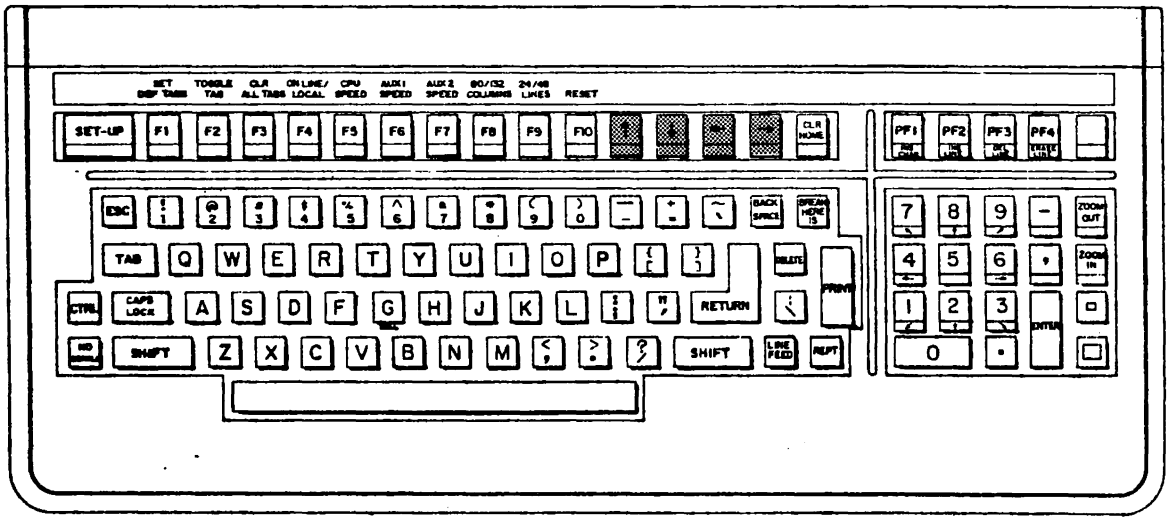
PRINT GRAPHICS (SHIFT PRINT) dumps the graphics screen through the selected AUX port using the correct format for the currently selected printer/plotter. The AUX output port for printing graphics can be selected. AUX 1 port is default.

### 3.4.10 AUTO PRINT

AUTO PRINT (CNTRL PRINT) toggles auto print mode.

## 3.5 Arrow keys

Figure 3-5 Arrow keys




The arrow keys are located at the top right of the main keyboard between the FUNCTION KEYS and CLEAR HOME keys.

### 3.5.1 Normal mode

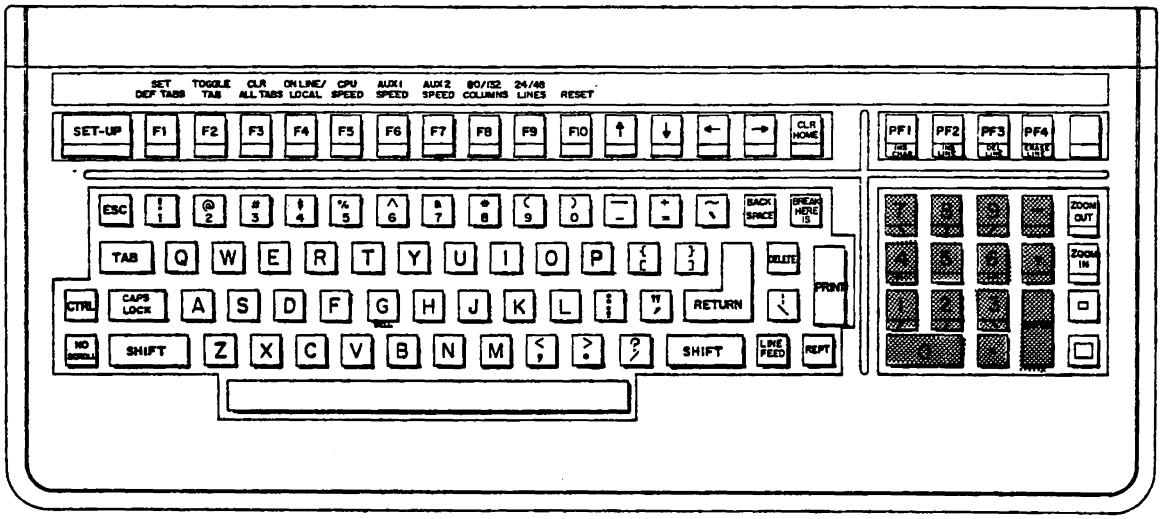
When in ANSI or VT52 mode and application mode is not selected, the arrow keys generate the move up, down, left, and right sequences.

### 3.5.2 Application mode

When the arrow keys are in application mode they generate special application mode sequences. See the chapter on ANSI mode for a list of the sequences generated.

## 3.6 Numeric keypad

Figure 3-6 Numeric keypad




The numeric keypad is the rectangular cluster of keys on the extreme right of the keyboard.

### 3.6.1 Normal mode

When the numeric keypad is in normal mode, the keys on the numeric keypad transmit the same characters as their QWERTY equivalents.

### 3.6.2 Application mode

When in ANSI or VT52 mode and application keypad mode is selected, the keys on the numeric keypad generate special escape sequences which the host system software interprets. See the ANSI or VT52 mode chapter for summaries of the generated sequences.

### 3.6.3 4014 mode

When in 4014 mode, the numeric keys 1, 2, 3, 4, 6, 7, 8, and 9 will move the cross hair or pan-zoom window in any one of 8 directions.

### 3.6.4 User defined keys

Ten function keys, F1 through F10 (normal or modified by CTRL or SHIFT), provides the user with 30 programmable keys. These keys transmit the user defined sequence of characters to the host. See the define user key section within the ANSI mode chapter for information on how to program these keys. The default value for each key is a null string. User defined keys can be stored in the non-voltile memory. The functions can be saved in the non-voltile memory after programming them by entering SETUP and typing SHIFT S.

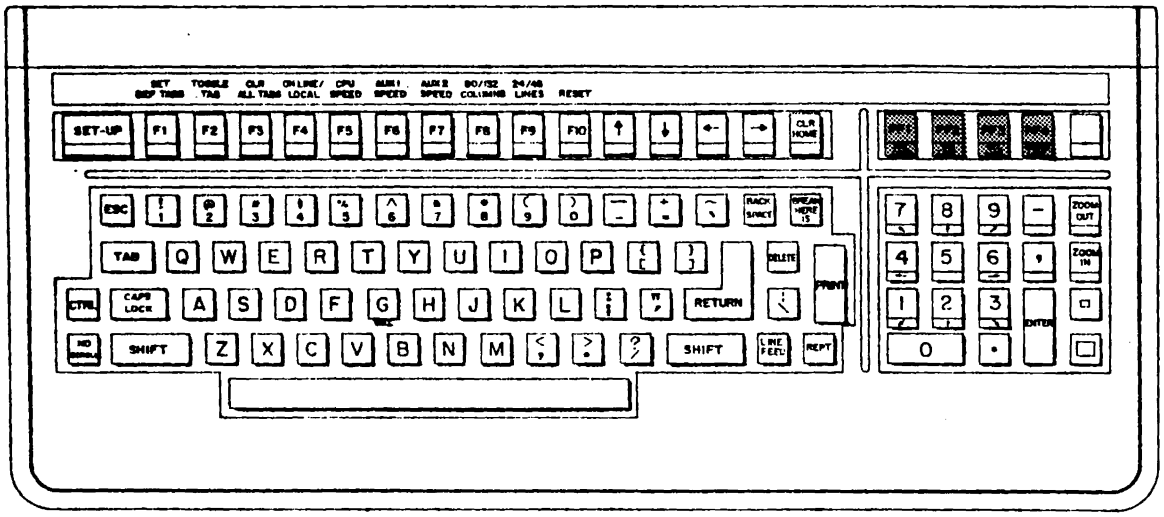
The relationship of key to function number is summarized in the following table:

**Figure 3-7 User defined function keys**

| Function number | Key |
|---|---|
| 0 | F1 |
| 1 | F2 |
| 2 | F3 |
| 3 | F4 |
| 4 | F5 |
| 5 | F6 |
| 6 | F7 |
| 7 | F8 |
| 8 | F9 |
| 9 | F10 |
| 10 | SHIFT F1 |
| 11 | SHIFT F2 |
| 12 | SHIFT F3 |
| 13 | SHIFT F4 |
| 14 | SHIFT F5 |
| 15 | SHIFT F6 |
| 16 | SHIFT F7 |
| 17 | SHIFT F8 |
| 18 | SHIFT F9 |
| 19 | SHIFT F10 |
| 20 | CTRL F1 |
| 21 | CTRL F2 |
| 22 | CTRL F3 |
| 23 | CTRL F4 |
| 24 | CTRL F5 |
| 25 | CTRL F6 |
| 26 | CTRL F7 |
| 27 | CTRL F8 |
| 28 | CTRL F9 |
| 29 | CTRL F10 |

## 3.7 PF keys

Figure 3-8 PF keys



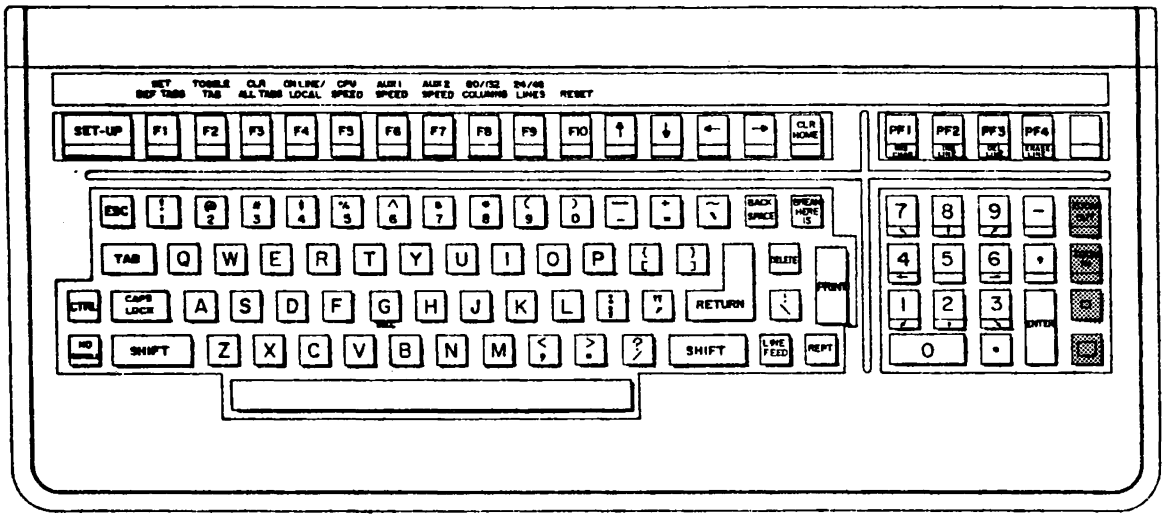

PF1 through PF4 have many functions depending on the current mode. They generate the same sequences as are found in a VT102 normally. In edit mode, these keys have special functions which are explained in the edit mode section. The sequences generated by the PF keys in ANSI and VT52 mode are summarized in the following table.

Figure 3-9 PF key sequences

| Key | ANSI sequence | VT52 sequence |
|---|---|---|
| PF1 | ESC O P | ESC P |
| PF2 | ESC O Q | ESC Q |
| PF3 | ESC O R | ESC R |
| PF4 | ESC O S | ESC S |

## 3.8 Zoom Control Keys

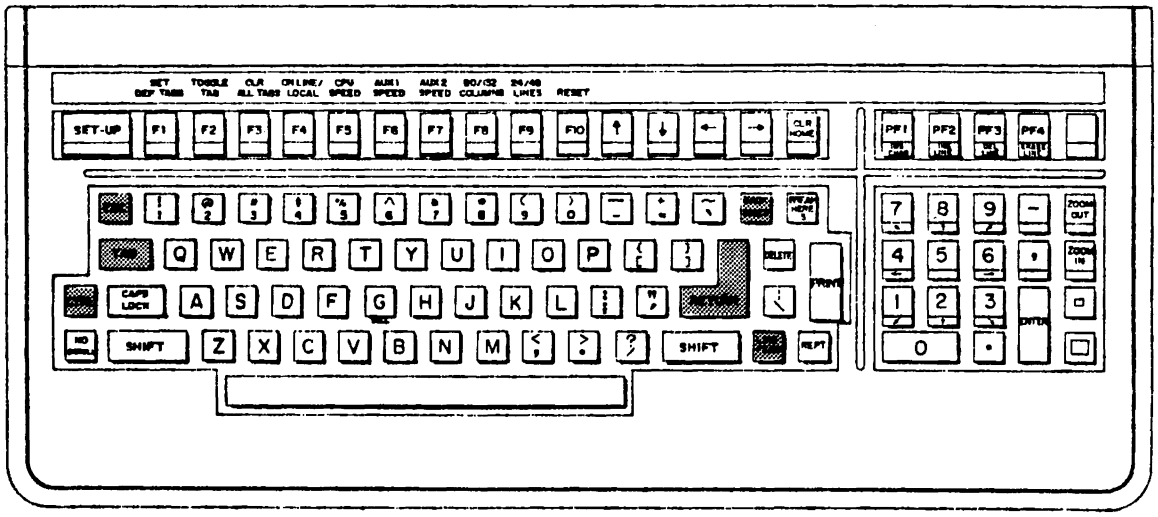
Figure 3-10 Zoom Control Keys




Four keys to the right of the keypad, provide the controls for the pan and zoom; turn ON/OFF zoom window, zoom IN/OUT and increase/decrease size of zoom window. See chapter on Pan and Zoom for their functions.

## 3.9 Miscellaneous keys

Figure 3-11 Miscellaneous keys




### 3.9.1 ESC

The ESC key generates an ESC (1Bh).

### 3.9.2 TAB

When the terminal is ONLINE the TAB key transmits an HT (09h) to the host. When the terminal is in LOCAL the tab key moves the cursor to the next tab stop. If there is no next tab stop the cursor moves to the right margin.

### 3.9.3 DEL

When the terminal is ONLINE the DEL key transmits a DEL (7Fh) to the host.

### 3.9.4 BACKSPACE

When the terminal is ONLINE the BACKSPACE key transmits a BS (08h) to the host. When the terminal is in LOCAL the cursor moves left one column.

### 3.9.5 LINEFEED

When the terminal is ONLINE the LINEFEED key transmits a LF (0Ah) to the host. When the terminal is in LOCAL the cursor moves down one line.

### 3.9.6 RETURN

The RETURN key is located on the right side of the keyboard above the SHIFT key. When the terminal is ONLINE the RETURN key transmits a CR (0Dh) or a CR (0Dh) LF (0Ah) pair to the host depending on whether newline is off or on respectively. When the terminal is in LOCAL or SETUP the cursor is moved to the left margin.

### 3.9.7 EDIT Key

The EDIT key is located on the top right hand corner of the numeric keypad. It is operational only in ANSI or VT52 modes, and it toggles the terminal in and out of edit mode. Read the chapter on Edit Mode for more details.

# CHAPTER 4

# SETUP

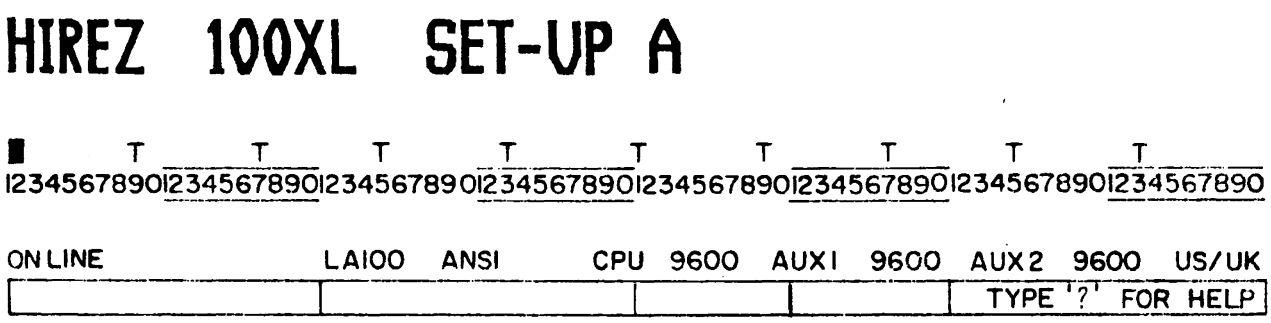
SETUP mode gives the user the capability of setting and storing non-volatile terminal parameters. Although there can be up to 5 SETUP screens, the command structure is similar in all screens.

## 4.1 Entering/exiting SETUP

SETUP is entered by depressing the SETUP key. SETUP is exited by depressing the SETUP key while in SETUP.

## 4.2 SETUP screen description

Figure 4-1 SETUP A screen




When SETUP is entered, the normal alphanumeric display is removed and the SETUP A screen appears in the top 10 lines of the display. Each screen is divided into seperate lines, each line giving you specific information about the screen. The lines will be described from top to bottom.

### 4.2.1 Title line

The title line displays blinking "HiREZ 100XL SETUP" followed by the SETUP screen letter in double high, double wide characters.

### 4.2.2 Cursor line

The cursor line contains the alpha cursor. This cursor can be moved left and right by the leftarrow and rightarrow keys. In SETUP A each tab stop is displayed by a "T" on this line.

### 4.2.3 Field line

The field line contains boolean or numeric parameter values laid out in specific fields. Boolean parameters are grouped together in reverse video blocks of 4 with a number preceding each block. Numeric parameters, if any, are displayed as integer or real values to the right of the boolean blocks.

In SETUP A the field line contains a line of digits which run repeatedly from 1 to 0 to give you a reference for setting tab stops.

### 4.2.4 Description line

The description line is used for two purposes. The first is to display the name of the field that is currently selected. The second is to echo characters that are entered into string parameters.

### 4.2.5 Status line

The status line displays multiple choice parameter values. It is divided into 6 fields. From left to right they are ONLINE/LOCAL, normal/insert mode, Printer/plotter selection, Terminal mode, CPU baud rate, AUX 1 baud rate, AUX 2 baud rate, and character set selection.

### 4.2.6 Auxillary Status Line

The auxillary status line is divided into 4 fields and displayed in reverse background. From left to right, NO SCROLL, KEYBOARD LOCK, AUX1 BUSY, AUX2 BUSY, and a HELP message. While in Set-Up, a '?' will provide a Help Menu; typing any key returns to the previous Set-Up mode. The Help Menu guides the user through all options other than those labeled above the Function Keys. Commands cannot be lower case and you must exit the Help Menu to use the commands.

## 4.3 Parameters

Each parameter can either be multiple choice, boolean, numeric, or string.

### 4.3.1 Multiple choice parameters

Multiple choice parameters allow the user a choice between several selections. The user depresses a single key until the selection he wants appears on the display. Multiple choice parameters may be changed from any SETUP screen. An example of this would be terminal mode which can be either ANSI, VT52, SECONDARY, or 4014.

### 4.3.2 Boolean parameters

Boolean parameters are displayed on the field line as a 1 or a 0 within a reverse video block. For the purposes of this manual a 1 will indicate a boolean TRUE and a 0 will indicate a boolean FALSE. Use leftarrow and rightarrow to position the cursor above the desired field. Text will be displayed in the description line which will inform you of the current setting of the parameter. Use SHIFT T to toggle the state of the boolean parameter. An example of a boolean parameter is AUTO REPEAT which can either be OFF or ON.

### 4.3.3 Numeric parameters

Numeric parameters are displayed as integer or real decimal numbers on the field line to the right of the boolean fields. To change the value of the parameter move the cursor above the numeric field. The name of the field will appear in the description line. Type the desired new value using the numeric keypad. Using the QWERTY numeric keys will not work. If you wish to rechange the current number without moving off and back on the current field, depress the ENTER key before entering the new value. To enter fractional values preceed the fraction with the decimal point on the numeric keypad. An example of a numeric parameter is

the X gain.

### 4.3.4 String parameters

String parameters store a sequence of ASCII characters. They are entered by typing the control key for the specified string parameter. The parameter name followed by a colon will be displayed in the description line. Next you enter a character which will be used as the string delimiter. This character must not appear in the string to be entered. Next, enter the string of characters. Finally, enter the delimiter character again to terminate the string. If you enter more characters than the string parameter will hold only the characters entered before the maximum number has been reached will be stored. When the string has been entered the description line will be cleared and the cursor returned to the left margin on the cursor line.

## 4.4 Parameter position specifiers

When each parameter is described in this chapter a position specifier which allows you to find the parameter within SETUP is given. This section describes what each specifier means for a particular parameter type.

### 4.4.1 Multiple choice position specifiers

For multiple choice parameters the position specifier is the key that drives the choice.

### 4.4.2 Boolean position specifiers

The format for a boolean position specifier is:

<setup screen> - <field number> : <block offset>

<setup screen> is the SETUP screen letter where the parameter is located. <field number> is the number that preceeds the reverse video boolean block. <block offset> is the bit offset within the block. Block offsets range from 1 to 4.

### 4.4.3 Numeric position specifiers

The format for a numeric position specifier is:

<setup screen> - <field number>

<setup screen> is the SETUP screen letter where the parameter is located. <field number> is found by starting at the last boolean field number and incrementing once for each field between the last boolean field and the numeric field of interest.

### 4.4.4 String position specifier

For string parameters the position specifier is the key that initiates the string entry.

## 4.5 SETUP control keys

This section describes keys which are used in SETUP but are not tied to a particular parameter.

### 4.5.1 Movement

Function: Move to next SETUP screen
Key: Uparrow

Discussion:

Uparrow goes to the next alphabetically higher screen (from A to B). If the terminal is currently at the last SETUP screen it will wrap around to SETUP A.

Function: Move to previous SETUP screen
Key: Downarrow

Discussion:

Downarrow goes to the next alphabetically lower screen (from B to A). If the terminal is currently at the SETUP A screen it will wrap around to the last SETUP screen.

Function: Move left across fields
Key: Leftarrow

Discussion:

Leftarrow moves the cursor to the left across fields in the SETUP screen. As soon as the cursor is in a valid field, the name of the field and possibly it's state are displayed in the description line.

Function: Move right across fields
Key: Rightarrow

Discussion:

Rightarrow moves the cursor to the right across fields in the SETUP screen. As soon as the cursor is in a valid field, the name of the field and possibly it's state are displayed in the description line.

### 4.5.2 Saving/restoring

Function: Restore factory defaults
Key: SHIFT D

Discussion:

SHIFT D restores all parameters to factory default values.

Function: Restore saved user parameters
Key: SHIFT R

Discussion:

SHIFT R restores the parameters that were last saved in non-volatile memory by a SHIFT S.

Function: Save user parameters
Key: SHIFT S

Discussion:

SHIFT S stores the current parameters in the non-volatile storage area. After the values are stored the terminal will beep.

Function: Set Function Key Default
Key: SHIFT F

Discussion:

SHIFT F sets function key defaults. All function keys are programmed to null strings.

### 4.5.3 Modifying boolean values

Function: Toggle boolean parameter
Key: SHIFT T

Discussion:

SHIFT T is used to toggle the state of a boolean parameter.

## 4.6 Summary of SETUP control keys

Movement

| Function | Key |
|---|---|
| Move to next SETUP screen | Uparrow |
| Move to previous SETUP screen | Downarrow |
| Move left across fields | Leftarrow |
| Move right across fields | Rightarrow |

Saving/restoring

| Function | Key |
|---|---|
| Restore factory defaults | SHIFT D |
| Restore saved user parameters | SHIFT R |
| Save user parameters | SHIFT S |
| Set Function Key Default | SHIFT F |

Modifying boolean values

| Function | Key |
|---|---|
| Toggle boolean parameter | SHIFT T |

## 4.7 SETUP parameters

### 4.7.1 ONLINE/LOCAL parameter

Name: ONLINE/LOCAL
Position: F4 key
Type: Multiple choice
Choices: ONLINE, LOCAL

Discussion:

The 4 key drives the ONLINE/LOCAL multiple choice parameter. When the terminal is ONLINE, all characters typed at the keyboard are sent to the host. When the terminal is LOCAL, all characters typed at the keyboard are treated as if they had come from the host.

Name: Brightness Control
Position:
Choices: Increase Brightness/Decrease Brightness

Discussion:

The video brightness can be increased by typing > repeatedly until desired brightness is reached. The brightness can be decreased by typing < repeatedly.

### 4.7.2 Terminal mode parameter

Name: Terminal mode
Position: SHIFT M
Type: Multiple choice
Choices: ANSI, VT52, SECONDARY, 4014

Discussion:

The SHIFT M drives the terminal mode multiple choice parameter. You can use this key to select ANSI, VT52, SECONDARY, or 4014 mode. See the chapters on each individual mode for more information.

### 4.7.3 keyboard/Character Set Selection

Name: Keyboard/Character Set Selection
Position: SHIFT C
Type: Multiple choice
Choices: US/UK, GERMAN, SWEDISH, FRENCH

Discussion:

The SHIFT C key drives the multinational keyboard/character set parameter. You can use the key to select US/UK, GERMAN, SWEDISH or FRENCH keyboard configuration and character sets. See Appendix __ for keyboard configuration and character sets.

### 4.7.4 Reset parameter

Name: Reset
Position: F10 key
Type: None

Discussion:

The F10 key causes a power up reset to be executed.

### 4.7.5 Keyboard parameters

Name: Auto repeat
Position: B-0:1
Type: Boolean
TRUE: Auto repeat on
FALSE: Auto repeat off

Discussion:

If auto repeat is on and a key is held down it will repeatedly generate the same sequence. Auto repeat rate is 1200 baud.

Name: Keyclicks
Position: B-1:2
Type: Boolean
TRUE: Keyclicks on
FALSE: Keyclicks off

Discussion:

If keyclicks are on then each time a key is depressed an audible click will be produced.

Name: WPS terminal
Position: B-3:2
Type: Boolean
TRUE: WPS terminal enabled
FALSE: WPS terminal disabled

Discussion:

If WPS terminal is enabled the LINEFEED key and \ key are redefined for compatability with word processing software.

### 4.7.6 Tab stops

Name: Set factory default tab stops
Position: F1 key
Type: None

Discussion:

The F1 key sets the tab stops to factory default positions.

Name: Set/clear tab (toggle tab)
Position: F2 key
Type: None

Discussion:

The F2 key sets/clears a single tab stop at the current cursor column.

Name: Clear all tabs
Position: F3 key
Type: None

Discussion:

The F3 key clears all tabs.

### 4.7.7 VT102 parameters

Name: 80/132 columns
Position: F8 key
Type: Multiple choice
Choices: 80 columns, 132 columns

Discussion:

The F8 key controls 80/132 column mode. A side effect of this command is to unconditionally go to SETUP A.

Name: 24/48 lines
Position: F9 key
Type: Multiple choice
Choices: 24 lines, 48 lines

Discussion:

The F9 key controls 24/48 line mode. A side effect of this command is to unconditionally go to SETUP A.

Name: Cursor blinking
Position: B-0:2
Type: Boolean
TRUE: Cursor blink
FALSE: Cursor constant

Discussion:

If the cursor is set to blink, the cursor will blink at 10 times per second.

Name: Cursor type
Position: B-0:3
Type: Boolean
TRUE: Cursor block
FALSE: Cursor underline

Discussion:

This parameter determines how the cursor is displayed. You can choose either a reverse video block cursor or an underline cursor.

Name: Cursor visability
Position: B-0:4
Type: Boolean
TRUE: Cursor visible
FALSE: Cursor not visible

Discussion:

If cursor is set not visible the cursor will not be seen on the screen.

Name: Margin bell
Position: B-1:1
Type: Boolean
TRUE: Margin bell enabled
FALSE: Margin bell disabled

Discussion:

If margin bell is enabled then the terminal will beep at you when the cursor passes the 8th column to the left of the right margin.

Name: VT102 auto wrap
Position: B-1:3
Type: Boolean
TRUE: VT102 auto wrap on
FALSE: VT102 auto wrap off

Discussion:

If auto wrap is on and the cursor reaches the right margin a newline is performed and output continues on the next line. Else, each new character received is displayed at the end of the current line.

Name: VT102 newline
Position: B-1:4
Type: Boolean
TRUE: VT102 newline on
FALSE: VT102 newline off

Discussion:

If newline is off a RETURN transmits a CR only and a received LF moves the cursor to the next line in the current column. If newline is on, a RETURN transmits a CR LF pair and a received LF moves the cursor to the next line, column 1.

Name: VT102 monitor mode
Position: B-2:1
Type: Boolean
TRUE: VT102 monitor mode on
FALSE: VT102 monitor mode off

Discussion:

Monitor mode allows you to examine each character as it is received. When monitor mode is on, no control sequence processing is performed. Instead, on the left hand side of the screen the hexadecimal equivalent of each character is displayed and on the right hand side of the screen the actual character is displayed. All control characters are displayed in reverse video with 40h added to their value to make them visible. This

is especially useful when debugging an application. The use of this mode is not recommended while in edit mode.

Name: ANSI
Position: B-2:4
Type: Boolean
TRUE: ANSI Mode
FALSE: VT52 Mode

Discussion:

Selects the terminal mode to return to (ANSI or VT52) when exiting the graphics mode with an ESC 2 or ^X (18h) sequence.

Name: CRT Saver
Position: B-2:2
Type: Boolean
TRUE: CRT Saver On
FALSE: CRT Saver Off

Discussion:

When CRT saver is selected, the screen video intensity automatically lowered after a period of non-usage of the keyboard or communication and video returns with receipt of character from keyboard or host.

Name: Default G0/G1 Character Set
Position: B-3:1
Type: Boolean
TRUE: US Char Set
FALSE: UK Char Set

Discussion:

Set the default G0/G1 character set designator to US or UK. This bit is only checked on power up.

### 4.7.8 VT102 printer parameters

Name: Print terminator
Position: B-6:4
Type: Boolean
TRUE: Form feed terminator
FALSE: No print terminator

Discussion:

If form feed terminator is selected then after a print screen command is completed a FF is transmitted to the printer.

Name: Print extent
Position: B-7:1
Type: Boolean
TRUE: Print full screen
FALSE: Print scroll region

Discussion:

Determines how much of the screen is sent to the printer when a print screen command is executed.

Name: Incoming parity
Position: B-7:4
Type: Boolean
TRUE: Check incoming parity
FALSE: Ignore incoming parity

Discussion:

This allows you to ignore/check incoming parity, regardless of whether you are transmitting parity (ie, parity enabled).

### 4.7.9 Edit Mode and Parameters

Name: Edit Mode
Position: E-0:1
Type: Boolean
TRUE: Edit mode ON
FALSE: Edit mode OFF

Discussion:

Edit mode ON puts the terminal into edit mode. The terminal does not enter edit mode if the terminal is currently in 4014 mode. Edit mode OFF takes terminal out of edit mode.

Name: Edit Execution
Position: E-0:2
Type: Boolean
TRUE: Edit execution immediate
FALSE: Edit execution deferred

Discussion:

With edit execution immediate selected, when in ANSI or VT52 modes, typing the EDIT key toggles the terminal in and out of edit mode. When edit execution is deferred, typing the EDIT key sends:

ESC [ ? 10 h requesting the host to put the terminal into edit mode if the terminal is currently in interactive mode.

ESC [ ? 10 l requesting the host to put the terminal out of edit mode into interactive mode if the terminal is currently in edit mode.

Name: Guarded Area Transmit
Position: E-0:3
Type: Boolean
TRUE: Guarded area transmit ALL
FALSE: Guarded area transmit UNPROTECTED

Discussion:

With guarded area transmit ALL selected, the entire screen or the entire line (depending on line transmit OFF/ON) is transmitted to the host. With guarded area transmit UNPROTECTED selected, only unprotected fields are transmitted to the host during block or line transmission.

Name: Space Compression
Position: E-0:4
Type: Boolean
TRUE: Space compression ON
FALSE: Space compression OFF

Discussion:

With space compression ON selected, the trailing spaces in an unprotected field are not transmitted to the host during block transmission to the host. An RS (record separator, 1Eh) character is sent as a delimitor at the end of every unprotected field. With space compression OFF, the whole unprotected field is transmitted.

Name: Line Transmit
Position: E-1:1
Type: Boolean
TRUE: Line transmit ON
FALSE: Line transmit OFF

Discussion:

With line transmit ON, transmission to the host is initiated by typing SHIFT ENTER or the RETURN key. Only the current cursor line is transmitted to the host.

With line transmit OFF, typing the RETURN key does not initiate transmission. Typing the SHIFT ENTER key transmits a block (entire screen) to the host.

Name: Transmit Execution
Position: E-1:2
Type: Boolean
TRUE: Transmit execution immediate
FALSE: Transmit execution deferred

Discussion:

With transmit execution immediate selected, typing SHIFT ENTER (or RETURN with line transmit ON) initiates transmission of a block of characters to the host.

With transmit execution deferred selected, typing SHIFT ENTER sends an ESC S sequence to the host, requesting to transmit. The host has to respond with an ESC 5 sequence to initiate the transmission.

Name: Bold Protected
Position: E-2:3
Type: Boolean
TRUE: Bold protected ON
FALSE: Bold protected OFF

Discussion:

Bold protected ON designates the character attribute bold protected in edit mode.

With bold protected OFF, the character attribute bold is unprotected in edit mode.

Name: Underline Protected
Position: E-2:4
Type: Boolean
TRUE: Underline protected ON
FALSE: Underline protected OFF

Discussion:

Underline protected ON designates the character attribute underline protected in edit mode.

With underline protected OFF, the character attribute underline is unprotected in edit mode.

Name: Blink Protected
Position: E-2:1
Type: Boolean
TRUE: Blink protected ON
FALSE: Blink protected OFF

Discussion:

Blink protected ON designates the character attribute blink protected in edit mode. With blink protected OFF, the character attribute blink is unprotected in edit mode.

Name: Reverse Video Protected
Position: E-2:2
Type: Boolean
TRUE: Reverse video protected ON
FALSE: Reverse video protected OFF

Discussion:

Reverse video protected ON designates the character attribute reverse video protected in edit mode.

With reverse video protected OFF, the character attribute reverse video is unprotected in edit mode.

Name: Reserved
Position: E-2:3
Type:
TRUE:
FALSE:

Discussion:

reserved

Name: Erase Mode
Position: E-2:4
Type: Boolean
TRUE: Erase mode ALL
FALSE: Erase mode UNPROTECTED

Discussion:

With erase mode ALL selected, the computer can edit protected and unprotected characters. With erase mode UNPROTECTED selected, the computer can edit only the unprotected characters.

Name: EOL Character
Position: E-3:1
Type: Boolean
TRUE: EOL character enabled
FALSE: EOL character disabled

Discussion:

No end of line character is transmitted to the host at the end of a line with EOL character disabled. During transmission of a block of characters to the host with EOL character enabled, the selected end of line character(s) are sent to the host at the end of every line.

Name: End of Line Character
Position: E-3:2
Type: Boolean
TRUE: End of line character CR/CRLF
FALSE: End of line character RS

Discussion:

With end of line character enabled and end of line character CR/CRLF selected, a CR (if VT102 new line is OFF) or CRLF (if VT102 new line is ON) is sent to the host at the end of each line transmitted to the host during block transmission. If end of line character RS (1Eh) is selected then an RS character is sent to the host at the end of every line during transmission to the host.

Name: Beginning of Block Character
Position: E-3:3
Type: Boolean
TRUE: Beginning of block character STX
FALSE: Beginning of block character none

Discussion:

During the transmission of a block of characters to the host, a beginning of block character STX (02h) is sent (if selected) to the host preceeding the block of characters.

Name: End of Block Character
Position: E-3:4
Type: Boolean
TRUE: End of block character ETX
FALSE: End of block character none

Discussion:

With end of block character ETX selected, an ETX (03h) character is sent to the host at the end of the transmitted block of characters.

### 4.7.10 4014 parameters

Name: 4014 monitor mode
Position: C-0:1
Type: Boolean
TRUE: 4014 monitor mode on
FALSE: 4014 monitor mode off

Discussion:

Identical to VT102 monitor mode except that as each character is received it is also processed as a graphics character. Thus you can see both the graphics picture being drawn and each character that is processed.

Name: Auto TEK entry
Position: C-0:2
Type: Boolean
TRUE: Auto TEK entry enabled
FALSE: Auto TEK entry disabled

Discussion:

If auto TEK entry is enabled then if the terminal is in ANSI or VT52 mode and a GS is received then the terminal automatically enters 4014 mode. This is an especially useful feature for those users who cannot modify 4014 compatible software to send the necessary mode switching sequences.

Name: Screen clear with auto TEK
Position: C-0:3
Type: Boolean
TRUE: Screen clear with auto TEK enabled
FALSE: Screen clear with auto TEK disabled

Discussion:

If this feature is enabled then the alpha screen is cleared automatically when doing an auto TEK entry.

Name: GIN terminator
Position: C-0:4
Type: Boolean
TRUE: CR GIN term
FALSE: No GIN term

Discussion:

Sets the GIN response terminator.

Name: EOT after GIN term
Position: C-1:1
Type: Boolean
TRUE: EOT after GIN term enabled
FALSE: EOT after GIN term disabled

Discussion:

If CR is selected for the GIN terminator then this parameter allows you to optionally send an EOT after the CR.

Name: Double TEK margin
Position: C-1:2
Type: Boolean
TRUE: Double TEK margin enabled
FALSE: Double TEK margin disabled

Discussion:

Selects between 1 or 2 4014 alpha margins.

Name: Page full break
Position: C-1:3
Type: Boolean
TRUE: Page full break enabled
FALSE: Page full break disabled

Discussion:

Enables/disables the page full break feature. For a discussion of this feature see the 4014 chapter.

Name: TEK auto LF
Position: C-1:4
Type: Boolean
TRUE: TEK auto LF enabled
FALSE: TEK auto LF disabled

Discussion:

If TEK auto LF is enabled and a CR is received the cursor moves to the left margin on the next line. If TEK auto LF is disabled then when a CR is received the cursor moves to the left margin on the current line.

Name: Space action
Position: C-2:1
Type: Boolean
TRUE: Space does not clear character cell
FALSE: Space clears character cell

Discussion:

Since a 4014 is a storage tube device, no selective screen erase is available. You must erase the whole screen or nothing. Some system software uses the sequence BS SP BS to visibly delete a character from the screen when a DEL is transmitted. Setting space clears char cell will allow this technique to work correctly.

Name: TEK character set
Position: C-2:2
Type: Boolean
TRUE: TEK char set standard
FALSE: TEK char set APL

Discussion:

Determines the default character set used for 4014 alpha submode.

Name: Vector storage
Position: C-2:3
Type: Boolean
TRUE: Vector storage enabled
FALSE: Vector storage disabled

Discussion:

Determines if each vector will be stored in dynamic memory when it is received. This feature must be enabled if you wish to use printer/plotter or pan-zoom capabilities.

Name: Gin response
Position: C-2:4
Type: Boolean
TRUE: Response embedded between STX/ETX
FALSE: Normal Gin response

Discussion:

With Gin response embedded between STX/ETX selected, an STX character preceed the Gin response and is followed by an ETX character.

Name: X window size
Position: C-3
Type: Numeric
Limits: xxx : xxx

Discussion:

Determines the horizontal size of the viewport.

Name: Y window size
Position: C-4
Type: Numeric
Limits: xxx : xxx

Discussion:

Determines the vertical size of the viewport.

Name: X window location
Position: C-5
Type: Numeric
Limits: xxx : xxx

Discussion:

Determines the X offset from the lower left hand corner of the screen to the lower left hand corner of the viewport.

Name: Y window location
Position: C-6
Type: Numeric
Limits: xxx : xxx

Discussion:

Determines the Y offset from the lower left hand corner of the screen to the lower left hand corner of the viewport.

Name: X gain
Position: C-7
Type: Numeric
Limits: xxx : xxx

Discussion:

Sets the internal X gain variable value for virtual to physical co-ordinate translation.

Name: Y gain
Position: C-8
Type: Numeric
Limits: xxx : xxx

Discussion:

Sets the internal Y gain variable value for virtual to physical co-ordinate translation.

Name: X origin
Position: C-9
Type: Numeric
Limits: xxx : xxx

Discussion:

Sets the internal X origin variable value for virtual to physical co-ordinate translation.

Name: Y origin
Position: C-10
Type: Numeric
Limits: xxx : xxx

Discussion:

Sets the internal Y origin variable value for virtual to physical co-ordinate translation.

### 4.7.11 4014 printer/plotter parameters

Name: Printer initialization string
Position: SHIFT I (SETUP D only)
Type: String

Discussion:

Sets the string which will be sent to a dot matrix printer at the start of a graphics dump. This might include switching the printer into graphics mode or changing the pitch on the dot density.

Name: Printer beginning of line string
Position: SHIFT J (SETUP D only)
Type: String

Discussion:

Sets the string which will be sent to a dot matrix printer at the beginning of each raster line during a graphics dump. This is required for printers which need to enter graphics mode before printing each line.

Name: Printer end of line string
Position: SHIFT K (SETUP D only)
Type: String

Discussion:

Sets the string which will be sent to a dot matrix printer at the end of each raster line during a graphics dump.

Name: Printer termination string
Position: SHIFT M (SETUP D only)
Type: String

Discussion:

Sets the string which will be sent to a dot matrix printer at the end of a graphics dump. This string resets the printer to its original state.

Name: Printer/plotter selection
Position: SHIFT P
Type: Multiple choice
Choices: LA100, MX80, HP-GL, USER

Discussion:

SHIFT P selects the graphics printer/plotter interface for the hardcopy device selected. Currently printer/plotter interfaces for LA100, EPSON MX80, and HP7470A are available. Also, a user specified dot matrix printer can be selected.

Name: Graph byte count transmission
Position: D-1:1
Type: Boolean
TRUE: Graph byte count sent
FALSE: Graph byte count not sent

Discussion:

Determines whether a count of bytes in the current raster line will be sent to a dot matrix printer. The count is sent after the beginning of line string and before the graphics data bytes are sent.

Name: Byte count type
Position: D-1:2
Type: Boolean
TRUE: Byte count sent in binary
FALSE: Byte count sent in decimal

Discussion:

Determines the format for the count bytes. Either the count will be transmitted as two 8 bit binary bytes or as a decimal digit string.

Name: LS/MS count byte first
Position: D-1:3
Type: Boolean
TRUE: LS count byte first
FALSE: MS count byte first

Discussion:

If the count bytes are to be sent in binary then this parameter determines if the most significant or least significant byte of the 16 bit count is transmitted first.

Name: Firing pin order
Position: D-1:4
Type: Boolean
TRUE: LS bit of graph byte is top firing pin
FALSE: LS bit of graph byte is bottom firing pin

Discussion:

For each graphics raster data byte transmitted this parameter determines if the LS bit of the byte is the top or bottom firing pin of the dot matrix head.

Name: Printer dump gain
Position: D-3
Type: Numeric
Limits: xxx : xxx

Discussion:

This parameter controls the size of the hardcopy output.

Name: Printer dump aspect ratio
Position: D-4
Type: Numeric
Limits: xxx : xxx

Discussion:

Since the HiREZ 100XL screen and a dot matrix hardcopy device invariably have different aspect ratios, some method of adjustment is needed to acheive a 1:1 aspect ratio on the printer. Read section on printer/plotter for calculating the aspect ratio correction factor.

Name: Number of count bytes to send
Position: D-5
Type: Numeric
Limits: xxx : xxx

Discussion:

If the count bytes are being transmitted as a decimal digit string then this parameter determines how many decimal digits will be sent. Unused leading digits are always 0. For example, if a particular line for graphics required 10 bytes of information to be sent, and if the number of count bytes was set to 3, then the sequence 010 is sent by the terminal to the printer. If lead zeros are to be suppressed, set the number of count bytes to sent to zero.

Name: Number of firing pins
Position: D-6
Type: Numeric
Limits: xxx : xxx

Discussion:

Determines the number of firing pins on the dot matrix head which are used to produce a raster image.

Name: Graph data bias value
Position: D-7
Type: Numeric
Limits: xxx : xxx

Discussion:

Sets a value to be added to the binary bit image graphics data byte before it is transmitted to the printer.

Name: Input device selection
Position: SHIFT A (SETUP D only)
Type: Multiple choice
Choices: Digitizer, Summamouse, Logitech Mouse

Discussion:

Selects the desired interface for the input device (Digitizer, Summamouse, or Logitech Mouse) connected to AUX 2 port as an input device.

### 4.7.12 CPU communications parameters

Name: CPU baud rate
Position: F5 key
Type: Multiple choice
Choices: 50, 75, 110, 134, 150, 300, 600, 1200, 1800, 2400, 3600, 4800, 7200, 9600, 19.2

Discussion:

Select the serial communications baud rate for the CPU port.

Name: Answerback message
Position: SHIFT A
Type: String

Discussion:

SHIFT A allows the user to enter the terminal answerback message. The answerback message is transmitted to the host when you type a CTRL BREAK or when the terminal receives an ENQ. The string limit is 20 characters.

Name: Local echo
Position: B-2:3
Type: Boolean
TRUE: Local echo on
FALSE: Local echo off

Discussion:

If local echo is enabled then all characters that are typed on the keyboard are displayed by the HiREZ 100XL as well as being transmitted to the host. This command is useful when communicating with hosts which operate in half duplex mode.

Name: CPU auto XON/XOFF
Position: B-3:3
Type: Boolean
TRUE: CPU auto XON/XOFF enabled
FALSE: CPU auto XON/XOFF disabled

Discussion:

Determine if the software XON/XOFF handshaking protocol is to be used by the HiREZ 100XL to inform the host that character transmission must be suspended/resumed.

Name: Incoming XOFF response
Position: B-3:4
Type: Boolean
TRUE: Respond to incoming XOFF
FALSE: Ignore incoming XOFF

Discussion:

Determine if the HiREZ 100XL will honor XON/XOFF transmitted to it by the host.

Name: CPU parity enable
Position: B-4:1
Type: Boolean
TRUE: CPU parity on
FALSE: CPU parity off

Discussion:

Determine if parity checking will be performed.

Name: CPU parity type
Position: B-4:2
Type: Boolean
TRUE: CPU parity even
FALSE: CPU parity odd

Discussion:

Determines the type of parity checking performed.

Name: CPU data bits
Position: B-4:3
Type: Boolean
TRUE: CPU 7 data bits
FALSE: CPU 8 data bits

Discussion:

Determines the number of data bits used.

Name: CPU stop bits
Position: B-4:4
Type: Boolean
TRUE: CPU 2 stop bits
FALSE: CPU 1 stop bit

Discussion:

Determines the number of stop bits used.

Name: Break
Position: B-5:1
Type: Boolean
TRUE: Break enabled
FALSE: Break disabled

Discussion:

If break is enabled then the BREAK key will function as described in the keyboard chapter. Else the BREAK key performs no function unless modified by CTRL or SHIFT.

Name: Auto answerback
Position: B-5:2
Type: Boolean
TRUE: Auto answerback enabled
FALSE: Auto answerback disabled

Discussion:

This bit performs no function and is provided for VT102 compatibility.

Name: Transmit Speed to CPU
Position: B-9:1
Type: Boolean
TRUE: Transmit speed to CPU 30 chars per sec.
FALSE: Transmit speed to CPU normal

Discussion:

The HiREZ 100XL supports vector upload (in Tek mode) and block transmits (in Edit mode) to host. For hosts which cannot handle high receive rates, the terminal transmit rate can be lowered to a fixed 30 character/sec transmit rate.

### 4.7.13 AUX communications parameters

Name: AUX 1 baud rate
Position: F6 key
Type: Multiple choice
Choices: 50, 75, 110, 134,
150, 300, 600, 1200,
1800, 2400, 3600, 4800,
7200, 9600, 19.2

Discussion:

Select the serial communications baud rate for the AUX 1 port.

Name: AUX 2 baud rate
Position: F7 key
Type: Multiple choice
Choices: 50, 75, 110, 134,
150, 300, 600, 1200,
1800, 2400, 3600, 4800,
7200, 9600, 19.2

Discussion:

Select the serial communications baud rate for the AUX 2 port.

Name: AUX 1 handshake
Position: B-5:3
Type: Boolean
TRUE: AUX 1 handshake: XON/XOFF
FALSE: AUX 1 handshake: DTR

Discussion:

Determines whether XON/XOFF software handshaking or DTR hardware handshaking is used to control the transmission of data out the AUX 1 port.

Name: AUX 2 handshake
Position: B-7:3
Type: Boolean
TRUE: AUX 2 handshake: XON/XOFF
FALSE: AUX 2 handshake: DTR

Discussion:

Determines whether XON/XOFF software handshaking or DTR hardware handshaking is used to control the transmission of data out the AUX 2 port.

Name: AUX 1 parity enable
Position: B-5:4
Type: Boolean
TRUE: AUX 1 parity on
FALSE: AUX 1 parity off

Discussion:

Determine if parity checking will be performed.

Name: AUX 2 parity enable
Position: B-7:4
Type: Boolean
TRUE: AUX 2 parity on
FALSE: AUX 2 parity off

Discussion:

Determine if parity checking will be performed.

Name: AUX 1 parity type
Position: B-6:1
Type: Boolean
TRUE: AUX 1 parity even
FALSE: AUX 1 parity odd

Discussion:

Determine type of parity checking performed.

Name: AUX 2 parity type
Position: B-8:1
Type: Boolean
TRUE: AUX 2 parity even
FALSE: AUX 2 parity odd

Discussion:

Determine type of parity checking performed.

.tp 20

Name: AUX 1 data bits
Position: B-6:2
Type: Boolean
TRUE: AUX 1 7 data bits
FALSE: AUX 1 8 data bits

Discussion:

Determines the number of data bits used.

Name: AUX 2 data bits
Position: B-8:2
Type: Boolean
TRUE: AUX 2 7 data bits
FALSE: AUX 2 8 data bits

Discussion:

Determines the number of data bits used.

Name: AUX 1 stop bits
Position: B-6:3
Type: Boolean
TRUE: AUX 1 stop bits
FALSE: AUX 1 stop bit

Discussion:

Determines the number of stop bits used.

Name: AUX 2 stop bits
Position: B-8:3
Type: Boolean
TRUE: AUX 2 stop bits
FALSE: AUX 2 stop bit

Discussion:

Determines the number of stop bits used.

Name: Graphics hardcopy output port
Position: B-8:4
Type: Boolean
TRUE: Graphics hardcopy output port AUX 2
FALSE: Graphics hardcopy output port AUX 1

Discussion:

The user can select AUX 1 OR AUX 2 port as the graphics hardcopy output port. The plotting and printing of the graphics screen images can be done via the selected port.

## 4.8 Summary of SETUP parameters

ONLINE/LOCAL parameter

| Name | Position |
|---|---|
| ONLINE/LOCAL<br>Brightness Control | F4 key |

Terminal mode parameter

| Name | Position |
|---|---|
| Terminal mode | SHIFT M |

keyboard/Character Set Selection

| Name | Position |
|---|---|
| Keyboard/Character Set Selection | SHIFT C |

Reset parameter

| Name | Position |
|---|---|
| Reset | F10 key |

Keyboard parameters

| Name | Position |
|---|---|
| Auto repeat | B-0:1 |
| Keyclicks | B-1:2 |
| WPS terminal | B-3:2 |

Tab stops

| Name | Position |
|---|---|
| Set factory default tab stops | F1 key |
| Set/clear tab (toggle tab) | F2 key |
| Clear all tabs | F3 key |

VT102 parameters

| Name | Position |
|---|---|
| 80/132 columns | F8 key |
| 24/48 lines | F9 key |
| Cursor blinking | B-0:2 |
| Cursor type | B-0:3 |
| Cursor visability | B-0:4 |
| Margin bell | B-1:1 |
| VT102 auto wrap | B-1:3 |
| VT102 newline | B-1:4 |
| VT102 monitor mode | B-2:1 |
| ANSI | B-2:4 |
| CRT Saver | B-2:2 |
| Default G0/G1 Character Set | B-3:1 |

VT102 printer parameters

| Name | Position |
|---|---|
| Print terminator | B-6:4 |
| Print extent | B-7:1 |
| Incoming parity | B-7:4 |

Edit Mode and Parameters

| Name | Position |
|---|---|
| Edit Mode | E-0:1 |
| Edit Execution | E-0:2 |
| Guarded Area Transmit | E-0:3 |
| Space Compression | E-0:4 |
| Line Transmit | E-1:1 |
| Transmit Execution | E-1:2 |
| Bold Protected | E-2:3 |
| Underline Protected | E-2:4 |
| Blink Protected | E-2:1 |
| Reverse Video Protected | E-2:2 |
| Reserved | E-2:3 |
| Erase Mode | E-2:4 |
| EOL Character | E-3:1 |
| End of Line Character | E-3:2 |
| Beginning of Block Character | E-3:3 |
| End of Block Character | E-3:4 |

4014 parameters

| Name | Position |
|---|---|
| 4014 monitor mode | C-0:1 |
| Auto TEK entry | C-0:2 |
| Screen clear with auto TEK | C-0:3 |
| GIN terminator | C-0:4 |
| EOT after GIN term | C-1:1 |
| Double TEK margin | C-1:2 |
| Page full break | C-1:3 |
| TEK auto LF | C-1:4 |
| Space action | C-2:1 |
| TEK character set | C-2:2 |
| Vector storage | C-2:3 |
| Gin response | C-2:4 |
| X window size | C-3 |
| Y window size | C-4 |
| X window location | C-5 |
| Y window location | C-6 |
| X gain | C-7 |
| Y gain | C-8 |
| X origin | C-9 |
| Y origin | C-10 |

4014 printer/plotter parameters

| Name | Position |
|---|---|
| Printer initialization string | SHIFT I (SETUP D only) |
| Printer beginning of line string | SHIFT J (SETUP D only) |
| Printer end of line string | SHIFT K (SETUP D only) |
| Printer termination string | SHIFT M (SETUP D only) |
| Printer/plotter selection | SHIFT P |
| Graph byte count transmission | D-1:1 |
| Byte count type | D-1:2 |
| LS/MS count byte first | D-1:3 |
| Firing pin order | D-1:4 |
| Printer dump gain | D-3 |
| Printer dump aspect ratio | D-4 |
| Number of count bytes to send | D-5 |
| Number of firing pins | D-6 |
| Graph data bias value | D-7 |
| Input device selection | SHIFT A (SETUP D only) |

CPU communications parameters

| Name | Position |
|---|---|
| CPU baud rate | F5 key |
| Answerback message | SHIFT A |
| Local echo | B-2:3 |
| CPU auto XON/XOFF | B-3:3 |
| Incoming XOFF response | B-3:4 |
| CPU parity enable | B-4:1 |
| CPU parity type | B-4:2 |
| CPU data bits | B-4:3 |
| CPU stop bits | B-4:4 |
| Break | B-5:1 |
| Auto answerback | B-5:2 |
| Transmit Speed to CPU | B-9:1 |

AUX communications parameters

| Name | Position |
|---|---|
| AUX 1 baud rate | F6 key |
| AUX 2 baud rate | F7 key |
| AUX 1 handshake | B-5:3 |
| AUX 2 handshake | B-7:3 |
| AUX 1 parity enable | B-5:4 |
| AUX 2 parity enable | B-7:4 |
| AUX 1 parity type | B-6:1 |
| AUX 2 parity type | B-8:1 |
| AUX 1 data bits | B-6:2 |
| AUX 2 data bits | B-8:2 |
| AUX 1 stop bits | B-6:3 |
| AUX 2 stop bits | B-8:3 |
| Graphics hardcopy output port | B-8:4 |

# CHAPTER 5

## Communications

The HiREZ 100XL uses a minimal subset of the IEEE RS-232c serial communication protocol. Only those parts of the protocol that are essential for communication have been implemented. For those of you not familiar with serial communications a short discussion is provided below.

## 5.1 Transmission lines

At a bare minimum full duplex serial communications requires 3 lines: transmit data (TxD), receive data (RxD), and signal ground (GND). TxD is the line that the device uses to transmit data to another device. RxD is the line that the device uses to receive data from another device. GND gives a common reference voltage to measure TxD and RxD from.

In addition to these 3 lines the HiREZ 100XL has a minimum set of hardware handshake lines for each port. See the specifics on each port for more information.

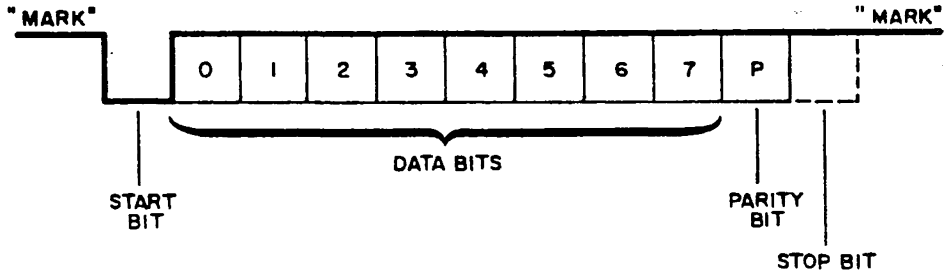
## 5.2 Terminal vs. computer

In order that data and handshakes are exchanged correctly a device must know whether it's port looks like a computer (DCE) device or a terminal (DTE) device. On the HiREZ 100XL the CPU port is DTE and the AUX 1 and AUX 2 ports are DCE.

## 5.3 Serial transmission format

When no transmission is occurring on a serial line the line is in the asserted or MARK condition. The unasserted condition is refered to as SPACE.

**Figure 5-1 Serial bit stream for one byte**




### 5.3.1 Baud rate

The baud rate determines the amount of time that the serial line is held in the MARK or SPACE condition for each bit. Since for a given setting of data bits, parity, and stop bits the total number of bits transmitted is constant, the baud rate determines the maximum possible throughput.

### 5.3.2 Start bit

At the start of each byte transmitted the serial line is held in a SPACE condition for one bit time. This is called the start bit and informs the receiver that a byte is being transmitted.

### 5.3.3 Data bits

After the start bit is transmitted each bit of the byte is sent. Transmission starts with the least significant bit and continues until the most significant bit is transmitted. For each bit, SPACE indicates a 0 and MARK indicates a 1. Either 7 bits or 8 bits can be transmitted.

### 5.3.4 Parity bit

After the data bits have been transmitted an optional parity bit is sent. If even parity is selected then if an even number of 1's were transmitted the parity bit is a 1. If odd parity is selected then if an odd number of 1's were transmitted the parity bit is a 1. If mark parity is selected then the parity bit is always 1. If space parity is selected then the parity bit is always 0. Note that when selecting odd/even parity, you must also enable parity, which is another option setting in SET-UP B. Further more, as in a VT102 terminal, the HiREZ 100XL allows you to ignore incoming parity (also selectable in SET-B).

NOTE

Mark or space parity is not implemented at this time.

### 5.3.5 Stop bits

At the end of the entire bit stream 1 or 2 SPACE bits are transmitted to mark the end of transmission.

## 5.4 Break

Sets serial line SPACE condition for 275 ms. +-10%. This is used by some computer hardware as an unconditional abort.

## 5.5 Disconnect

Sets serial line SPACE condition for 1.8 seconds +-10%. This is used by some modems as a disconnect command.

## 5.6 CPU port specifics

The CPU port is primarily an input port. Typically, for every character transmitted by the HiREZ 100XL several characters are received from the host.

### 5.6.1 Connector pins

The following pins are used on the HiREZ 100XL CPU connector:

**Figure 5-2 CPU connector pin out**

| Pin | Type | Function |
|---|---|---|
| 2 | Output | Transmit data |
| 3 | Input | Receive data |
| 4 | Output | Request to send |
| 5 | Input | E1 strap |
| 6 | Input | E3 strap |
| 7 | N/A | Signal ground |
| 8 | Input | E5 strap |
| 20 | Output | Data terminal ready |

### 5.6.2 Outgoing XON/XOFF handshaking

Some functions that are performed by the HiREZ 100XL take longer to perform than it takes to receive the characters that specify the function. If too many of this type of function are specified then the HiREZ 100XL has a backlog of characters that have not been processed yet. These character are stored in an intermediate circular buffer. If the process goes on too long and no method of stopping the flow of incomming characters is provided the buffer will overflow. This results in loss of data as the HiREZ 100XL has no place to store the characters received after buffer overflow.

Outgoing XON/XOFF is a software handshake that gives the HiREZ 100XL a way to tell the host to quit transmitting. When the HiREZ 100XL's buffer fills to 100 characters (buffer size is 256 characters) an XOFF is transmitted to the host. The host must then stop transmission of characters. When the HiREZ 100XL has processed all the characters in it's buffer it transmits an XON to the host. The host then can resume transmission.

### 5.6.3 Incoming XON/XOFF handshaking

The host computer sometimes has the same problem that the HiREZ 100XL has when receiving characters. Although this occurs less frequently, on heavily loaded time share systems using software that does many terminal enquiries at a high baud rate the host will definitely have problems.

Incomming XON/XOFF works in the reverse of outgoing XON/XOFF. This time it is the HiREZ 100XL which is told to stop/start transmission of characters.

### 5.6.4 Incoming hardware handshaking

There is no incoming hardware handshake available on the CPU port. XON/XOFF software handshake is the only handshake available.

### 5.6.5 Modem disconnect

The RTS and DTR outgoing handshake lines are used to implement a hardware modem disconnect. When SHIFT BREAK is depressed both RTS and DTR go to the SPACE condition for the durration of the disconnect serial line pulse. Otherwise these 2 handshakes are always in the MARK condition.

## 5.7 AUX port specifics

### 5.7.1 Connector pins

The following pins are used on the HiREZ 100XL AUX 1 and AUX 2 connectors:

**Figure 5-3 AUX connector pin out**

| Pin | Type | Function |
|---|---|---|
| 2 | Input | Receive data |
| 3 | Output | Transmit data |
| 7 | N/A | Signal ground |
| 20 | Input | Data terminal ready (AUX 2 port pin 20 is pulled up). |

### 5.7.2 Incoming handshaking

You may chose from SETUP whether you wish XON/XOFF or DTR handshaking for the AUX ports.

For output to plotter, it is recommended that DTR handshake be selected and used. For printer output, the DTR line must always be connected, and, if XON/XOFF handshaking is used, it must always be held high.

# CHAPTER 6

# Edit Mode

## 6.1 Overview

The HiREZ 100XL can operate as an editing terminal with local editing capabilities. In the normal (interactive) mode all characters typed on the keyboard are transmitted by the terminal to the host and the received characters are processed as described in the VT52 and VT102 sections.

In the edit mode, all characters typed on the keyboard are not sent directly to the host. The characters are displayed on the terminal screen; the user has the capability to edit the text on the screen locally. The editing functions include: insert character, delete character, delete line, insert line, clear line, etc. A page of text (24x80/24x132, 48x80/48x132) can be transmitted to the host.

The edit mode can be selected from the host, keyboard, or through the SETUP E. The edit mode is selectable only when the terminal is in (ANSI) VT102 or the VT52 mode. Entering TEK 4014 mode takes the terminal out of edit mode (when selected).

The received characters from the host with the terminal in edit mode, is processed normally with exceptions to certain sequences when Erase Unprotected Mode is selected in SETUP E. These are explained in the received character processing section.

In edit mode, any character attribute can be selected to represent a protected field. Characters with normal attribute or attributes not selected to be protected are unprotected and can be edited from the host and keyboard. A group of protected or unprotected columns on a row constitute a field.

Protected fields on the screen, cannot be edited from the keyboard (over-written, deleted, erased, etc.). The regions above and below the scroll margins, when the scroll region is not full screen, are protected.

## 6.2 Keyboard and Edit Operations

The keyboard operation is different when in edit mode. As stated before, characters typed on the keyboard are not sent to the host but are displayed on the screen at current cursor position and the cursor is moved to the next unprotected column. SETUP E enables the user to select different options and parameters for the edit mode. A status line appears on the screen on the 25/49 line when in edit mode. The status line displays:

* Current cursor row and column

* Whether characters typed are inserted

* Indicates keyboard locked (if that condition exists)

* Indicates a block is being transmitted to the host during trasmission.

The following function keys produce different actions (than during normal operation) on the terminal when in edit mode.

### 6.2.1 SHIFT CLEAR key

Clears all unprotected fields and homes cursor.

### 6.2.2 TAB key

Moves the cursor to the beginning of the next unprotected field, the next tab stop setting or the end of the line, whichever is found first.

### 6.2.3 BACK SPACE key

Moves the cursor to beginning of previous unprotected field, previous tab stop or beginning of line, whichever is found first.

### 6.2.4 DELETE key

Deletes a character at cursor position (only if it is in an unprotected field). All characters from the next column to the end of the field are moved over one column to the left and the last column in the field is replaced by a space character. The cursor does not move. If the cursor is on a protected column, no characters are deleted. The cursor moves to the next unprotected field.

### 6.2.5 PF1 key

Toggles the terminal in and out of insert mode.

The status bar indicates the insert mode condition. When in insert mode, all characters from the cursor position (inclusive) to the end of current field, are moved right one position and the typed character is inserted at current cursor position. The character at the end of the field is lost. Also the cursor moves to the next unprotected column.

### 6.2.6 PF2 key

Inserts a line at current cursor line. Lines starting at the current cursor line and ending above the line containing a protected field below are moved down one row. The last row moved down is lost. A line is inserted at current cursor line and cleared. A line cannot be inserted if the cursor is currently on a line with a protected field.

### 6.2.7 PF3 key

Deletes the line at current cursor position. No line is deleted if the cursor is currently on a line with a protected field. Lines starting one line below the current cursor line and ending at a line with a protected field or bottom of screen are moved up one line and a blank line inserted at the bottom.

### 6.2.8 PF4 key

Clears all unprotected fields on current cursor line.

### 6.2.9 SHIFT ENTER

Transmits a block of characters to the host. The format and contents are dependent on current selections in SETUP E. Refer to sections on SETUP E and Transmit to host in Edit Mode. Keyboard locked and transmitting conditions are indicated on the status line.

### 6.2.10 RETURN key

Transmits a line of text to host. Refer to section on transmitting to host in Edit Mode.

### 6.2.11 ARROW keys

Moves the cursor in the four directions.

### 6.2.12 LINEFEED Key

Performs a linefeed operation. The screen does not scroll up when the end of the scroll window is reached.

### 6.2.13 EDIT key

Toggles the terminal in and out of edit mode (only if edit execution immediate is selected in SETUP E).

## 6.3 Transmitting Block of Text to Host

An edited block of text can be transmitted to the host. The block is transmitted by typing the SHIFT ENTER key or the RETURN key (if line transmit is on in SETUP E).

The following parameters can be selected from SETUP E.

* Transmit all/unprotected
* Space compression ON/OFF
* Line transmit ON/OFF
* Transmit execution immediate/deferred
* End of line character(s)
* Beginning of block character
* End of block character

The actions resulting with different selections for the above are discussed in SETUP E description.

The transmission can also be initiated from the host. The transmission can be aborted by entering and exiting SETUP.

# CHAPTER 7

# ANSI mode

ANSI mode implements ANSI X3.64 protocol. Many DEC private modes have also been added to provide compatibility with DEC software.

## 7.1 Sequence description

An ANSI sequence is composed of 3 parts: The command string introducer, the parameters, and the terminator. An example of a standard ANSI sequence is the cursor position command which positions the cursor to a given row and column on the screen. This sequence is:

ESC [ Pl ; Pc H

### 7.1.1 Command string introducer

The command string introducer (CSI) is a unique sequence of characters which alert the terminal that a control sequence is about to begin. For the cursor position sequence (as well as most other ANSI mode sequences) the CSI is ESC (1Bh) [ (5Bh).

### 7.1.2 Parameters

A parameter is an ASCII decimal digit string. This string provides a numeric value to the terminal for the particular sequence. Multiple parameters may be entered seperated by a semicolon. When multiple parameters are used, their meaning is determined by the order in which they occur in the sequence. The format in this manual for a parameter is an upper case P followed by a lower case alphabetic character. In the cursor position sequence the 2 parameters are Pl and Pc for the row and column number to position to. If you were actually trying to position the terminal to line 20, column 5 you would send:

ESC [ 2 0 ; 5 H

A private mode parameter will have the digit string preceded by a ? (3Fh).

### 7.1.3 Terminator

The terminator is a single character which determines the particular function the sequence will perform. In the cursor position sequence the terminator is H (48h).

## 7.2 Error handling

As soon as an unexpected character is detected in an ANSI mode sequence the terminal aborts the sequence and displays the rest of the characters.

## 7.3 ANSI mode sequences

### 7.3.1 Mode switching

Function: Enter 4014 mode
Sequence: ESC 1

Discussion:

Enter 4014 mode from ANSI mode.

Function: Enter VT52 mode
Sequence: ESC [ ? 2 l

Discussion:

Enter VT52 mode from ANSI mode.

Function: Enter edit mode
Sequence: ESC [ ? 10 h

Discussion:

Enter edit mode from ANSI mode.

### 7.3.2 Define user keys

Function: Define user key
Sequence: ESC P Pc ; Pl
| Pk 1 / Ps 1 ;
Pk 2 / Ps 2 ;
Pkn/Psn ESC \

Discussion:

The function keys F1 through F10, unmodified and modified by CTRL or SHIFT, send 30 user definable character sequences to the host computer. See the keyboard chapter for a breakdown of function number versus key. A total of 560 bytes are available for programming. Any key can be programmed to any length provided that sum of the lengths of all strings does not exceed 560. If the terminal runs out of memory during a definition it will beep and display the unused characters.

If Pc is 0 clear all keys before definition. Otherwise redefine specified key only. SELANAR suggests that all keys be cleared when starting an application which uses user defined keys so any definitions left over from another application will not cause problems.

If Pl is 0 lock user defined keys against redefinition from the keyboard. Otherwise redefinition from the keyboard is allowed. SELANAR suggests that user defined keys should be locked after definition by an application so that the user cannot inadvertently destroy the definitions. User defined keys should always be unlocked when an application terminates.

Pkn is the number of the function key to define and must be in the range 0 to 29.

Psn is a sequence of ASCII characters which cannot contain a semicolon or an ESC \ pair. Any other characters are legal.

Multiple keys can be defined in one sequence by placing a semicolon after the first string definition and following the semicolon by a second user defined key number.

Device reports are available to check on the status of user defined key parameters. See the device reports section within this chapter.

NOTE

Once user defined keys are locked, they cannot be re-programmed from the keyboard until unlocked from host CPU. Also note that on initial shipment from factory, they are in locked state, and must be unlocked (optionally 'saved' as unlocked) from host CPU before programming from keyboard.

**Example:**

To unlock defining from keyboard, with terminal ONLINE in ANSI mode, send the following sequence from the host (or type from the keyboard with pins 2 and 3 shorted on the CPU PORT).

ESC P 0 ; 1 | 0 / H E L L O ESC \

This sequence clears all keys of prior definition,

unlocks for definition from keyboard and programs function key F1 with the string 'HELLO'.

Programmable multiple keys:

ESC P 1 ; 1 | 1 / L O G I N ; 2 C S 5 1 6 ESC \

Above sequence programs function key F2 with string 'LOGIN' and function key F3 with string 'CS516'.

### 7.3.3 Set mode

Set mode sets internal HiREZ 100XL variables to TRUE. Some of these variables can also be controlled from SETUP. For each set mode command there is a corresponding reset mode command to reset the internal variable to FALSE.

Function: Guarded area transmit ALL
Sequence: ESC [ 1 h

Discussion:

Selects entire screen (or line, if line transmit selected) for transmission to host in edit mode.

Function: Keyboard lock
Sequence: ESC [ 2 h

Discussion:

Lock the keyboard. When in this mode the keyboard will not generate any characters and the keyclicks will be turned off. However, data can still be received from the host. This is useful if you wish to display information to the user for a fixed period of time and not allow him to mangle it by typing the wrong characters at the wrong time. This mode can be exitted only by receiving a keyboard unlock sequence from the host or by entering and exiting SETUP.

Function: Insert on
Sequence: ESC [ 4 h

Discussion:

When a displayable character is received from the host the terminal shifts right by one column all characters to the right of the current cursor position and places the received char at the cursor postion. Cursor is advanced right by one column. This action may force useful data off of the right margin of screen. If the cursor reaches the right screen margin and auto wrap is on, the cursor will advance to the next line. Else, it will remain on the right margin.

Function: Erase mode ALL
Sequence: ESC [ 6 h

Discussion:

Selects erase mode ALL in edit mode. With this mode selected, the computer can edit protected and unprotected characters on the screen.

Function: Local echo off
Sequence: ESC [ 1 2 h

Discussion:

Turn off local echo of characters typed on the keyboard.

Function: Newline on
Sequence: ESC [ 2 0 h

Discussion:

When newline is on a received LF, FF, or VT causes the cursor to move to column 1 of the next line. When RETURN is typed on the keyboard both a CR and LF are generated.

Function: 48 lines
Sequence: ESC [ ? 0 h

Discussion:

When in 48 line mode the alpha screen has 48 lines of text display available. The sequence forces a screen clear and cursor home. This mode in conjuction with 132 column mode is very useful for displaying wide format printer listings.

Function: Application arrow keys
Sequence: ESC [ ? 1 h

Discussion:

When application arrow key mode is selected the arrow keys will generate application sequences instead of the normal cursor positioning sequences. Sequences generated are:

| | |
|---|---|
| Uparrow | ESC O A |
| Downarrow | ESC O B |
| Leftarrow | ESC O C |
| Rightarrow | ESC O D |

Function: 132 columns
Sequence: ESC [ ? 3 h

Discussion:

When in 132 column mode the alpha screen has 132 columns of text display available. The sequence forces a screen clear and cursor home. This mode in conjuction with 48 line mode is very useful for displaying wide format printer listings.

Function: Relative Origin
Sequence: ESC [ ? 6 h

Discussion:

When in relative origin mode the cursor is not allowed to leave the scrolling region. Line numbering is relative to the upper left hand corner of the scrolling region. A side effect of this command is to move the cursor to the upper left hand corner of the scrolling region.

Example:

```
ESC [ 1 9 ; 2 4 r    ; Set bottom 6 lines as
                     ; scrolling region
ESC [ 1 ; 1 H        ; Move cursor to screen home
ESC [ ? 6 h          ; Turn on relative origin
ESC [ 1 ; 1 H        ; Move cursor to scrolling
                     ; region home
```

Function: Auto wrap ON
Sequence: ESC [ ? 7 h

Discussion:

When the cursor is advanced past the right margin and auto wrap is ON the cursor is automatically advanced to the next line, column 1.

Example:

```
ESC [ 1 ; 8 0 H     ; Move to upper right hand
                    ; corner
ESC [ C             ; Cursor does not move to next
                    ; line
ESC [ ? 7 h         ; Turn on auto wrap
SP                  ; Cursor moves to next line,
                    ; column 1
```

Function: Auto repeat ON
Sequence: ESC [ ? 8 h

Discussion:

If any key on the keyboard is held down and auto repeat is ON the key will repeat it's action until it is released.

Function: Line transmit ON
Sequence: ESC [ ? 1 1 h

Discussion:

Selects line transmit ON. Type SHIFT ENTER or RETURN in edit mode to transmit the current cursor line to host.

Function: Space Compression ON
Sequence: ESC [ ? 1 3 h

Discussion:

Select space compression ON in edit mode. The trailing spaces in an unprotected field are not transmitted to the host during transmission to the host. A RS (record seperator, 1Eh) character is sent as a delimitor between unprotected fields.

Function: Transmit execution immediate
Sequence: ESC [ ? 1 4 h

Discussion:

Select transmit execution immediate. With transmit execution immediate selected, typing SHIFT ENTER or RETURN with line transmit ON, transmits a block of characters immediately to the host.

Function: Edit key execution immediate
Sequence: ESC [ 1 6 h

Discussion:

Select edit key execution immediate. When in ANSI or VT52 modes, typing the EDIT key toggles the terminal in and out of edit mode.

Function: Print formfeed ON
Sequence: ESC [ ? 1 8 h

Discussion:

When print formfeed is on a FF is transmitted to the printer after a print cursor line or a print screen has been completed.

Function: Print full screen
Sequence: ESC [ ? 1 9 h

Discussion:

When a print screen command is received and print full screen is selected the entire alpha screen is transmitted to the printer.

### 7.3.4 Reset mode

Reset mode sets internal HiREZ 100XL variables to FALSE. Some of these variables can also be controlled from SETUP. For each reset mode command there is a corresponding set mode command to set the internal variable to TRUE.

Function: Guarded area transmit
Sequence: ESC [ 1 l

Discussion:

Select only unprotected fields on the screen (or line if line transmit ON selected) for transmission to host in edit mode.

Function: Keyboard unlock
Sequence: ESC [ 2 l

Discussion:

See keyboard lock under set mode.

Function: Replace on
Sequence: ESC [ 4 l

Discussion:

When a displayable character is received it is placed at the current cursor position and the cursor is move right by one column.

Function: Erase mode unprotected
Sequence: ESC [ 6 l

Discussion:

Select erase mode unprotected. With this mode selected, the computer can edit only unprotected fields on the screen. If the cursor is currently on a unprotected field, the received characters are displayed starting the next unprotected field. Selection of this mode affects editing function sequences (in interactive mode) and erasing sequences.

Function: Local echo on
Sequence: ESC [ 1 2 l

Discussion:

When local echo is turned on all characters typed on the keyboard are displayed on the screen and transmitted to the host.

Function: Newline OFF
Sequence: ESC [ 2 0 l

Discussion:

When newline is OFF a received LF, FF, or VT causes the cursor to move to the same column of the next line. When RETURN is typed on the keyboard only a CR is generated.

Function: 24 lines
Sequence: ESC [ ? 0 l

Discussion:

When in 24 line mode the alpha screen has 24 lines of text display available. The sequence forces a screen clear and cursor home.

Function: Normal arrow keys
Sequence: ESC [ ? 1 l

Discussion:

When this mode is selected, the arrow keys generate the corresponding cursor positioning sequence. Sequences generated are:

| | |
|---|---|
| Uparrow | ESC [ A |
| Downarrow | ESC [ B |
| Leftarrow | ESC [ D |
| Rightarrow | ESC [ C |

Function: 80 columns
Sequence: ESC [ ? 3 l

Discussion:

When in 80 column mode the alpha screen has 80 columns of text display available. The sequence forces a screen clear and cursor home.

Function: Absolute origin
Sequence: ESC [ ? 6 l

Discussion:

Line numbering is relative to the upper left hand corner of the screen.

Example:

See relative origin in set mode.

Function: Auto wrap OFF
Sequence: ESC [ ? 7 l

Discussion:

When the cursor trys to advance past the right margin and auto wrap is OFF the cursor does not move.

Function: Auto repeat OFF
Sequence: ESC [ ? 8 l

Discussion:

If any key on the keyboard is held down and auto repeat is OFF the key will perform it's action only once.

Function: Exit edit mode/select interactive mode
Sequence: ESC [ ? 1 0 1

Discussion:

Exits edit mode and selects ANSI mode or VT52 (interactive) mode.

Function: Line transmit OFF
Sequence: ESC [ ? 1 1 1

Discussion:

Select line transmit OFF. Type SHIFT ENTER in edit mode to transmit the entire screen to the host.

Function: Space compression OFF
Sequence: ESC [ ? 1 3 1

Discussion:

Select space compression OFF in edit mode. The entire unprotected fields (including the trailing spaces) are transmitted to the host during block transmission.

Function: Transmit execution deferred
Sequence: ESC [ ? 1 4 l

Discussion:

Select transmit execution immediate in edit mode. Typing SHIFT ENTER sends an ESC S sequence to the host. The host has to respond with an ESC 5 sequence to initiate the transmission from the terminal.

Function: Edit key execution deferred
Sequence: ESC [ ? 1 6 l

Discussion:

Select edit key execution deferred in edit mode. Typing the edit key sends ESC [ ? 1 0 h to the host requesting the host to put the terminal into edit mode (if the terminal is in interactive mode). The host should send back the same sequence to the terminal to put it into edit mode if the request is granted.

Send ESC [ ? 1 0 l to the host requesting the host to put the terminal into interactive mode (if the terminal is in edit mode). The host should send back the same sequence to the terminal to put it into interactive mode if the request is granted.

Function: Print form feed OFF
Sequence: ESC [ ? 1 8 l

Discussion:

When print formfeed is OFF no character is transmitted to the printer after a print cursor line or a print screen has been completed.

Function: Print scrolling region
Sequence: ESC [ ? 1 9 l

Discussion:

When a print screen command has been received and print scrolling region is enabled only the scrolling region will be transmitted to the printer.

### 7.3.5 Keypad mode

Function: Enter application keypad mode
Sequence: ESC =

Discussion:

When application keypad mode is selected the numeric keypad will generate application sequences instead of the normal characters. Sequences generated are:

**Figure 7-1 ANSI application keypad sequences**

| Key | Sequence |
|---|---|
| ENTER | ESC O M |
| , | ESC O l |
| - | ESC O m |
| . | ESC O n |
| 0 | ESC O p |
| 1 | ESC O q |
| 2 | ESC O r |
| 3 | ESC O s |
| 4 | ESC O t |
| 5 | ESC O u |
| 6 | ESC O v |
| 7 | ESC O w |
| 8 | ESC O x |
| 9 | ESC O y |

NOTE

Although the PF keys are right above the numeric keypad, for the purposes of this discussion they are not part of it.

Function: Exit application keypad mode
Sequence: ESC >

Discussion:

Numeric keypad keys generate the characters that are printed on the keys. The ENTER key generates the same characters as the RETURN key.

### 7.3.6 Character sets

There are 3 character sets avaiable on the HiREZ 100XL: US (ASCII), UK, and special and line drawing. Only 2 sets can be active at a given time. The active sets are named G0 and G1. Any of the 3 sets can be designated to be either G0 or G1. Once G0 and G1 are designated the SI and SO commands will switch you between sets.

Function: G0 is UK character set
Sequence: ESC ( A

Discussion:

Designates the UK character set as G0. The only difference between the UK and US character set is that the # (23h) character is mapped to the UK pound sign.

Function: G0 is US character set
Sequence: ESC ( B

Discussion:

Designates the US (ASCII) character set as G0.

Function: G0 is special character set
Sequence: ESC ( 0

Discussion:

Designates the special and line drawing character set as G0. The special and line drawing character set maps special character into the range from _ (5Fh) to ~ (7Eh). See the appendix on special and line drawing character set for a table of these characters.

Function: G1 is UK character set
Sequence: ESC ) A

Discussion:

Designates the UK character set as G1. The only difference between the UK and US character set is that the # (23h) character is mapped to the UK pound sign.

Function: G1 is US character set
Sequence: ESC ) B

Discussion:

Designates the US (ASCII) character set as G1.

Function: G1 is special character set
Sequence: ESC ) 0

Discussion:

Designates the special and line drawing character set as G1. The special and line drawing character set maps special character into the range from _ (5Fh) to ~ (7Eh). See the appendix on special and line drawing character set for a table of these characters.

Function: G1 character set select
Sequence: SO (0Eh)

Discussion:

Select the G1 character set.

Function: G0 character set select
Sequence: SI (0Fh)

Discussion:

Select the G0 character set.

### 7.3.7 Character attributes

Character attributes allow you to highlight characters on the screen. Any number of character attributes can be active at one time. After a character attributes command has been received all characters will be displayed in that attribute no matter where you move the cursor.

Function: No attributes
Sequence: ESC [ 0 m

Discussion:

Turn off all attributes.

Function: Bold
Sequence: ESC [ 1 m

Discussion:

All futher characters are displayed with increased intensity.

Function: Underline
Sequence: ESC [ 4 m

Discussion:

All further characters are displayed with underlining.

Function: Blink
Sequence: ESC [ 5 m

Discussion:

All further characters are displayed blinking.

Function: Reverse video
Sequence: ESC [ 7 m

Discussion:

All further characters are displayed in reverse video.

### 7.3.8 Scrolling region

Function: Set top and bottom margins
Sequence: ESC [ Pt ; Pb r

Discussion:

Set the top and bottom margins of the scrolling region to Pt and Pb respectively. If a LF or index sequence is received and the cursor is on the bottom margin the text in the scrolling region is scrolled up. If a reverse index sequence is received and the cursor is on the top margin the text in the scrolling region is scrolled down. In either case the rest of the text on the screen is uneffected. By setting relative origin the cursor can be forced to remain within the scrolling region.

### 7.3.9 Cursor movement

Function: Cursor up
Sequence: ESC [ Pn A

Discussion:

Moves the cursor Pn lines up relative to it's current position.

Example:

```
ESC [ 2 B          ; Cursor moves down 2 lines
ESC [ 3 C          ; Cursor moves right 3 columns
ESC [ 2 A          ; Cursor moves up 2 lines
ESC [ 3 D          ; Cursor ends up where it
                   ; started
```

Function: Cursor down
Sequence: ESC [ Pn B

Discussion:

Moves the cursor Pn lines down relative to it's current position.

Example:

See cursor up

Function: Cursor right
Sequence: ESC [ Pn C

Discussion:

Moves the cursor Pn columns right relative to it's current position.

Example:

See cursor up

Function: Cursor left
Sequence: ESC [ Pn D

Discussion:

Moves the cursor Pn columns left relative to it's current position.

Example:

See cursor up

Function: Cursor position
Sequence: ESC [ Pl ; Pc H

Discussion:

Moves the cursor to line Pl and column Pc.

Example:

```
ESC [ 1 0 ; 5 H      ; Move cursor to line 10,
                     ; column 5
```

Function: Horizontal and vertical position
Sequence: ESC [ Pl ; Pc f

Discussion:

Identical to cursor position function.

Function: Index
Sequence: ESC D

Discussion:

Identical to cursor down except that if the cursor is on the bottom margin the screen will scroll up.

Function: Reverse index
Sequence: ESC M

Discussion:

Identical to cursor up except that if the cursor is on the top margin the screen will scroll down.

Function: Next line
Sequence: ESC E

Discussion:

Move the cursor to the next line, column 1.

Function: Save cursor and attributes
Sequence: ESC 7

Discussion:

Save the current cursor postion, all attributes, character set and origin mode selection. If more that one save is performed before a restore, the last saved values will be used.

Function: Restore cursor and attributes
Sequence: ESC 8

Discussion:

Restore saved cursor position, attributes, character set and origin mode. If no save has been performed the cursor moves to home position, and other parameters are unaffected.

### 7.3.10 Horizontal tabulation

When an HT is received the cursor is moved to the next tab stop to the right of the current position. If no tab stop is set to the right of the current position the cursor moves to the right margin. Tab stops may be set at any column.

When in edit mode with erase mode reset set, a HT (unprotected) causes the cursor to move to the next tabulation setting or beginning of next unprotected field or end of line, whichever is found first.

Function: Set tab at current column
Sequence: ESC H

Discussion:

Set a tab stop at the column of the current cursor position.

Function: Clear tab at current column
Sequence: ESC [ 0 g

Discussion:

Clear the tab stop at the column of the current cursor position if one is set. Else, no action.

Function: Clear all tabs
Sequence: ESC [ 3 g

Discussion:

Clear all tab stops. This command should be given before setting up new horizontal tabulation to make sure all old tab stops are cleared.

### 7.3.11 Line attributes

Line attributes effect the entire line of the current cursor position. They are used to change the size of the characters displayed on the line. If the line is erased with any variation of the erase screen command the line attribute reverts to single high, single wide.

Function: Double high top half
Sequence: ESC # 3

Discussion:

Sets the line defined by the current cursor position to be the top half of a double high line. A line in this mode can display only 40 or 66 columns of characters depending on whether 80 or 132 column mode is selected.

Example:

```
H i SP T h e r e     ; "Hi There" on first line
H i SP T h e r e     ; "Hi There" on second line
ESC [ H              ; Home cursor
ESC # 3             ; First line double high,
                     ; top half
LF                   ; Move to second line
ESC # 4             ; Second line double
                     ; high, bottom half
ESC [ H              ; Home cursor
ESC # 5             ; First line to single
                     ; high, single wide
ESC # 6             ; Second line to single
                     ; high, double wide
```

Function: Double high bottom half
Sequence: ESC # 4

Discussion:

Set the line defined by the current cursor position to be the bottom half of a double high line. A line in this mode can display only 40 or 66 columns of characters depending on whether 80 or 132 column mode is selected.

Example:

See double high top half.

Function: Single wide single high
Sequence: ESC # 5

Discussion:

Set the line defined by the current cursor position to be single high, single wide. This is the default setting for all lines

Example:

See double high top half.

Function: Double wide single high
Sequence: ESC # 6

Discussion:

Set the line defined by the current cursor position to be single high, double wide. A line in this mode can display only 40 or 66 columns of characters depending on whether 80 or 132 column mode is selected.

Example:

See double high top half.

### 7.3.12 Erasing

Function: Erase from cursor to end of line
Sequence: ESC [ 0 K

Discussion:

Erases from the current cursor position to the end of the line.

Example:

```
H i SP T h e r e     ; "Hi there"
ESC [ 5 D            ; Cursor appears on the "T"
ESC [ 0 K            ; "There" is erased
ESC [ 1 K            ; "Hi " is erased
```

Function: Erase from start of line to cursor
Sequence: ESC [ 1 K

Discussion:

Erases from the start of the line to the current cursor position.

Example:

See erase from cursor to end of line

Function: Erase entire line
Sequence: ESC [ 2 K

Discussion:

Erases the entire line that the cursor is on.

Example:

```
H i SP T h e r e     ; "Hi there"
ESC [ 2 K            ; Entire line is erased
```

Function: Erase from cursor to end of screen
Sequence: ESC [ 0 J

Discussion:

Erases from the current cursor position to the end of the screen.

Example:

```
H i SP T h e r e     ; "Hi There" on first line
ESC E                ; Move to next line
L i n e SP 2         ; "Line 2" on second line
CR                   ; Move to start of line
ESC [ 0 J            ; Erase the second line
ESC [ 1 J            ; Erase first line
```

Function: Erase from start of screen to cursor
Sequence: ESC [ 1 J

Discussion:

Erases from the start of the screen to the current cursor position.

Example:

See erase from cursor to end of screen.

Function: Erase entire screen
Sequence: ESC [ 2 J

Discussion:

Erase the entire screen.

Example:

```
H i SP T h e r e     ; "Hi There" on first line
ESC E                ; Move to next line
L i n e SP 2         ; "Line 2 on second line
ESC [ 2 J            ; Erase the screen
```

NOTE

When in edit mode and erase mode reset (unprotected) selected, the action of the erase sequences differ. Only unprotected characters are erased.

### 7.3.13 Editing functions

Editting functions allow the host to insert or delete characters or lines at the current cursor position. The cursor position is not effected by these functions.

Function: Delete character
Sequence: ESC [ Pn P

Discussion:

Delete Pn characters to the right of the current cursor position including character at current cursor position. All characters to the right which are not deleted are moved left to fill the gap left by the deletion. Blanks are entered at the right margin with the same attributes as the last character moved left.

Example:

```
H i g h SP T h e r e; "High There"
ESC 1 ; 3 H          ; Cursor appears over the "g"
ESC [ 2 P            ; Delete the "gh"
```

NOTE

When in edit mode and erase mode reset (unprotected) selected, deletes Pn characters to the right of current cursor position (only if cursor is currently on an unprotected field). All characters to the right (which are not deleted) to the end of the unprotected field, are moved left to fill the gap caused by deletion and spaces added to the right to end of field.

Function: Insert line
Sequence: ESC [ Pn L

Discussion:

Insert Pn lines at the current cursor line. Current line and all lines below it are moved down. Any lines which get pushed past the bottom margin are lost. This sequence is ignored outside the scrolling region.

Example:

```
ESC [ 1 ; 6 r          ; Set up 6 line scrolling
                       ; region
L i n e SP 1           ; "Line 1" on first line
ESC E                  ; Move to next line
L i n e SP 2           ; "Line 2" on second line
ESC E                  ; Move to next line
L i n e SP 3           ; "Line 3" on third line
ESC E                  ; Move to next line
L i n e SP 4           ; "Line 4" on forth line
ESC [ 2 ; 6 H          ; Position cursor over "2"
ESC [ 3 L              ; Insert 3 lines, "Line 4"
                       ; disappears
ESC [ 3 M              ; Delete 3 lines
```

NOTE

When in edit mode and erase mode reset (unprotected) selected, insert Pn lines at current cursor line. Lines starting current line and ending Pn lines above line containing a protected field below are moved down Pn lines. Pn lines at the bottom are lost. Inserted lines are cleared. No lines inserted if cursor currently on a line with protected field(s).

Function: Delete line
Sequence: ESC [ Pn M

Discussion:

Delete Pn lines at the current cursor line. As a line is deleted all lines below it move up. This sequence is ignored outside the scrolling region.

Example:

See insert line.

NOTE

When in edit mode and erase mode reset (unprotected) selected, delete Pn lines starting current cursor line. Lines starting Pn lines below current cursor line and ending at a line with a protected field are moved up Pn lines and Pn blank lines are inserted at the bottom.

### 7.3.14 Printer control

Printer control sequences allow you to send characters to the AUX port on the HiREZ 100XL. The characters can either come from the host or the screen depending on which sequence you use. When characters come from the screen the only non-printable characters which are transmitted to the printer are CR, LF, FF, and SP. Any printer operation can be aborted by entering SETUP.

Function: Enter auto print
Sequence: ESC [ ? 5 i

Discussion:

When in auto print mode a display line is transmitted to the AUX 1 port when the cursor moves off the line due to a LF, VT, FF, or auto wrap.

Function: Exit auto print
Sequence: ESC [ ? 4 i

Discussion:

Exit auto print mode.

Function: Enter printer controller AUX 1 port
Sequence: ESC [ 5 i

Discussion:

When the printer controller is active all characters are transmitted to the AUX 1 port without displaying them on the screen. No characters are eaten by the HiREZ 100XL except for a NUL.

Function: Enter printer controller AUX 2 port
Sequence: ESC [ > 5 i

Discussion:

When the printer controller is active all characters are transmitted to the AUX 2 port without displaying them on the screen. No characters are eaten by the HiREZ 100XL except for a NUL.

Function: Exit printer controller
Sequence: ESC [ 4 i

Discussion:

Exit the printer controller.

Function: Print screen
Sequence: ESC [ i

Discussion:

Print either the whole screen or just the scrolling region (via AUX 1 port) depending on whether print full screen or print scrolling region is selected.

Function: Print cursor line
Sequence: ESC [ ? 1 i

Discussion:

Print the current cursor position line (via AUX 1 port). The cursor does not move.

### 7.3.15 Device reports

Device reports are used by system software to determine the status of various aspects of the HiREZ 100XL.

Function: Transmit answerback
Sequence: ENQ

Discussion:

Transmit the answerback message to the host. The answerback message can be programmed from SETUP.

Function: HiREZ status report
Sequence: ESC [ 5 n

Discussion:

Enquiry the terminal as to whether it has passed the power up reset self test. This sequence is of limited utility because if the HiREZ 100XL cannot pass the self test it will typically be unable to communicate with the host.

Function: HiREZ is OK
Sequence: ESC [ 0 n

Discussion:

This is the terminal's response to the HiREZ status report if it has successfully passed the power up reset self test.

Function: HiREZ is not OK
Sequence: ESC [ 3 n

Discussion:

This is the terminal's response to the HiREZ status report if it has not passed the power up reset self test.

Function: Cursor position report
Sequence: ESC [ 6 n

Discussion:

Enquiry the terminal for the current alpha cursor position.

Function: Cursor position
Sequence: ESC [ Pl ; Pc R

Discussion:

This is the terminal's response to the cusor postion report. Pl and Pc are the cursor line and column respectively.

Function: Printer status report
Sequence: ESC [ ? 1 5 n

Discussion:

Enquiry the terminal for the status of the printer.

Function: Printer ready
Sequence: ESC [ ? 1 0 n

Discussion:

This is the terminal's response to the printer status report if a printer is connected to the HiREZ 100XL and is ready to receive data.

Function: Printer not ready
Sequence: ESC [ ? 1 1 n

Discussion:

This is the terminal's response to the printer status report if a printer is connected to the HiREZ 100XL but is not ready to receive data.

Function: No printer
Sequence: ESC [ ? 1 2 n

Discussion:

This is the terminal's response to the printer status report if no printer is connected to the HiREZ 100XL.

Function: Identify terminal
Sequence: ESC [ 0 c

Discussion:

Enquiry the terminal for what type of terminal it is. This sequence is used by system software to automatically determine the type of terminal on a specific serial communications line.

Function: We are VT102
Sequence: ESC [ ? 6 c

Discussion:

This is the terminal's response to the identify terminal enquiry. It identifies the HiREZ 100XL as a VT102 so system software will be able to talk to it correctly.

Function: Report user defined key status
Sequence: ESC ? 2 5 n

Discussion:

Enquiry the terminal for the current lock/unlock status of the user defined keys.

Function: User defined keys locked
Sequence: ESC ? 2 0 n

Discussion:

This is the terminal's response to the report user defined key status enquiry if the user key definitions are locked.

Function: User defined keys unlocked
Sequence: ESC ? 2 1 n

Discussion:

This is the terminal's response to the report user defined key status enquiry if the user key definitions are unlocked.

Function: Report free space for user defined keys
Sequence: ESC ? 2 6 n

Discussion:

Enquiry the terminal for the number of characters that can still be programmed in the user defined key area.

Function: Free space for user defined keys
Sequence: ESC ? Pn n

Discussion:

This is the terminal's response to the report free space enquiry. Pn is the number of characters that can still be programmed in the user defined key area.

Enquiry the terminal for the current digitizer co-ordinates. The terminal responds with a 5 byte sequence followed by a carriage return. Refer to section on input devices for data format.

### 7.3.16 Edit Mode Sequences

Function: Request to transmit
Sequence: ESC S

Discussion:

In edit mode, when SHIFT ENTER (or RETURN key with line transmit ON selected) is typed and transmit execution deferred selected, the terminal sends the sequence ESC S to the host requesting to transmit a block of text.

Function: Transmit to host
Sequence: ESC 5

Discussion:

When in edit mode, the terminal transmits the screen (or a line of text if line transmit selected) or receipt of this sequence from the host.

Function: Protected field attributes OFF
Sequence: ESC 0 } or ESC 2 5 4 }

Discussion:

Select all attributes OFF protection in edit mode.

Function: Bold protected attribute
Sequence: ESC [ 1 }

Discussion:

Select bold as protected attribute in edit mode.

Function: Underline protected attribute
Sequence: ESC [ 4 }

Discussion:

Select underline as protected attribute in edit mode.

Function: Blink protected attribute
Sequence: ESC [ 5 }

Discussion:

Select blink as protected attribute in edit mode.

Function: Reverse video protected attribute
Sequence: ESC [ 7 }

Discussion:

Protected attribute in edit mode.

Function: Transmit termination character NONE
Sequence: ESC [ 0 |

Discussion:

No termination character transmitted to the host at the end of the block of text in edit mode.

Function: Transmit termination character ETX
Sequence: ESC [ 2 |

Discussion:

An ETX (03h, end of text) character is transmitted to the host at the end of a block of text in edit mode.

Function: Beginning of transmission character NONE
Sequence: ESC [ ? 0 |

Discussion:

No character is transmitted to the host at the beginning of a block of text in edit mode.

Function: Beginning of transmission character STX
Sequence: ESC [ ? 2 |

Discussion:

An STX (02h, start of text) character is transmitted to the host at the beginning of a block of text in edit mode.

### 7.3.17 Reset

Function: Reset to power up state
Sequence: ESC c

Discussion:

Perform a power up reset.

NOTE

After a power up reset at least 10 seconds must elapse before the HiREZ 100XL is able to receive further commands. Any commands received before 10 seconds have elapsed will most probably be ignored or garbled.

### 7.3.18 Self test

Function: Screen alignment
Sequence: ESC # 8

Discussion:

Fill the screen with E's. This is used by the factory to adjust the monitor.

Function: Linearity display
Sequence: ESC # 9

Discussion:

Draw the linearity adjustment pattern on the screen. Any character typed after this sequence will advance the characters in the display. SHIFT Q exits this display. On exit the terminal is left in 48 line, 132 column mode. This is used by the factory to adjust the monitor.

Function: Power up self test
Sequence: ESC [ 2 ; 1 y

Discussion:

Execute a power up self test.

Function: CPU data loopback test
Sequence: ESC [ 2 ; 2 y

Discussion:

This test will only operate if pins 2 and 3 on the EIA connector are tied together and terminal is on-line. It cycles through all baud rate, data bit, stop bit, and parity settings transmitting and receiving the entire 7 bit ASCII character set at each setting. The visible characters are displayed as the are received.

Function: Continuous power up self test
Sequence: ESC [ 2 ; 9 y

Discussion:

Perform the power up self test continuously until either failure or power off.

NOTE

Pins 2 and 3 (send and receive) must be connected for these tests. Also, for AUX port tests, tie pin 20 (DTR) to +12V, which is available on CPU port pin 20.

Function: Continuous CPU data loopback test
Sequence: ESC [ 2 ; 1 0 y

Discussion:

Perform the CPU data loopback test continuously until either failure or power off. See previous note.

Function: AUX 1 data loopback test
Sequence: ESC [ 2 ; 1 6 y

Discussion:

Same as the CPU data loopback test except that the AUX 1 port is used instead of the CPU port.

Function: AUX 2 data loopback test
Sequence: ESC [ 2 ; 1 7 y

Discussion:

Same as the CPU data loopback test except that the AUX 2 port is used instead of the CPU port.

Function: Continuous AUX 1 data loopback test
Sequence: ESC [ 2 ; 2 4 y

Discussion:

Perform the AUX 1 data loopback test continuously until either failure or power off. See previous note.

Function: Continuous AUX 2 data loopback test
Sequence: ESC [ 2 ; 2 5 y

Discussion:

Perform the AUX 2 data loopback test continuously until either failure or power off. See previous note.

Function: Screen and graphics RAM test
Sequence: ESC [ 2 ; 5 0 y

Discussion:

Perform screen RAM and graphics RAM test. Reports any failures and the size of dynamic memory available for vector storage for graphics and pan and zoom.

Function: Continuous loopback and RAM test
Sequence: ESC [ 2 ; 5 3 y

Discussion:

Perform CPU loopback test, AUX 1 loopback test, AUX loopback test, and screen RAM tests continuously until failure or power OFF.

NOTE

All loopback tests require loopback connectors connected (pins 2 and 3 tied together) at the ports.

### 7.3.19 Video Controls

Function: Turn OFF text video
Sequence: ESC [ > 0 t

Discussion:

The text (ANSI) screen video is turned OFF. Screen updates and editing can be performed with video turned OFF.

Function: Turn ON text video
Sequence: ESC [ > 1 t

Discussion:

The text (ANSI) screen video is turned ON.

Function: Turn OFF graph video
Sequence: ESC [ > 0 g
ESC [ < 0 g

Discussion:

The graphics video is turned OFF.

Function: Turn ON graph video
Sequence: ESC [ > 1 g

Discussion:

The graph video is turned ON.

### 7.3.20 Miscellaneous single character commands

Function: Ring bell
Sequence: BEL

Discussion:

Ring the terminal bell.

Function: Move left
Sequence: BS

Discussion:

Move the cursor left one column. If cursor is at left margin then no action is performed.

Function: Move to next tab stop
Sequence: HT

Discussion:

Move to next tab stop to the right of the cursor. If no tab stops are set to the right of the cursor then move to right margin.

Function: Do linefeed action
Sequence: LF, VT, or FF

Discussion:

If newline is off then move to next line, same column. If newline is on then move to next line, column 1. In either case, if at the bottom margin then scroll screen up.

Function: Move to left margin
Sequence: CR

Discussion:

Move to left margin.

Function: Cancel sequence
Sequence: CAN or SUB

Discussion:

If in the middle of a command sequence then cancel the sequence. Else, no action.

## 7.4 Summary of ANSI mode sequences

Mode switching

| Function | Sequence |
|---|---|
| Enter 4014 mode | ESC 1 |
| Enter VT52 mode | ESC [ ? 2 1 |
| Enter edit mode | ESC [ ? 10 h |

Define user keys

| Function | Sequence |
|---|---|
| Define user key | ESC P Pc ; Pl |

Set mode

| Function | Sequence |
|---|---|
| Guarded area transmit ALL | ESC [ 1 h |
| Keyboard lock | ESC [ 2 h |
| Insert on | ESC [ 4 h |
| Erase mode ALL | ESC [ 6 h |
| Local echo off | ESC [ 1 2 h |
| Newline on | ESC [ 2 0 h |
| 48 lines | ESC [ ? 0 h |
| Application arrow keys | ESC [ ? 1 h |
| 132 columns | ESC [ ? 3 h |
| Relative Origin | ESC [ ? 6 h |
| Auto wrap ON | ESC [ ? 7 h |
| Auto repeat ON | ESC [ ? 8 h |
| Line transmit ON | ESC [ ? 1 1 h |
| Space Compression ON | ESC [ ? 1 3 h |
| Transmit execution immediate | ESC [ ? 1 4 h |
| Edit key execution immediate | ESC [ 1 6 h |
| Print formfeed ON | ESC [ ? 1 8 h |
| Print full screen | ESC [ ? 1 9 h |

Reset mode

| Function | Sequence |
|---|---|
| Guarded area transmit | ESC [ 1 1 |
| Keyboard unlock | ESC [ 2 1 |
| Replace on | ESC [ 4 1 |
| Erase mode unprotected | ESC [ 6 1 |
| Local echo on | ESC [ 1 2 1 |
| Newline OFF | ESC [ 2 0 1 |
| 24 lines | ESC [ ? 0 1 |
| Normal arrow keys | ESC [ ? 1 1 |
| 80 columns | ESC [ ? 3 1 |
| Absolute origin | ESC [ ? 6 1 |
| Auto wrap OFF | ESC [ ? 7 1 |
| Auto repeat OFF | ESC [ ? 8 1 |
| Exit edit mode/select interactive mode | ESC [ ? 1 0 1 |
| Line transmit OFF | ESC [ ? 1 1 1 |
| Space compression OFF | ESC [ ? 1 3 1 |
| Transmit execution deferred | ESC [ ? 1 4 1 |
| Edit key execution deferred | ESC [ ? 1 6 1 |
| Print form feed OFF | ESC [ ? 1 8 1 |
| Print scrolling region | ESC [ ? 1 9 1 |

Keypad mode

| Function | Sequence |
|---|---|
| Enter application keypad mode | ESC = |
| Exit application keypad mode | ESC > |

Character sets

| Function | Sequence |
|---|---|
| G0 is UK character set | ESC ( A |
| G0 is US character set | ESC ( B |
| G0 is special character set | ESC ( 0 |
| G1 is UK character set | ESC ) A |
| G1 is US character set | ESC ) B |
| G1 is special character set | ESC ) 0 |
| G1 character set select | SO (0Eh) |
| G0 character set select | SI (0Fh) |

## Character attributes

| Function | Sequence |
|---|---|
| No attributes | ESC [ 0 m |
| Bold | ESC [ 1 m |
| Underline | ESC [ 4 m |
| Blink | ESC [ 5 m |
| Reverse video | ESC [ 7 m |

## Scrolling region

| Function | Sequence |
|---|---|
| Set top and bottom margins | ESC [ Pt ; Pb r |

## Cursor movement

| Function | Sequence |
|---|---|
| Cursor up | ESC [ Pn A |
| Cursor down | ESC [ Pn B |
| Cursor right | ESC [ Pn C |
| Cursor left | ESC [ Pn D |
| Cursor position | ESC [ Pl ; Pc H |
| Horizontal and vertical position | ESC [ Pl ; Pc f |
| Index | ESC D |
| Reverse index | ESC M |
| Next line | ESC E |
| Save cursor and attributes | ESC 7 |
| Restore cursor and attributes | ESC 8 |
| Set tab at current column | ESC H |
| Clear tab at current column | ESC [ 0 g |
| Clear all tabs | ESC [ 3 g |

## Line attributes

| Function | Sequence |
|---|---|
| Double high top half | ESC # 3 |
| Double high bottom half | ESC # 4 |
| Single wide single high | ESC # 5 |
| Double wide single high | ESC # 6 |

## Erasing

| Function | Sequence |
|---|---|
| Erase from cursor to end of line | ESC [ 0 K |
| Erase from start of line to cursor | ESC [ 1 K |
| Erase entire line | ESC [ 2 K |
| Erase from cursor to end of screen | ESC [ 0 J |
| Erase from start of screen to cursor | ESC [ 1 J |
| Erase entire screen | ESC [ 2 J |

## Editing functions

| Function | Sequence |
|---|---|
| Delete character | ESC [ Pn P |
| Insert line | ESC [ Pn L |
| Delete line | ESC [ Pn M |

## Printer control

| Function | Sequence |
|---|---|
| Enter auto print | ESC [ ? 5 i |
| Exit auto print | ESC [ ? 4 i |
| Enter printer controller AUX 1 port | ESC [ 5 i |
| Enter printer controller AUX 2 port | ESC [ > 5 i |
| Exit printer controller | ESC [ 4 i |
| Print screen | ESC [ i |
| Print cursor line | ESC [ ? 1 i |

## Device reports

| Function | Sequence |
|---|---|
| Transmit answerback | ENQ |
| HiREZ status report | ESC [ 5 n |
| HiREZ is OK | ESC [ 0 n |
| HiREZ is not OK | ESC [ 3 n |
| Cursor position report | ESC [ 6 n |
| Cursor position | ESC [ Pl ; Pc R |
| Printer status report | ESC [ ? 1 5 n |
| Printer ready | ESC [ ? 1 0 n |
| Printer not ready | ESC [ ? 1 1 n |
| No printer | ESC [ ? 1 2 n |
| Identify terminal | ESC [ 0 c |
| We are VT102 | ESC [ ? 6 c |
| Report user defined key status | ESC ? 2 5 n |
| User defined keys locked | ESC ? 2 0 n |
| User defined keys unlocked | ESC ? 2 1 n |
| Report free space for user defined keys | ESC ? 2 6 n |
| Free space for user defined keys | ESC ? Pn n |

## Edit Mode Sequences

| Function | Sequence |
|---|---|
| Request to transmit | ESC S |
| Transmit to host | ESC 5 |
| Protected field attributes OFF | ESC 0 } or ESC 2 5 4 } |
| Bold protected attribute | ESC [ 1 } |
| Underline protected attribute | ESC [ 4 } |
| Blink protected attribute | ESC [ 5 } |
| Reverse video protected attribute | ESC [ 7 } |
| Transmit termination character NONE | ESC [ 0 \| |
| Transmit termination character ETX | ESC [ 2 \| |
| Beginning of transmission character NONE | ESC [ ? 0 \| |
| Beginning of transmission character STX | ESC [ ? 2 \| |

## Reset

| Function | Sequence |
|---|---|
| Reset to power up state | ESC c |

## Self test

| Function | Sequence |
|---|---|
| Screen alignment | ESC # 8 |
| Linearity display | ESC # 9 |
| Power up self test | ESC [ 2 ; 1 y |
| CPU data loopback test | ESC [ 2 ; 2 y |
| Continuous power up self test | ESC [ 2 ; 9 y |
| Continuous CPU data loopback test | ESC [ 2 ; 1 0 y |
| AUX 1 data loopback test | ESC [ 2 ; 1 6 y |
| AUX 2 data loopback test | ESC [ 2 ; 1 7 y |
| Continuous AUX 1 data loopback test | ESC [ 2 ; 2 4 y |
| Continuous AUX 2 data loopback test | ESC [ 2 ; 2 5 y |
| Screen and graphics RAM test | ESC [ 2 ; 5 0 y |
| Continuous loopback and RAM test | ESC [ 2 ; 5 3 y |
| Turn OFF text video | ESC [ > 0 t |
| Turn ON text video | ESC [ > 1 t |
| Turn OFF graph video | ESC [ > 0 g |
| Turn ON graph video | ESC [ > 1 g |

Miscellaneous single character commands

| Function | Sequence |
|---|---|
| Ring bell | BEL |
| Move left | BS |
| Move to next tab stop | HT |
| Do linefeed action | LF, VT, or FF |
| Move to left margin | CR |
| Cancel sequence | CAN or SUB |

# CHAPTER 8

## VT52 mode

VT52 mode is included in the HiREZ 100XL to provide compatibility with existing DEC software.

NOTE

Since ANSI mode is much more flexible and efficient than VT52 mode, SELANAR strongly suggests that all new alphanumeric application software be written using ANSI mode.

## 8.1 Sequence description

VT52 mode control sequences are a single control character or ESC followed by a single character. No possibility of specifying multiple value parameters is provided. The exception to this rule is the cursor position command which encodes the line and column into two ASCII characters following the escape sequence.

## 8.2 Error handling

If an unknown character is encountered after an ESC no action is performed.

## 8.3 VT52 mode sequences

### 8.3.1 Mode switching

Function: Enter ANSI mode
Sequence: ESC <

Discussion:

Enter ANSI mode from VT52 mode.

Function: Enter 4014 mode
Sequence: ESC 1

Discussion:

Enter 4014 mode from VT52 mode.

### 8.3.2 Keypad mode

Function: Enter application keypad mode
Sequence: ESC =

Discussion:

When application keypad mode is selected the numeric keypad will generate application sequences instead of the normal characters. Sequences generated are:

**Figure 8-1 VT52 application keypad sequences**

| Key | Sequence |
|---|---|
| ENTER | ESC ? M |
| , | ESC ? l |
| - | ESC ? m |
| . | ESC ? n |
| 0 | ESC ? p |
| 1 | ESC ? q |
| 2 | ESC ? r |
| 3 | ESC ? s |
| 4 | ESC ? t |
| 5 | ESC ? u |
| 6 | ESC ? v |
| 7 | ESC ? w |
| 8 | ESC ? x |
| 9 | ESC ? y |

NOTE

Although the PF keys are right above the numeric keypad, for the purposes of this discussion they are not part of it.

Function: Exit application keypad mode
Sequence: ESC >

Discussion:

Numeric keypad keys generate the characters that are printed on the keys. The ENTER key generates the same characters as the RETURN key.

### 8.3.3 Character sets

Function: Select G1 character set
Sequence: ESC F

Discussion:

Select the special character and line drawing set for characters in the range _ (5Fh) to ~ (7Eh).

Function: Select G0 character set
Sequence: ESC G

Discussion:

Select the standard ASCII character set for characters in the range _ (5Fh) to ~ (7Eh).

### 8.3.4 Cursor movement

Function: Cursor up
Sequence: ESC A

Discussion:

Moves the cursor 1 line up relative to it's current position.

Example:

```
ESC B          ; Cursor moves down 1 line
ESC C          ; Cursor moves right 1 column
ESC A          ; Cursor moves up 1 line
ESC D          ; Cursor ends up where it
               ; started
```

Function: Cursor down
Sequence: ESC B

Discussion:

Moves the cursor 1 line down relative to it's current position.

Example:

See cursor up

Function: Cursor right
Sequence: ESC C

Discussion:

Moves the cursor 1 column right relative to it's current position.

Example:

See cursor up

Function: Cursor left
Sequence: ESC D

Discussion:

Moves the cursor 1 column left relative to it's current position.

Example:

See cursor up

Function: Cursor position
Sequence: ESC Y Pl Pc

Discussion:

Moves the cursor to line Pl and column Pc. Pl and Pc are single ASCII characters whose value is the line or column to go to plus 1Fh. For example, to go to line 1 column 8 Pl is SP (20h) and Pc is ' (27h).

Function: Reverse index
Sequence: ESC I

Discussion:

Identical to cursor up except that if the cursor is on the top margin the screen will scroll down.

### 8.3.5 Erasing

Function: Erase to end of line
Sequence: ESC K

Discussion:

Erase from current cursor position to the end of the line.

Function: Erase to end of screen
Sequence: ESC J

Discussion:

Erase from current cursor position to the end of the screen.

### 8.3.6 Printer control

Printer control sequences allow you to send characters to the AUX port on the HiREZ-100XL. The characters can either come from the host or the screen depending on which sequence you use. When characters come from the screen the only non-printable characters which are transmitted to the printer are CR, LF, FF, and SP. Any printer operation can be aborted by entering SETUP.

Function: Enter auto print
Sequence: ESC ^

Discussion:

When in auto print mode a display line is transmitted to the AUX port when the cursor moves off the line due to a LF, VT, FF, or auto wrap.

Function: Exit auto print
Sequence: ESC -

Discussion:

Exit auto print mode.

Function: Enter printer controller
Sequence: ESC W

Discussion:

When the printer controller is active all characters are transmitted to the AUX port without displaying them on the screen. No characters are eaten by the HiREZ-100XL except for a NUL.

Function: Exit printer controller
Sequence: ESC X

Discussion:

Exit the printer controller.

Function: Print screen
Sequence: ESC ]

Discussion:

Print either the whole screen or just the scrolling region depending on whether print full screen or print scrolling region is selected.

Function: Print cursor line
Sequence: ESC V

Discussion:

Print the current cursor position line. The cursor does not move.

### 8.3.7 Device reports

Device reports are used by system software to determine the status of various aspects of the HiREZ-100XL.

Function: Transmit answerback
Sequence: ENQ

Discussion:

Transmit the answerback message to the host. The answerback message can be programmed from SETUP.

Function: Identify terminal
Sequence: ESC Z

Discussion:

Enquiry the terminal for what type of terminal it is. This sequence is used by system software to automatically determine the type of terminal on a specific serial communications line.

Function: We are VT52
Sequence: ESC / Z

Discussion:

This is the terminal's response to the identify terminal enquiry. It identifies the HiREZ-100XL as a VT52 so system software will be able to talk to it correctly.

### 8.3.8 Miscellaneous single character commands

Function: Ring bell
Sequence: BEL

Discussion:

Ring the terminal bell.

Function: Move left
Sequence: BS

Discussion:

Move the cursor left one column. If cursor is at left margin then no action is performed.

Function: Move to next tab stop
Sequence: HT

Discussion:

Move to next tab stop to the right of the cursor. If no tab stops are set to the right of the cursor then move to right margin.

Function: Do linefeed action
Sequence: LF, VT, or FF

Discussion:

If newline is off then move to next line, same column. If newline is on then move to next line, column 1. In either case, if at the bottom margin then scroll screen up.

Function: Move to left margin
Sequence: CR

Discussion:

Move to left margin.

Function: Cancel sequence
Sequence: CAN or SUB

Discussion:

If in the middle of a command sequence then cancel the sequence. Else, no action.

## 8.4 Summary of VT52 mode sequences

Mode switching

| Function | Sequence |
|---|---|
| Enter ANSI mode | ESC < |
| Enter 4014 mode | ESC 1 |

Keypad mode

| Function | Sequence |
|---|---|
| Enter application keypad mode | ESC = |
| Exit application keypad mode | ESC > |

Character sets

| Function | Sequence |
|---|---|
| Select G1 character set | ESC F |
| Select G0 character set | ESC G |

Cursor movement

| Function | Sequence |
|---|---|
| Cursor up | ESC A |
| Cursor down | ESC B |
| Cursor right | ESC C |
| Cursor left | ESC D |
| Cursor position | ESC Y Pl Pc |
| Reverse index | ESC I |

Erasing

| Function | Sequence |
|---|---|
| Erase to end of line | ESC K |
| Erase to end of screen | ESC J |

Printer control

| Function | Sequence |
|---|---|
| Enter auto print | ESC ^ |
| Exit auto print | ESC - |
| Enter printer controller | ESC W |
| Exit printer controller | ESC X |
| Print screen | ESC ] |
| Print cursor line | ESC V |

Device reports

| Function | Sequence |
|---|---|
| Transmit answerback | ENQ |
| Identify terminal | ESC Z |
| We are VT52 | ESC / Z |

Miscellaneous single character commands

| Function | Sequence |
|---|---|
| Ring bell | BEL |
| Move left | BS |
| Move to next tab stop | HT |
| Do linefeed action | LF, VT, or FF |
| Move to left margin | CR |
| Cancel sequence | CAN or SUB |

# CHAPTER 9

## 4014 mode

4014 mode emulates the actions of a TEKTRONIX 4014 terminal with the enhanced graphics module. Any differences between the actions of the HiREZ 100XL in 4014 mode and a TEKTRONIX 4014 are enumerated in the section on unimplemented 4014 features.

4014 mode is intended for graphics work, not advanced alphanumeric editting. Only rudimentary alpha functions such as cursor positioning are provided. Since a 4014 is a storage tube device, individual characters cannot be erased without erasing the entire screen. The HiREZ 100XL emulates this feature (some 4014 software requires that the character cell cannot be individually erased). If you wish to do primarily alphanumeric work SELANAR strongly suggests that you use ANSI or VT52 modes.

SELANAR does not suggest that the HiREZ 100XL can be a replacement for a 4014. It is a low cost alternative that has most of the functionality of a 4014 with reduced resolution and a smaller screen.

## 9.1 Alpha submode

Alpha mode displays characters in the range SP (20h) to ~ (7Eh). 4 seperate character sizes and 2 character sets are available to the user. All characters are drawn as a series of graphics vectors scaled to the appropriate size. This allows the pan-zoom feature to zoom in on alpha characters as well as grapics vectors since the two are really the same.

### 9.1.1 Cursor positioning

The home position for the alpha cursor is in the upper left hand corner of the screen. The cursor can be positioned by 2 methods. The first is to use cursor movement commands from a known position to get to the desired position. The second (and preferable) method uses vector graphics submode to position the graphics beam and then enters alpha submode. The alpha cursor will be positioned at the last graphics beam position.

### 9.1.2 Margins

Selecting 1 or 2 margins effects the action of the terminal when the cursor in on the bottom line and a LF is received. If 1 margin is selected the cursor wraps around to the top of the screen in the same column. If 2 margins are selected and the terminal is in the first margin, 2048 is added to the X component of the cursor address and Y component is set to the first line. This has the effect of moving the cursor to the first line in the second margin at a column that is the same distance from the second margin as the old column was from the first margin. If the terminal is in the second margin the reverse happens.

### 9.1.3 Page full break

Since the 4014 has no scrolling capability some method must be provided to view more than one page of text. A page full condition is defined as when the cursor rests on the bottom line of margin 2 (margin 1 if 1 margin enabled) and a LF is received. The terminal will beep and wait for the user to type a character on the keyboard. When the character is typed the terminal clears the screen, homes the alpha cursor, and output continues. The character that was typed is sent to the host.

## 9.2 Vector graphics submode

Vector graphics submode allows you to draw a vector between any 2 points in the virtual plot area.

### 9.2.1 Physical screen organization

The X=0, Y=0 origin is located in the lower left hand corner of the screen. Y addresses increase going up. X addresses increase going right.

### 9.2.2 Virtual screen organization

Given default origins and gains the X=0, Y=0 origin is located in the lower left hand corner of the screen. Y addresses increase going up. X addresses increase going right.

### 9.2.3 Virtual/physical translation

A 4014 screen has a dot resolution of 3120 in Y by 4096 in X. A HiREZ 100XL has a dot resolution of 780 in Y by 1024 in X. Obviously some sort of a mapping operation is performed to convert the 4014 virtual space to the HiREZ 100XL physical space.

The mapping operation is a simple 2 dimensional linear transformation. As each X and Y value is used for display it is transformed from virtual to physical space. Conversely, when a GIN response is computed a physical to virtual space transformation is performed.

The transformation equations are:

```
Xphysical = (Xvirtual+Xorigin) * Xgain
Yphysical = (Yvirtual+Yorigin) * Ygain
```

SELANAR native commands allow you to change the values of the Xorigin, Xgain, Yorigin, and Ygain internal variables. Since internal precision is only 16 bits, care must be taken in setting the origins and gains so that arithmetic overflow does not occur at any point in the calculation.

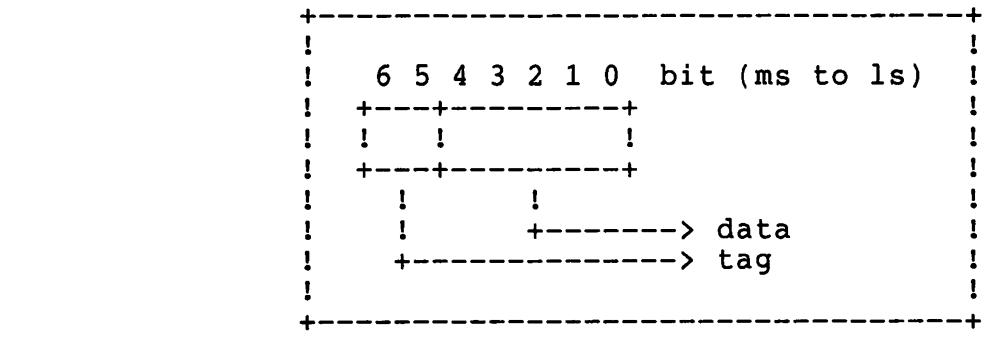
NOTE

Virtual to physical translation occurs when the value is used for display, not when the value is received. Thus all values stored in dynamic memory are virtual values.

### 9.2.4 Virtual co-ordinate specification

Virtual co-ordinates are specified using the TEKTRONIX 4010/4014 format. This format uses bit fields within ASCII characters to transmit the co-ordinate. The bit fields are:

**Figure 9-1 Graphics submode character bit fields**




The tag field defines how the data field is interpretted and is divided as follows:

**Figure 9-2 Tag bit value interpretation**

| Value | Data interpretation |
|---|---|
| 0 | Control sequence |
| 1 | High order X or Y |
| 2 | Low order X |
| 3 | Low order Y or exta byte |

A control sequence character allows you to change submodes, line types, etc. The other 3 tag values are used to specify the 12 bit virtual addresses. The 12 bit X and Y addresses are divided into the following fields:

**Figure 9-3 X address bit fields**

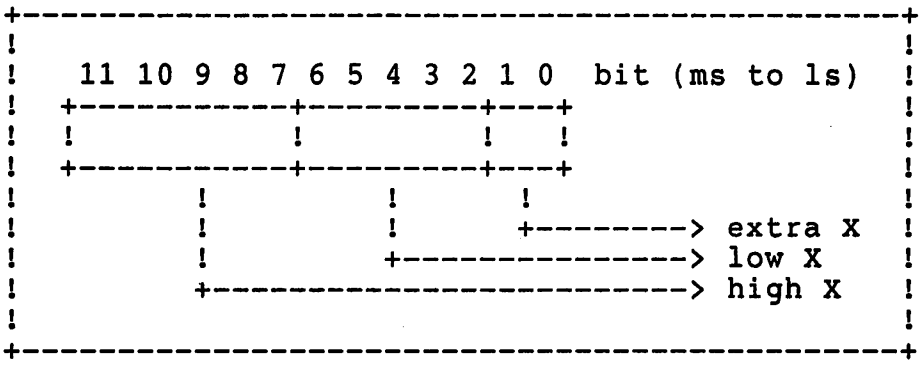
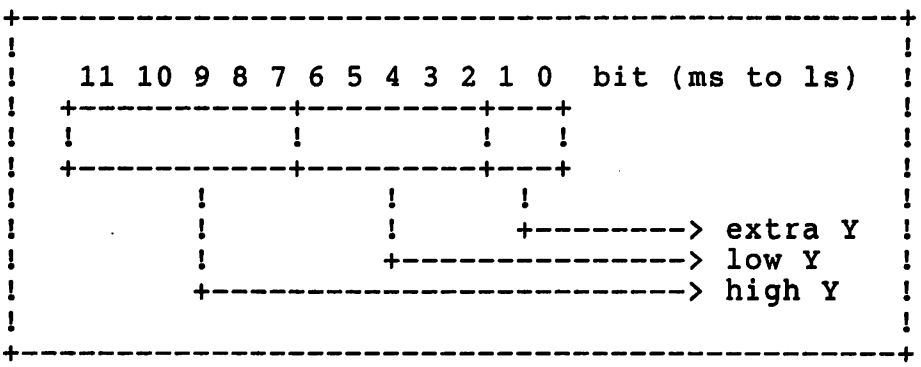
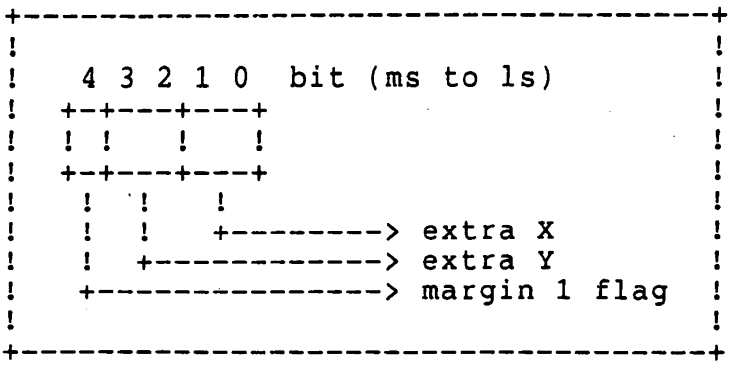



**Figure 9-4 Y address bit fields**




The high and low fields within each address are determined from the data field of the character with the correct tag bits. The 2 bit extra field within each address is decoded out of the data field of the extra byte as follows:

Figure 9-5 Extra byte bit fields




If 2 margins are enabled and the margin 1 flag bit is 1, the first margin is selected.

The observant reader will have noticed that we don't have enough bits in the tag field to select the 1 out of 5 possibilities that we need to decode high Y, low Y, high X, low X, and extra. This decoding is achieved by the order in which the bytes are sent. The order in which to send the bytes is:

<high Y> <extra> <low Y> <high X> <low X>

NOTE

For an example of how to convert numeric coordinate values to ASCII characters used in Tektronix/plot 10 type format, see application note 1, in chapter 12.

### 9.2.5 Reducing bytes sent

You need not send all 5 bytes every time you wish to specify a co-ordinate. The HiREZ 100XL internally stores each field as it is received. Thus you only need to specify fields which have changed plus enough bytes to fulfill requirement that bytes be sent in a certain order. A low X byte is always required as this is the byte which tells the parser that you have completely specified the co-ordinate. Which bytes you must send to change a given byte are summarized in the following table:

**Figure 9-6 Minimum bytes to specify a co-ordinate**

| Byte changing | Bytes to send | | | |
|---|---|---|---|---|
| | High Y | Low Y | High X | Low X |
| High Y | * | | | * |
| Extra | | * | | * |
| Low Y | | * | | * |
| High X | | * | * | * |
| Low X | | | | * |

By using this technique the number of bytes actually sent to the HiREZ 100XL to specify an average co-ordinate can be reduced by half.

## 9.3 Point plot submode

Point plot submode is identical to vector graphics submode except that as each co-ordinate is received it is plotted as a single point.

## 9.4 Incremental plot submode

Incremental plot submode allows you to move the graphics beam one virtual dot in any of 8 directions for each character received. The movement characters in incremental plot mode are:

**Figure 9-7 Incremental plot submode commands**

| Character | Action |
|---|---|
| SP | Pen up |
| P | Pen down |
| D | Go north |
| E | Go northeast |
| A | Go east |
| I | Go southeast |
| H | Go south |
| J | Go southwest |
| B | Go west |
| F | Go northwest |

Pen up indicates movement without drawing. Pen down indicates movement with drawing. North is up. East is right. South is down. West is left.

## 9.5 Cross hair submode

When cross hair submode is entered a vertical and horizontal line is displayed on the screen. The intersection of these two lines is the position of the cross hair. The position may be changed by using the arrow keys or the digits on the numeric keypad. If any other character is typed a GIN graphics response is sent to the host with the status byte being replaced with the character that was typed. Bypass submode is entered before the first character of the GIN response is sent. The GIN mode response can also be requested by a terminal enquiry (ESC ENQ).

## 9.6 Bypass submode

Bypass submode is a method of ignoring host echoes of the characters in a GIN response. When in bypass submode all characters are ignored except for BEL, LF, CR, ESC, FS, GS, RS, and US. Any of these characters will exit from bypass submode and perform the appropriate action.

## 9.7 Write through submode

Write through submode is actually a modification of all other submodes. When write through is active and an object is drawn on the graphics screen it's vectors are stored in a special write through buffer. Aproximately 1 second after each vector was first drawn it is erased. This feature is used on a 4014 for display of data that must be updated constantly without total screen erasure. It is also useful for animation of objects that contain a small number of vectors.

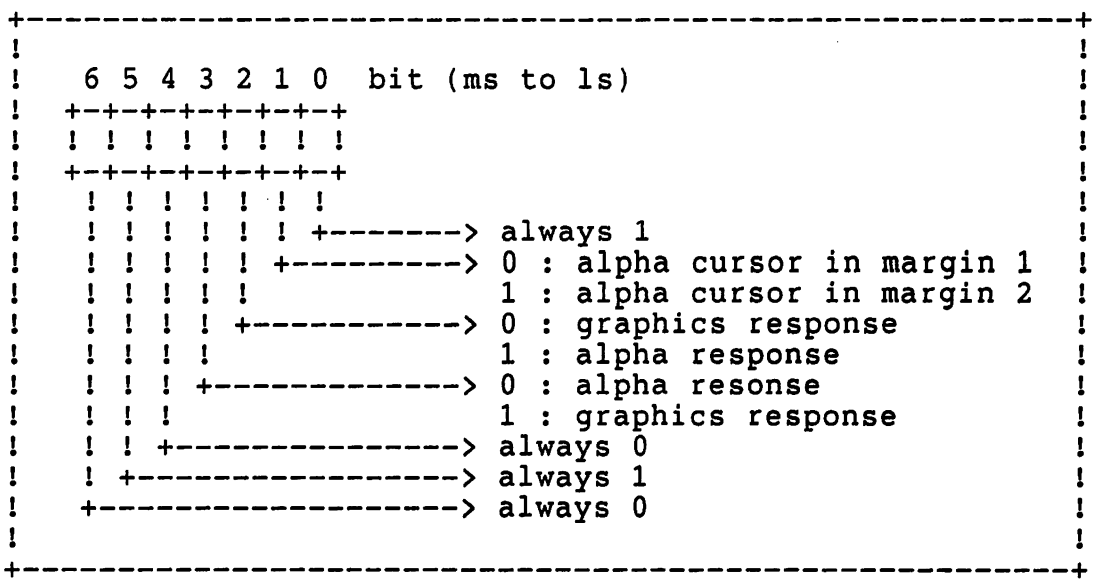
## 9.8 GIN responses

GIN is any acronym for Graphics INput. In a 4014 it is the only way that the host can receive any data about the terminal. Each GIN response is composed of 5 data bytes followed by an optional terminator. The terminator can either be a single CR or a CR EOT pair. Whether a terminator is sent and the type of terminator can be selected from SETUP. The 5 data bytes that are sent are:

<status> <high X> <low X> <high Y> <low Y>

The status byte is decoded as follows:

**Figure 9-8 GIN status byte bit fields**




The high and low position bytes are decoded the same as the high and low bytes of a co-ordinate specification with the tag field always equal to 1. Note that only the most significant 10 bits of the 12 bit address are sent. The least significant 2 bits are assumed to be 0. This is to insure compatability with a TEKTRONIX 4010.

If the status byte indicates that this is an alpha response, the 4 position bytes give the current location of the alpha cursor. Otherwise the 4 position bytes give the current graphics beam position.

The only exception to this format is if you type a key within cross hair submode. Then the status byte is replace with the character that was typed.

The accuracy of the transmitted location is dependent on the dot resolution of the HiREZ 100XL.

## 9.9 4014 mode sequences

### 9.9.1 Mode switching

Function: Enter ANSI mode
Sequence: ESC 2

Discussion:

Enters ANSI mode from 4014 mode. No graphic variable values are affected. (Alternate sequence: CNTL X ( 1 8 h) ).

NOTE

In SETUP, if B-2:4 bit reset enters VT52 mode from 4014 mode.

### 9.9.2 Cursor position

Function: Cursor up
Sequence: VT

Discussion:

Move alpha cursor up one line.

Function: Cursor down
Sequence: LF

Discussion:

Move alpha cursor down one line. If at bottom margin take action specified by margin 1/margin 2 and page full break options.

Function: Cursor right
Sequence: HT

Discussion:

Move alpha cursor right one column. If at right margin move to left margin, next line.

Function: Cursor left
Sequence: BS

Discussion:

Move alpha cursor left one column. If at left margin no action is performed.

### 9.9.3 Terminal status

Function: Report terminal status
Sequence: ESC ENQ

Discussion:

This sequence sets bypass submode and initiates a GIN mode response. An alpha response is sent if the terminal is in alpha submode. Otherwise a graphics mode response is sent.

### 9.9.4 Erasing

Function: Erase screen
Sequence: ESC FF

Discussion:

Erases graphics screen and homes cursor. Unconditionally switches to alpha submode. Dynamic memory storage area is cleared, and if zoom-in condition exists, zoom-out is performed.

### 9.9.5 Character sets

Function: Select APL characters
Sequence: ESC SO

Discussion:

Switch to APL character set for alpha mode character display.

Function: Select ASCII characters
Sequence: ESC SI

Discussion:

Switch to ASCII character set for alpha mode character display.

### 9.9.6 Printer control

Function: Print graphics
Sequence: ESC ETB

Discussion:

Transmits dot matrix or plotter (depending on the printer/plotter selection) graphics information to the AUX port. See the chapter on printer/plotter for more information.

### 9.9.7 4014 submode switching

4014 mode has several submodes which control the interpretation of characters received from the host. For more information on each submode please see the beginning of this chapter.

Function: Enter alpha submode
Sequence: US

Discussion:

Enter 4014 alpha submode.

Function: Enter vector graphics submode
Sequence: GS

Discussion:

Enter 4014 vector graphics submode.

Function: Enter point plot submode
Sequence: FS

Discussion:

Enter 4014 point plot submode.

Function: Enter incremental plot submode
Sequence: RS

Discussion:

Enter 4014 incremental plot submode.

Function: Enter cross hair submode
Sequence: ESC SUB

Discussion:

Enter 4014 cross hair submode.

Function: Enter bypass submode
Sequence: ESC CAN

Discussion:

Enter 4014 bypass submode.

### 9.9.8 Select character sizes

Function: Size 1 chararacters
Sequence: ESC 8

Discussion:

Selects 74 columns and 35 lines for alpha mode. This is the largest character size.

Function: Size 2 characters
Sequence: ESC 9

Discussion:

Selects 81 columns and 38 lines for alpha mode.

Function: Size 3 characters
Sequence: ESC :

Discussion:

Selects 121 columns and 58 lines for alpha mode.

Function: Size 4 characters
Sequence: ESC ;

Discussion:

Selects 133 columns and 64 lines for alpha mode. This is the smallest character size.

### 9.9.9 Select line type

Function: Solid lines
Sequence: ESC \

Discussion:

Use solid lines for vector drawing. Alternate sequences for this are ESC e, ESC f, or ESC g.

Function: Dotted lines
Sequence: ESC a

Discussion:

Use dotted lines for vector drawing.

Function: Dot-dash lines
Sequence: ESC b

Discussion:

Use dot-dash lines for vector drawing.

Function: Short dash lines
Sequence: ESC c

Discussion:

Use short dash lines for vector drawing.

Function: Long dash lines
Sequence: ESC d

Discussion:

Use long dash lines for vector drawing.

Function: Select user defined line type
Sequence: ESC x

Discussion:

Select user defined line type.

### 9.9.10 Write through submode

Function: Write through submode, solid lines
Sequence: ESC p

Discussion:

Enter 4014 write through submode. Use solid lines for vector drawing. Alternate sequences for this are ESC u, ESC v, or ESC w.

Function: Write through submode, dotted lines
Sequence: ESC q

Discussion:

Enter 4014 write through submode. Use dotted lines for vector drawing.

Function: Write through submode, dot-dash lines
Sequence: ESC r

Discussion:

Enter 4014 write through submode. Use dot-dash lines for vector drawing.

Function: Write through submode, short dash lines
Sequence: ESC s

Discussion:

Enter 4014 write through submode. Use short dash lines for vector drawing.

Function: Write through submode, long dash lines
Sequence: ESC t

Discussion:

Enter 4014 write through submode. Use long dash lines for vector drawing.

### 9.9.11 Simulate DEL

Function: Simulate DEL
Sequence: ESC ?

Discussion:

For systems that cannot send a DEL, this sequence simulates a graphics submode low Y whose data field is 7Fh.

### 9.9.12 SELANAR native commands

SELANAR uses the sequence ESC (1Bh) O (4Fh) to allow the user to control some of the internal HiREZ 100XL graphics variables. The sequence is followed by a single character which determines the function to perform. After the single character is received, the next 4014 vector to be received will be interpreted as data for the function. If any error occurs during processing of the sequence, the sequence is ignored and normal 4014 processing continues.

For the following discussion the first set of co-ordinates in the vector will be referred to as X1 and Y1 and the second set of co-ordinates as X2 and Y2. You must always send both sets of co-ordinates even if only one or two values are used by the sequence.

NOTE

For specifying parameters using native mode commands, a Tek 4014 coordinate format is used. This consists of five (5) ASCII characters, whose value is used in specifying desired paramters. For an example of how these characters can be selected for Selanar Native commands, see application note in Chapter 12.

Function: Dynamic memory save on/off
Sequence: ESC O D

Discussion:

As each vector is received by the HiREZ 100XL it is normally stored in dynamic memory for possible future uses such as pan-zoom or plotter functions. If more vectors are received than the HiREZ 100XL has memory for, a message is displayed in alpha mode and the terminal will beep. This function allows the user to turn the storage feature on and off under program control. X1 is 0 if you wish to disable dynamic memory save and non-0 if you wish to enable dynamic memory save.

Example:

```
ESC O D SP ' ' SP @ @; disable dynamic memory save
ESC O D SP a ' SP @ @; enable dynamic memory save
```

NOTE

The standard HiREZ 100XL terminal saves 6553 vector end points, which is optionally expandable to 98,300 vector end points.

You must disable dynamic memory save if you use an origin or gain set sequence otherwise pan-zoom operations will not function correctly. The only exception to this rule is if you immediately follow the set sequences with a clear screen sequence. Also, relative origin commands can be set at all times.

Function: Viewport
Sequence: ESC O V

Discussion:

Viewporting allows local vector clipping at limits other than the physical screen boundary. Also, screen clear will only clear the viewport area. In essence, viewporting allows you to place a window of graphics data on the screen without effecting other portions of the display. X1, Y1 define the lower left hand corner of the viewport. X2, Y2 define the length of the viewport in the X and Y directions respectively. Selections of values for viewport should satisfy full conditions.

```
0 < = X1 < = 1023
0 < = Y1 < = 780

0 < = X1 + X2 < = 1024
0 < = Y1 + Y2 < = 780
```

Example:

```
ESC 0 V " ' ' $ V SP ' y SP Y; sets viewport
                              ; lower left corner
```

```
; at 600,256
; length in X direction = 100
; length in Y direction = 100
```

Function: Origins
Sequence: ESC O O

Discussion:

Setting the graphics origins allows you to move the graphics picture around on the screen without changing the actual picture data. See the section on virtual/physical translation for more information on how origins and gain are used to translate the virtual space vector information to physical screen co-ordinates. X1, Y1 are the new origin values. X2, Y2 are the signs of the new origins (0 is positive, non-0 {< = 255 >} is negative).

Function: Relative origins
Sequence: ESC O R

Discussion:

The relative origins sequence allows you to change the graphics origins relative to their current position. This allows you to overcome the 12 bit limitation on the transmitted origin values. X1, Y1 are the changes with respect to the old origin. X2, Y2 are the signs of the change (0 is positive, non-0 {< = 255 >} is negative).

Function: X Gain
Sequence: ESC O X

Discussion:

This sequence allows you to change the X gain used in virtual to physical address translations. See the section on virtual/pnysical translation for more information on how origins and gain are used to translate the virtual space vector information to physical screen co-ordinates. X1/Y1 is the new X gain. X2 is the sign of the new X gain (0 is positive, ).

Function: Y Gain
Sequence: ESC O Y

Discussion:

This sequence allows you to change the Y gain used in virtual to physical address translations. See the section on virtual/pnysical translation for more information on how origins and gain are used to translate the virtual space vector information to physical screen co-ordinates. X1/Y1 is the new Y gain. X2 is the sign of the new Y gain (0 is positive, non-0 {< = 255>} is negative).

Function: Circle and arc generation
Sequence: ESC O C

Discussion:

X1 is the radius of the circle (0 - 4095 virtual units). Y1 is the increment angle for the arc segments (4 - 180 degrees). X2 is the start angle (0 - 360 degrees). Y2 is the end angle (0 - 360 degreees). Circles are always drawn counter-clockwise.

NOTE

The graphics beam must be moved, to the position at which the center of the arc/circle is desired, by using the Tektronix GS command.

Function: Write Mode
Sequence: ESC O W

Discussion:

This command allows selection of three write modes for graphics line types. The mode selection is:

OR - Every dot written for vectors or characters are ORed to existing dots on the screen. This is the same as drawing one picture on top of another.

XOR - Every dot written for vectors or characters are exclusive ORed to the dot displayed. Duplicating the same command would restore the image to the original screen.

Clear - All dots for vectors or characters are erased (written black).

Select modes by choosing the value of X1; X1 = 0 for OR, X1 = 1 for XOR, X1 = 2 for Clear mode. The value of Y1, X2, Y2 are ignored. The values of X1 are specified in Tektronix format. For example:

OR

| ESC | O | W | SP | ` | ` | SP | @ | @ |
|---|---|---|---|---|---|---|---|---|
| IBh | 4Fh | 57h | 20h | 60h | 60h | 20h | 40h | 40h |

XOR

| ESC | O | W | SP | a | ` | SP | @ | @ |
|---|---|---|---|---|---|---|---|---|
| IBh | 4Fh | 57h | 20h | 61h | 60h | 20h | 40h | 40h |

CLEAR

| ESC | O | W | SP | b | ` | SP | @ | @ |
|---|---|---|---|---|---|---|---|---|
| IBH | 4FH | 57H | 20H | 62H | 60H | 20H | 40H | 40H |

Note that in the above examples only the low X byte is sent for the second co-ordinate pair.

Function: User defined line type
Sequence: ESC L

Discussion:

On the HiREZ 100XL, besides the regular line types available in Tek mode (the solid and dot-dash line types), one more line type is available. This line type is user definable. Default pattern is all blanks. The line pattern has a length of 32 dots and is used repeatedly to generate a line when selected.

To define the UDLT:

Command syntax -

ESC L Ch1 Ch2 Ch3 Ch4 Ch5 Ch6 Ch7 Ch8

Where ESC L is the command introducer, and Ch1 .. Ch8 are ASCII characters. The least significant nibbles of the ASCII code of the 8 characters (received following ESC L) concatenated in the order received makes up the user defined pattern.

Example:

To generate the following pattern:

+++++++++-------++++++++-------

(+ = dot; - = space)

| Nibbles in HEX | n1 | n2 | n3 | n4 | n5 | n6 | n7 | n8 |
|---|---|---|---|---|---|---|---|---|
| | F | F | 0 | 0 | F | F | 0 | 0 |

Look into the ASCII chart for characters with corresponding LS nibbles.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ? | ? | 0 | 0 | ? | ? | 0 | 0 |

ASCII eq. of ? is HEX 3F
ASCII eq. of 0 is HEX 30

The command to define above line type is:

ESC L ? ? 0 0 ? ? 0 0

(Note spaces used above for clarity not a part of the string.)

## 9.10 Summary of 4014 mode sequences

Mode switching

| Function | Sequence |
|---|---|
| Enter ANSI mode | ESC 2 |

Cursor position

| Function | Sequence |
|---|---|
| Cursor up | VT |
| Cursor down | LF |
| Cursor right | HT |
| Cursor left | BS |

Terminal status

| Function | Sequence |
|---|---|
| Report terminal status | ESC ENQ |

Erasing

| Function | Sequence |
|---|---|
| Erase screen | ESC FF |

Character sets

| Function | Sequence |
|---|---|
| Select APL characters | ESC SO |
| Select ASCII characters | ESC SI |

Printer control

| Function | Sequence |
|---|---|
| Print graphics | ESC ETB |

4014 submode switching

| Function | Sequence |
|---|---|
| Enter alpha submode | US |
| Enter vector graphics submode | GS |
| Enter point plot submode | FS |
| Enter incremental plot submode | RS |
| Enter cross hair submode | ESC SUB |
| Enter bypass submode | ESC CAN |

Select character sizes

| Function | Sequence |
|---|---|
| Size 1 chararacters | ESC 8 |
| Size 2 characters | ESC 9 |
| Size 3 characters | ESC : |
| Size 4 characters | ESC ; |

Select line type

| Function | Sequence |
|---|---|
| Solid lines | ESC \ |
| Dotted lines | ESC a |
| Dot-dash lines | ESC b |
| Short dash lines | ESC c |
| Long dash lines | ESC d |
| Select user defined line type | ESC x |

Write through submode

| Function | Sequence |
|---|---|
| Write through submode, solid lines | ESC p |
| Write through submode, dotted lines | ESC q |
| Write through submode, dot-dash lines | ESC r |
| Write through submode, short dash lines | ESC s |
| Write through submode, long dash lines | ESC t |

Simulate DEL

| Function | Sequence |
|---|---|
| Simulate DEL | ESC ? |

SELANAR native commands

| Function | Sequence |
|---|---|
| Dynamic memory save on/off | ESC O D |
| Viewport | ESC O V |
| Origins | ESC O O |
| Relative origins | ESC O R |
| X Gain | ESC O X |
| Y Gain | ESC O Y |
| Circle and arc generation | ESC O C |
| Write Mode | ESC O W |
| User defined line type | ESC L |

## 9.11 Unimplemented 4014 features

### 9.11.1 Page key

There is a page key on the Tektronix 4014 keyboard which will clear the 4014's screen. The same operation is performed by typing CTRL HOME.

### 9.11.2 Reset key

There is a reset key on the TEKTRONIX 4014 keyboard which will reset the 4014 to power up state. The same operation is performed by the 0 key while in SETUP mode.

### 9.11.3 Defocused z-axis

Defocused z-axis allows the user of a 4014 storage tube to change the intensity of the dots drawn by changing the focus of the drawing beam. Since a HiREZ 100XL is a raster tube device this feature is not implemented.

### 9.11.4 Auto print

Auto print allows the 4014 to automatically dump the graphics screen to a printer when the page full condition is met. This is not implemented on the HiREZ 100XL.

### 9.11.5 Hold status

Hold status, which prolongs the life of a storage tube monitor, is not available.

### 9.11.6 Origin shifting

Origin shifting for alpha cursor is not available. This is a screen-preserving feature of the TEKTRONIX 4014 storage tube.

# CHAPTER 10

## Secondary mode

Secondary mode is currently not implemented on the HiREZ 100XL. If SECONDARY terminal mode is selected from SETUP the terminal will reset the terminal mode to ANSI when SETUP mode is exitted.

# CHAPTER 11

## Pan and zoom

In 4014 mode as each vector is received its co-ordinates are stored in dynamic memory. By the use of the pan-zoom functions of the zoom keys it is possible to redraw the vectors with new gain and origin parameters. This allows the user to zoom in on a section of the original picture. This feature is active only when the Dynamic Memory Save (Vector Save) is enabled, which can be selected from SETUP or a SELANAR native command.

NOTE

The HiREZ 100XL saves 6553 vector end points standard. Extended memory options are available for vecotr storage up to 98,300 end points, for which you would call the factory, or your distributor.

## 11.1 Pan-zoom function keys

### 11.1.1 Entering/exiting pan-zoom mode

Function: Entering/exiting pan-zoom mode
Key: ZOOM OUT

Discussion:

Depress ZOOM OUT key to enter pan-zoom mode. A blinking rectangle should appear in the extreme lower left hand corner of the screen. Depress ZOOM OUT key again to exit pan-zoom mode.

### 11.1.2 Changing window size

Function: Enlarge window
Key: Larger box key

Discussion:

Depress larger box key to enlarge the pan-zoom window.

Function: Enlarge window fast
Key: SHIFT larger box key

Discussion:

SHIFT larger box key enlarges at 10 times the rate of larger box key.

Function: Shrink window
Key: smaller box key

Discussion:

Depress smaller box key to shrink the pan-zoom window.

Function: Shrink window fast
Key: SHIFT smaller box key

Discussion:

SHIFT smaller box key shrinks the window at 10 times the rate of smaller box key.

### 11.1.3 Moving the window

Function: Move window left
Key: Numeric keypad 4

Function: Move window right
Key: Numeric keypad 6

Function: Move window up
Key: Numeric keypad 8

Function: Move window down
Key: Numeric keypad 2

Function: Move window left and up
Key: Numeric keypad 7

Function: Move window right and up
Key: Numeric keypad 9

Function: Move window right and down
Key: Numeric keypad 3

Function: Move window left and down
Key: Numeric keypad 1

Function: Move window left fast
Key: SHIFT numeric keypad 4

Function: Move window right fast
Key: SHIFT numeric keypad 6

Function: Move window up fast
Key: SHIFT numeric keypad 8

Function: Move window down fast
Key: SHIFT numeric keypad 2

Function: Move window left and up fast
Key: SHIFT numeric keypad 7

Function: Move window right and up fast
Key: SHIFT numeric keypad 9

Function: Move window right and down fast
Key: SHIFT numeric keypad 3

Function: Move window left and down fast
Key: SHIFT numeric keypad 1

NOTE

Using above keys with SHIFT key depressed, moves the window at 10 times the rate of unshifted.

### 11.1.4 Zooming

Function: Zooming in
Key: ZOOM IN

Discussion:

Depress ZOOM IN key to zoom in. The HiREZ 100XL erases the graphics screen and redraws only those portions of the picture that lie within the pan-zoom window making them large enough to fill the entire screen.

Function: Zooming out
Key: ZOOM OUT

Discussion:

Depress ZOOM OUT key to zoom out if your are currently zoomed in.

## 11.2 Summary of Pan-zoom function keys

Entering/exiting pan-zoom mode

| Function | Key |
|---|---|
| Entering/exiting pan-zoom mode | ZOOM OUT |

Changing window size

| Function | Key |
|---|---|
| Enlarge window | Larger box key |
| Enlarge window fast | SHIFT larger box key |
| Shrink window | smaller box key |
| Shrink window fast | SHIFT smaller box key |

Moving the window

| Function | Key |
|---|---|
| Move window left | Numeric keypad 4 |
| Move window right | Numeric keypad 6 |
| Move window up | Numeric keypad 8 |
| Move window down | Numeric keypad 2 |
| Move window left and up | Numeric keypad 7 |
| Move window right and up | Numeric keypad 9 |
| Move window right and down | Numeric keypad 3 |
| Move window left and down | Numeric keypad 1 |
| Move window left fast | SHIFT numeric keypad 4 |
| Move window right fast | SHIFT numeric keypad 6 |
| Move window up fast | SHIFT numeric keypad 8 |
| Move window down fast | SHIFT numeric keypad 2 |
| Move window left and up fast | SHIFT numeric keypad 7 |
| Move window right and up fast | SHIFT numeric keypad 9 |
| Move window right and down fast | SHIFT numeric keypad 3 |
| Move window left and down fast | SHIFT numeric keypad 1 |

Zooming

| Function | Key |
|---|---|
| Zooming in | ZOOM IN |
| Zooming out | ZOOM OUT |

# CHAPTER 12

## Printer/Plotter

HiREZ 100XL has printer plotter capability selectable from the SETUP mode. Interface of the printer or plotter is through the AUX port; see 'AUX Port Specifics' for electrical connections. Both the ANSI screen and the graphics screen can be individually selected for printing, however, this section addresses graphics only.

Only a few printers are directly supported; however, a definable printer mode is available. This USER mode allows entering specific printer parameters in SETUP D to customize the terminal to the desired printer, and the parameters may be saved in non-volatile RAM. An explanation is included as to how to set the printer parameters; however, it is not expected that users unfamiliar with graphics printers will be able to customize USER parameter to any printer. If difficulty occurs, contact the factory to see if parameter settings are available for your selected printer; if not, you can be placed on a list to be informed when settings are available.

## 12.1 Printer/Plotter Supported

HiREZ 100XL has built in support for interfacing and providing hardcopy to the following printers and plotters:

DEC LA100 Printer
EPSON MX80 Printer
HP 7470A Plotter

Others may be added in the future, however, if the printer does not exactly emmulate the above printers/plotters, the USER defined option will have to be used and parameters entered by the user and saved in non-volatile RAM. Instruction for this feature follows in this chapter.

## 12.2 Selecting Supported Printers/Plotters

To select a supported printer:

1. Enter SETUP mode
2. Type shift P to cycle through options displayed in the SETUP mode and select the desired choice:

   LA100
   MX80
   HP/GL
   USER

3. Exit SETUP mode
4. Make sure AUX port communication parameters are properly set and match the printer/plotter requirements.
5. Type SHIFT PRINT to initiate graphics printout.

## 12.3 Print Size

The size of the printout is controlled by PRINTER DUMP GAIN in SETUP D. This parameter may be varied from 0 to 1.00, 1.00 being the largest size, .5 being half size, etc. Factory default is 0.50.

When printing graphics, the screen image as saved in vector memory will be printed/plotted upon command. Pan and Zoom can also be used to change the print size and only that image displayed will be printed/plotted.

## 12.4 Interfacing With Supported Printers

The following are recommended settings for interfacing to supported printers. Note that baud rates must always match.

**Figure 12-1 Printer/plotter interface settings**

| Unit | Data bits | Stop bits | Parity | Handshake |
|---|---|---|---|---|
| LA100 | 8 | 1 | None | XON/XOFF |
| MX80 | 8 | 1 | None | DTR |
| HPGL | 8 | 1 | None | DTR |

## 12.5 Interfacing With Emulated Printers

If a printer is used which emulates a supported printer, the emulated printer should work; however, the aspect ratio may not be the same (a circle may not print perfectly round).

LA100: LA50, LA34, etc.

MX80 : MX100, Mannesmann Tally, etc.

## 12.6 Adjusting Aspect Ratio

Following a simple procedure, the aspect ratio parameter can be changed in the selected printer mode. Once changed, the value can be saved in non-volatile RAM (shift S) or the original default value recalled (shift D).

1. Connect printer to AUX port and set AUX port and printer parameters to match.

2. Select SETUP D and the desired printer option.

3. Set aspect ratio to 0 (note the number key pad must be used for all numeric parameters entered).

4. Select LOCAL and 4014 modes.

5. Type the following sequence:

```
^ ] SP ' SP @ SP ' 8 K 8 k 8 K 8 k SP @ SP ' SP @ 8 k 8 K
1Dh 20h 60h 20h 40h 20h 60h 38h 4Bh 6Bh 38h 4Bh 38h 6Bh
       20h 40h 20h 60h 20h 40h 38h 4Bh 38h 4Bh
```

   This should draw a square box with a diagonal line from bottom left corner to top right corner.

6. Print screen using SHIFT PRINT. Screen should be printed with the image rotated 90 degrees clockwise.

7. Measure the printout diagram height and width and divide the larger number by the smaller number. Use the four digits to the right of the decimal point (including the decimal point) as the aspect ratio adjust parameter.

8. Enter SETUP D and enter the number above as PRINTER

DUMP ASPECT RATIO.

9. Exit SETUP and print above image. This time the printout should be a perfect square.

## 12.7 Plotter Compatibility

The only format supported for plotters is for HPGL.

The HiREZ 100XL interfaces with the HP 7220A plotter along with the 7470A and compatible plotters.

The HiREZ 100XL does not set the scaling points P1 and P2 (using the IP command). This enables the HiREZ 100XL to plot on the maximum plottable area on plotters of all sizes. However, the user can program the plotter to set different plotting areas by sending and IP* command with parameters and a terminator and then plot the picture. The setup of the plotting area (setting P1 and P2) could also be done manually (refer to HP manual).

Example for setting plotting area (this command could be done by the host or from the keyboard with terminal in LOCAL mode).

From ANSI mode send (type):

| TYPE | COMMENTS |
|---|---|
| ESC [ 5 i | Terminal in print controller mode. |
| IP 100,100,1124,868; | Set plottable area 100,100<br>P1X P1Y<br>(bottom left corner)<br>1124,868 (top right corner)<br>P2X P2Y |
| ESC [ 4 i | Exit print controller |
| DRAW PICTURE | |
| PLOT | Picture plotted in the newly defined plottable area. |

*Recommend the user to read about the IP instruction in the HP Plotter User Manual.

Cycling power on the plotter or sending it an IN; sequence resets the plotter to default conditions.

To maintain correct aspect ratio, the ratio (P2X-P1X):(P2Y-P1Y) should match 1024:780.

## 12.8 Programming Unsupported Printers

The following steps should be taken to program the USER defined printer:

1. Review the parameters available to be changed in SETUP D. These are listed below.

2. Review the documentation provided by the printer manufacturer so that proper data can be provided.

3. If needed data is not available from printer documentation, contact the printer manufacturer for assistance.

4. Enter data parameters as explained below.

   SELANAR does not accept the responsibility for training the user to program all printer formats, but will try to provide some assistance as time permits.

   To inspect a string parameter, type the selection (such as SHIFT I) then SETUP to exit; do not enter characters or they will be used as a new string.

   Each of the binary parameters are selected by shift T.

   Set graphics byte count to be sent, number of firing pins and the graph data bias value.

   With proper selections made, save parameters (SHIFT S) and exit SETUP mode. The user mode is now ready to use. Follow the procedure for adjusting apsect ratio (see "Adjusting Aspect Ratio").

### 12.8.1 Setting Printer Parameters

The following parameters are programmable:

| | |
|---|---|
| Byte Count | Sent/Not Sent |
| Byte Count | Decimal/Binary |
| Byte First | Most Significant/ Least Significant |
| Pin Firing | Top/Bottom |
| Gain | |
| Aspect Ratio | |
| Number of Bytes | |
| Number of Firing Pins | |
| Data Bias Value | |
| Intializing String | (SHIFTI) |
| Beginning of Line String | (SHIFT J) |
| End of Line String | (SHIFT K) |
| Termination String | (SHIFT M) |

See SETUP D parameter - 4014 printer/plotter parameters for detailed explanation. These must be thoroughly understood before proceeding.

Select SETUP D and ensure that you have entered into USER option in SETUP parameters. This is done by skipping through options until USER appers on screen (this is done by hitting SHIFT 0 key).

Strings are entered (for parameters SHIFT I, J, K, and M) by typing the character (such as SHIFT I) followed by a character that will not be used in the string; when this character is typed again, the end of string is assumed. If no string is required, type a null string (same character typed twice).

For Example; SHIFT I (This will bring onto screen - Printer Initialization String).

At this point, a character must be entered as a delimitter to start the string of commands as detailed overleaf (please note again, that spaces in between characters should be ignored except when SP is present) and the same character should be used to end sequence.

## 12.9 Examples of Using Non-Supported Printers

### 12.9.1 Mannesman Tally

Example:

```
In SETUP D            ;
Printer               ; MX80
Protocol              ; Xon/Xoff
Data Bits             ; 8
Stop Bits             ; 1
Parity                ; None
Baud Rate             ; As Desired
Aspect Ratio Adjust   ; .5765
```

Discussion:

If desired, use SHIFT S to save; exit SETUP D.
Printer is ready to use.

### 12.9.2 C.Itoh 8510

Example:

```
In SETUP D            ;
PRINTER               ; USER
Position D-1:1        ; TRUE
Position D-1:2        ; FALSE
Position D-1:4        ; TRUE
Position D-5          ; 4
Position D-6          ; 6
Position D-7          ; 0

SHIFT I               ; ESC T 1 2 ESC N
SHIFT M               ; ESC A
SHIFT J               ; ESC S
SHIFT K               ; CR LF
```

```
Protocol              ; Xon/Xoff
Data Bits             ; 8
Stop Bits             ; 1
Parity                ; None
Baud Rate             ; As Desired
Aspect Ratio Adjust   ; .1322
```

Discussion:

If desired, use SHIFT S to save; exit SETUP D.
Printer is ready to use.

.tp 15

### 12.9.3 Data South DS180

Example:

```
In set-up D           ;
Position              ;
D-1:1                 ; Not Sent
D-1:2                 ; N/A
D-1:3                 ; N/A
D-1:4                 ; LS Bit Bottom
D-3                   ; 0.7
D-4                   ; 0.6020
D-5                   ; 0
D-6                   ; 6
D-7                   ; 64

Shift I               ; Ctrl
Shift J               ; null
Shift K               ; 6
Shift M               ; Ctrl ]
Shift P               ; USER
```

### 12.9.4 Anadex 9501

Example:

```
In setup D            ;
Position              ;
D-1:1                 ; Not Sent
D-1:2                 ; N/A
D-1:3                 ; N/A
D-1:4                 ; LS Bit Bottom
D-3                   ; 0.7
```

```
D-4                     ; 0.9
D-5                     ; 0
D-6                     ; 6
D-7                     ; 64

Shift I                 ; ctrl /
Shift J                 ; null
Shift K                 ; 6
Shift M                 ; Ctrl ]
Shift P                 ; USER
```

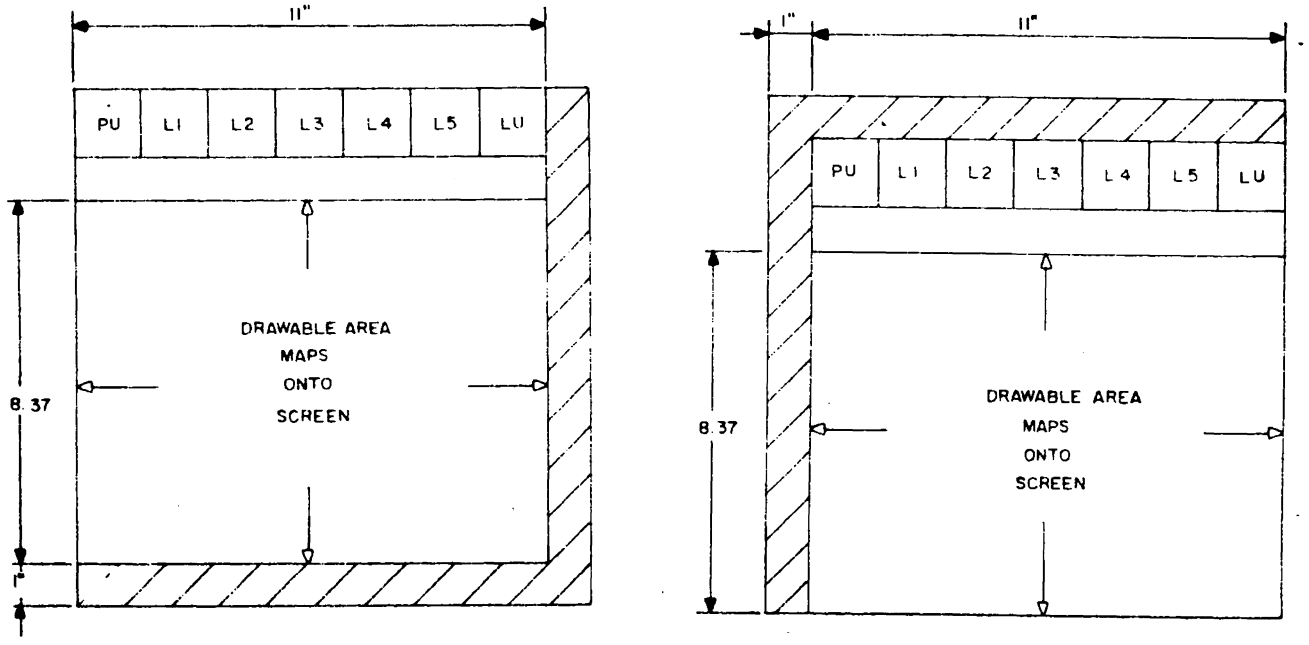
## CHAPTER 13

## Input Devices for HiREZ 100XL

The HiREZ 100XL interfaces with other input devices besides the keyboard. The HiREZ 100XL supports Summagraphics Mouse (Bit Pad One format), LOGITECH Mouse (supporting Bit Pad One mode) and the Summagraphics Digitizers (Bit Pad One compatible) or other devices emulating the above input devices. These devices can communicate with the HiREZ 100XL only through the AUXillary 2 port. The interface with either a digitizer or a mouse which can be selected in the SETUP D (make sure that the selected input device in SETUP D and the actual device connected to the AUX 2 port match).

The communication settings for different devices are provided in this chapter (make sure the AUX 2 port communication settings on the input device match).

Figure 13-1 Digitizer Drawable Area




Bit Pad 1

Bit Pad 2

## 13.1 Operation

### 13.1.1 Crosshair and Zoom Window Control

When the crosshair or the zoom window is enabled, it is possible to move the crosshair/zoom window with the digitizer or mouse. The programming sequences to activate the input devices are automatically sent when the crosshair/zoom window is enabled. With a digitizer using a stylus, depression of stylus at any point positions the crosshair/zoom window at a point corresponding on the screen. Using a cursor with the digitizer, the depression of the Z or the 3 (yellow or green) button results in the same action. The mouse uses relative positioning. The movement of the mouse with the R button depressed causes appropriate action.

With the crosshair cursor ON, depressing the 1 (white) button on the cursor or the M button on the mouse has the same effect of typing the character 'H' on the keyboard. Depressing the 2 (blue) button on the cursor or the L button on the mouse, has the same effect of typing the character 'P' on the keyboard. Depressing the above two buttons sends the character D or P to the host followed by the Gin co-ordinates and terminators.

With the zoom window ON, depressing the 1 button (on digitizer cursor) or the M button (on the mouse) increases the size of the zoom window in increments of 10 units. Depressing the 2 button (on the digitizer) or the L button (on the mouse) decreases the size of the zoom window in units of 10.

If both the crosshair and zoom window are enabled, the crosshair movement takes precedence over the zoom window movement.

### 13.1.2 Vector Drawing Using the Digitizer

(Operation not possible with the mouse)

To Select the vector drawing mode from Tek mode, send the following sequence:

ESC [ C

The terminal is now in vector drawing mode using the digitizer as an input device, a pen up condition exists.

All lines drawn hence will be drawn with the currently selected line type. Lines can be drawn by moving the cursor to desired start point (or positioning the stylus at start point) and depressing any button, and tracing the picture to be drawn with the button depressed. A pen up can be performed by moving the cursor (or positioning the stylus) at region PU (refer to figure 13.1) and depressing any button (or depressing the stylus). If no pen up was performed and the cursor moved to a new position and a button depressed, a straight line is drawn from the last point the button was depressed to the current cursor position. Six different line types can be selected by positioning the cursor at desired line type block (L1 through LU) and depressing any button. All new vectors will be drawn with the new line type selected.

Selecting a line type does not alter the pen up/down condition.

To exit the draw mode, type a SHIFT Q on keyboard.

Example: To Draw a Straight Line

Position cursor on block PU and depress button to perform pen up. Move cursor to line beginning and register point by depressing any button once. Move cursor to line end, depress any button again (results in a line being drawn between the two points). Now do a pen up.

Example: Trace a Curve

Perform a pen up. Move cursor to beginning of curve. Register point by depressing any button, keep the button depressed and trace the curve. The smoothness depends on the speed of the cursor movement. Do a pen up at the end of curve.

Example: Erase a Line

To erase a line, exit digitizer draw mode, set draw mode to erase line mode and enter digitizer draw mode. Redraw the line to be erased.

### 13.1.3 Point Mode Operation

This works in ANSI and TEK modes. Can be enabled from TEK mode with a sequence:

ESC [ A

Desired points are registered by depressing a button on the cursor and the terminal has a set of internal X,Y registers mounting the last registered position. The host sends the sequence ESC [ > n to inquire current digitizer/mouse position. The terminal sends back the following sequence to the host in response:

<CHAR> <Xhi> <Xlow> <Yhi> <Ylo> <CR>

Where CHAR corresponds to the button depressed on the digitizer or mouse. On the digitizer the positioning of the cursor is absolute and on the mouse the motion is relative. The limits are 0-1023 in X direction and 0-779 in Y direction. The least significant 5 bits of Xhi, Xlo concatenated in that order gives the X position and least significant 5 bits of character Yhi,Ylo concatenated gives the Y position.

**Figure 13-2 For digitizer, character sent is:**

| CHAR Sent | |
|---|---|
| D | if Z button on cursor stylus depressed. (Yellow) |
| H | if button 1 on cursor depressed. (White) |
| P | if button 2 on cursor depressed. (Blue) |
| \ | if button 3 on cursor depressed. (Green) |

**Figure 13-3 For the mouse, character sent is:**

| CHAR Sent | |
|---|---|
| P | if left button depressed |
| H | if middle button depressed |
| D | if right button depressed |

An ESC [ E from host in TEK mode disables this mode.

The above three operations are mutually exclusive and the user should take care in not mixing the above operations.

### 13.1.4 Uploading Vectors from Terminal to Host

With Dynamic Memory save enabled, all vectors drawn on screen are stored in the HiREZ 100XL's dynamic memory. These vectors can be uploaded to the host.

The sequence ESC [ U in TEK mode, puts the terminal into upload mode. The host has to send an ENQ CHAR [hex 05 or a control E] to the terminal. On receipt of an ENQ CHAR, the terminal responds with the following sequence:

M <Xhi> <Xlo> <Yhi> <Ylo> <CR>

When M means move to, X1, Y1. Least significant 5 bits of Xhi, Xlo concatenated gives X1; least significant 5 bits of Yhi, Ylo concatenated gives Y1. Or:

<CHAR> <Xhi> <Xlo> <Yhi> <Ylo> <CR>

| <CHAR> | DRAWN LINE TYPE |
|---|---|
| \ | solid or user defined |
| a | dotted |
| b | dot-dash |
| c | short dashed |
| d | long dashed |

(<CHAR> indicates the line type used for drawing the vector.)

Which says: from previous position draw to X1,Y1 with selected line type.

The host has to send an ENQ character to receive each co-ordinate. The host can abort the upload by sending any character other than ENQ.

If the end of the vector list is reached, the terminal responds with full sequence.

E <CR>

All vectors are in 0-1024 space.

## 13.2 Communication Settings for Digitizer/Mouse

BIT PAD ONE Digitizer

AUX 2 Port Settings

| |
|---|
| 7 data bits |
| 1 stop bit |
| odd parity |
| handshake - DTR |
| select digitizer in SETUP D |

On BIT PAD

| |
|---|
| SW2 - all OFF |
| SW1 - 7, 9 ON |
| 9600 baud |

BIT PAD TWO
(should be compatible with BIT PAD ONE, model 1103)

AUX 2 Port Settings

| |
|---|
| 8 data bits |
| 1 stop bit |
| no parity |
| handshake - DTR |
| 9600 Baud |
| select digitizer in SETUP D |

On BIT PAD

| | |
|---|---|
| Absolute mode | |
| Enable remote control | SW1-1 ON |
| Report format | SW2-1 OFF |
| Disable parity | SW3-1 OFF<br>SW3-3 OFF |

Summamouse/LOGITECH Mouse
(should be BIT PAD ONE format compatible)

AUX 2 Port Settings

| |
|---|
| 7 data bits |
| 1 stop bit |
| even parity |
| handshake - DTR |
| 9600 baud (summamouse)<br>1200 baud (LOGITECH mouse) |
| select summamouse or<br>LOGITECH mouse in SETUP D |

NOTE 1: The receive and transmit lines need to be reversed for the LOGITECH Mouse.

NOTE 2: The different input devices can be selected by typing SHIFT A in SETUP D.

# CHAPTER 14

## Application Note 1

The following method may be used for conversion X,Y coordinates to Tek 4014 format (numbers 0 to 4095). This method is useful for generating the Selanar native mode commands:

GIVEN: X and Y coordinates
RESULT: Five characters encoding 4014 for each coordinate.

<Yhigh><Extra><Ylow><Xhigh><Xlow>

Yhigh = INT (INT(Y/4)/32)+32

Extra = (Y-4*INT(Y/4))*4+X-4*INT(X/4)+96

Ylow = INT(Y/4)-32*INT(INT(Y/4)/32)+96

Xhigh = INT(INT(X/4)/32)+32

Xlow = INT(X/4)-32*INT(INT(X/4)/32)+64

Example: SET MODE VIEWPORT:

LOCATION 673,104

SIZE 1234,567

<Yhigh><Extra><Ylow><Xhigh><Xlow>; <ESC>OV az%H$nm)T

(decimal equivalent: 27,79,86,32,97,122,37,72,36,110,109,41,84)

## 14.1 Converting X,Y Coordinates to 4014 Format

```
50 REM
55 REM
60 REM
65 REM
70 REM
100 INPUT "X,Y";X,Y
200 Y1=INT(INT(Y/4)/32)+32
210 E =(Y-4*INT(Y/4)*4+X-4*INT(X/4)+96
220 Y2=INT(Y/4)-32*INT(INT(Y/4)/32)+96
230 X1=INT(INT(X/4)/32)+32
240 X2=INT(X/4)-32*INT(INT(X/4)/32+64
250 PRINT "....."
300 PRINT CHR$(Y1);CHR$(E);CHR$(Y2);CHR$(X1);CHR$(X2)
500 GOTO 100
1000 END
```

## APPENDIX A

## Specification

### Terminal Mode

Full DEC VT102 emulation
ANSI X3.64 protocol
20 user definable keys
24 or 48 lines
80 or 132 columns

### Character Attributes

Dual intensity
Blinking
Underline
Reverse video
Double high and double wide characters

### Tektronix 4014 Emulation Mode

4010 and 4014 software compatibilty
Addressable plot area 4096 x 4096
Resolution 1024 x 768
Variable line types
Vector plot
Point plot
Incremental plot
Write through plot
Page full break
Average vector drawing speed 70,000 pixels per second

### CRT Monitor

14 inch diagonal
P39 phospher
Non-glare screen
Flicker free at interlaced 64 HZ refresh
32M HZ bandwidth
29K HZ horizontal frequency

Mechanical

Ergonomic design
Tilt and swivel CRT
Low profile detachable keyboard

Options

Multiple printer/plotter support
HP graphic compatibilty

Power Requirment

115v ac 60 HZ
50 watts

## APPENDIX B

## ASCII code chart

| Octal | Decimal | Hex | Mnemonic | |
|---|---|---|---|---|
| 0 | 0 | 0 | NUL | |
| 1 | 1 | 1 | SOH | CTRL A |
| 2 | 2 | 2 | STX | CTRL B |
| 3 | 3 | 3 | ETX | CTRL C |
| 4 | 4 | 4 | EOT | CTRL D |
| 5 | 5 | 5 | ENQ | CTRL E |
| 6 | 6 | 6 | ACK | CTRL F |
| 7 | 7 | 7 | BEL | CTRL G |
| 10 | 8 | 8 | BS | CTRL H |
| 11 | 9 | 9 | HT | CTRL I |
| 12 | 10 | A | LF | CTRL J |
| 13 | 11 | B | VT | CTRL K |
| 14 | 12 | C | FF | CTRL L |
| 15 | 13 | D | CR | CTRL M |
| 16 | 14 | E | SO | CTRL N |
| 17 | 15 | F | SI | CTRL O |
| 20 | 16 | 10 | DLE | CTRL P |
| 21 | 17 | 11 | DC1 | CTRL Q |
| 22 | 18 | 12 | DC2 | CTRL R |
| 23 | 19 | 13 | DC3 | CTRL S |
| 24 | 20 | 14 | DC4 | CTRL T |
| 25 | 21 | 15 | NAK | CTRL U |
| 26 | 22 | 16 | SYN | CTRL V |
| 27 | 23 | 17 | ETB | CTRL W |
| 30 | 24 | 18 | CAN | CTRL X |
| 31 | 25 | 19 | EM | CTRL Y |
| 32 | 26 | 1A | SUB | CTRL Z |
| 33 | 27 | 1B | ESC | |
| 34 | 28 | 1C | FS | CTRL \ |
| 35 | 29 | 1D | GS | CTRL ] |
| 36 | 30 | 1E | RS | CTRL ^ |
| 37 | 31 | 1F | US | CTRL _ |

| Octal | Decimal | Hex | Mnemonic |
|---|---|---|---|
| 40 | 32 | 20 | SP |
| 41 | 33 | 21 | ! |
| 42 | 34 | 22 | " |
| 43 | 35 | 23 | # |
| 44 | 36 | 24 | $ |
| 45 | 37 | 25 | % |
| 46 | 38 | 26 | & |
| 47 | 39 | 27 | ' |
| 50 | 40 | 28 | ( |
| 51 | 41 | 29 | ) |
| 52 | 42 | 2A | * |
| 53 | 43 | 2B | + |
| 54 | 44 | 2C | , |
| 55 | 45 | 2D | - |
| 56 | 46 | 2E | . |
| 57 | 47 | 2F | / |
| 60 | 48 | 30 | 0 |
| 61 | 49 | 31 | 1 |
| 62 | 50 | 32 | 2 |
| 63 | 51 | 33 | 3 |
| 64 | 52 | 34 | 4 |
| 65 | 53 | 35 | 5 |
| 66 | 54 | 36 | 6 |
| 67 | 55 | 37 | 7 |
| 70 | 56 | 38 | 8 |
| 71 | 57 | 39 | 9 |
| 72 | 58 | 3A | : |
| 73 | 59 | 3B | ; |
| 74 | 60 | 3C | < |
| 75 | 61 | 3D | = |
| 76 | 62 | 3E | > |
| 77 | 63 | 3F | ? |

| Octal | Decimal | Hex | Mnemonic |
|---|---|---|---|
| 100 | 64 | 40 | @ |
| 101 | 65 | 41 | A |
| 102 | 66 | 42 | B |
| 103 | 67 | 43 | C |
| 104 | 68 | 44 | D |
| 105 | 69 | 45 | E |
| 106 | 70 | 46 | F |
| 107 | 71 | 47 | G |
| 110 | 72 | 48 | H |
| 111 | 73 | 49 | I |
| 112 | 74 | 4A | J |
| 113 | 75 | 4B | K |
| 114 | 76 | 4C | L |
| 115 | 77 | 4D | M |
| 116 | 78 | 4E | N |
| 117 | 79 | 4F | O |
| 120 | 80 | 50 | P |
| 121 | 81 | 51 | Q |
| 122 | 82 | 52 | R |
| 123 | 83 | 53 | S |
| 124 | 84 | 54 | T |
| 125 | 85 | 55 | U |
| 126 | 86 | 56 | V |
| 127 | 87 | 57 | W |
| 130 | 88 | 58 | X |
| 131 | 89 | 59 | Y |
| 132 | 90 | 5A | Z |
| 133 | 91 | 5B | [ |
| 134 | 92 | 5C | \ |
| 135 | 93 | 5D | ] |
| 136 | 94 | 5E | ^ |
| 137 | 95 | 5F | _ |

| Octal | Decimal | Hex | Mnemonic |
|---|---|---|---|
| 140 | 96 | 60 | ` |
| 141 | 97 | 61 | a |
| 142 | 98 | 62 | b |
| 143 | 99 | 63 | c |
| 144 | 100 | 64 | d |
| 145 | 101 | 65 | e |
| 146 | 102 | 66 | f |
| 147 | 103 | 67 | g |
| 150 | 104 | 68 | h |
| 151 | 105 | 69 | i |
| 152 | 106 | 6A | j |
| 153 | 107 | 6B | k |
| 154 | 108 | 6C | l |
| 155 | 109 | 6D | m |
| 156 | 110 | 6E | n |
| 157 | 111 | 6F | o |
| 160 | 112 | 70 | p |
| 161 | 113 | 71 | q |
| 162 | 114 | 72 | r |
| 163 | 115 | 73 | s |
| 164 | 116 | 74 | t |
| 165 | 117 | 75 | u |
| 166 | 118 | 76 | v |
| 167 | 119 | 77 | w |
| 170 | 120 | 78 | x |
| 171 | 121 | 79 | y |
| 172 | 122 | 7A | z |
| 173 | 123 | 7B | { |
| 174 | 124 | 7C | \| |
| 175 | 125 | 7D | } |
| 176 | 126 | 7E | ~ |
| 177 | 127 | 7F | DEL |

## APPENDIX C

## TEKTRONIX 4014 co-ordinate conversion chart

| X low | | X or Y co-ordinate | | | | | | | | Y Low | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| @ | 64 | 0 | 32 | 64 | 96 | 128 | 160 | 192 | 224 | 96 | ` |
| A | 65 | 1 | 33 | 65 | 97 | 129 | 161 | 193 | 225 | 97 | a |
| B | 66 | 2 | 34 | 66 | 98 | 130 | 162 | 194 | 226 | 98 | b |
| C | 67 | 3 | 35 | 67 | 99 | 131 | 163 | 195 | 227 | 99 | c |
| D | 68 | 4 | 36 | 68 | 100 | 132 | 164 | 196 | 228 | 100 | d |
| E | 69 | 5 | 37 | 69 | 101 | 133 | 165 | 197 | 229 | 101 | e |
| F | 70 | 6 | 38 | 70 | 102 | 134 | 166 | 198 | 230 | 102 | f |
| G | 71 | 7 | 39 | 71 | 103 | 135 | 167 | 199 | 231 | 103 | g |
| H | 72 | 8 | 40 | 72 | 104 | 136 | 168 | 200 | 232 | 104 | h |
| I | 73 | 9 | 41 | 73 | 105 | 137 | 169 | 201 | 233 | 105 | i |
| J | 74 | 10 | 42 | 74 | 106 | 138 | 170 | 202 | 234 | 106 | j |
| K | 75 | 11 | 43 | 75 | 107 | 139 | 171 | 203 | 235 | 107 | k |
| L | 76 | 12 | 44 | 76 | 108 | 140 | 172 | 204 | 236 | 108 | l |
| M | 77 | 13 | 45 | 77 | 109 | 141 | 173 | 205 | 237 | 109 | m |
| N | 78 | 14 | 46 | 78 | 110 | 142 | 174 | 206 | 238 | 110 | n |
| O | 79 | 15 | 47 | 79 | 111 | 143 | 175 | 207 | 239 | 111 | o |
| P | 80 | 16 | 48 | 80 | 112 | 144 | 176 | 208 | 240 | 112 | p |
| Q | 81 | 17 | 49 | 81 | 113 | 145 | 177 | 209 | 241 | 113 | q |
| R | 82 | 18 | 50 | 82 | 114 | 146 | 178 | 210 | 242 | 114 | r |
| S | 83 | 19 | 51 | 83 | 115 | 147 | 179 | 211 | 243 | 115 | s |
| T | 84 | 20 | 52 | 84 | 116 | 148 | 180 | 212 | 244 | 116 | t |
| U | 85 | 21 | 53 | 85 | 117 | 149 | 181 | 213 | 245 | 117 | u |
| V | 86 | 22 | 54 | 86 | 118 | 150 | 182 | 214 | 246 | 118 | v |
| W | 87 | 23 | 55 | 87 | 119 | 151 | 183 | 215 | 247 | 119 | w |
| X | 88 | 24 | 56 | 88 | 120 | 152 | 184 | 216 | 248 | 120 | x |
| Y | 89 | 25 | 57 | 89 | 121 | 153 | 185 | 217 | 249 | 121 | y |
| Z | 90 | 26 | 58 | 90 | 122 | 154 | 186 | 218 | 250 | 122 | z |
| [ | 91 | 27 | 59 | 91 | 123 | 155 | 187 | 219 | 251 | 123 | { |
| \ | 92 | 28 | 60 | 92 | 124 | 156 | 188 | 220 | 252 | 124 | : |
| ] | 93 | 29 | 61 | 93 | 125 | 157 | 189 | 221 | 253 | 125 | } |
| ^ | 94 | 30 | 62 | 94 | 126 | 158 | 190 | 220 | 254 | 126 | ~ |
| _ | 95 | 31 | 63 | 95 | 127 | 159 | 191 | 223 | 255 | 127 | DEL |
| | | SP | ! | " | # | $ | % | & | ' | | |
| | | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | | |

High X or Y

| X low | | X or Y co-ordinate | | | | | | | | Y Low | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| @ | 64 | 256 | 288 | 320 | 352 | 384 | 416 | 448 | 480 | 96 | ` |
| A | 65 | 257 | 289 | 321 | 353 | 385 | 417 | 449 | 481 | 97 | a |
| B | 66 | 258 | 290 | 322 | 354 | 386 | 418 | 450 | 482 | 98 | b |
| C | 67 | 259 | 291 | 323 | 355 | 387 | 419 | 451 | 483 | 99 | c |
| D | 68 | 260 | 292 | 324 | 356 | 388 | 420 | 452 | 484 | 100 | d |
| E | 69 | 261 | 293 | 325 | 357 | 389 | 421 | 453 | 485 | 101 | e |
| F | 70 | 262 | 294 | 326 | 358 | 390 | 422 | 454 | 486 | 102 | f |
| G | 71 | 263 | 295 | 327 | 359 | 391 | 423 | 455 | 487 | 103 | g |
| H | 72 | 264 | 296 | 328 | 360 | 392 | 424 | 456 | 488 | 104 | h |
| I | 73 | 265 | 297 | 329 | 361 | 393 | 425 | 457 | 489 | 105 | i |
| J | 74 | 266 | 298 | 330 | 362 | 394 | 426 | 458 | 490 | 106 | j |
| K | 75 | 267 | 299 | 331 | 363 | 395 | 427 | 459 | 491 | 107 | k |
| L | 76 | 268 | 300 | 332 | 364 | 396 | 428 | 460 | 492 | 108 | l |
| M | 77 | 269 | 301 | 333 | 365 | 397 | 429 | 461 | 493 | 109 | m |
| N | 78 | 270 | 302 | 334 | 366 | 398 | 430 | 462 | 494 | 110 | n |
| O | 79 | 271 | 303 | 335 | 367 | 399 | 431 | 463 | 495 | 111 | o |
| P | 80 | 272 | 304 | 336 | 368 | 400 | 432 | 464 | 496 | 112 | p |
| Q | 81 | 273 | 305 | 337 | 369 | 401 | 433 | 465 | 497 | 113 | q |
| R | 82 | 274 | 306 | 338 | 370 | 402 | 434 | 466 | 498 | 114 | r |
| S | 83 | 275 | 307 | 339 | 371 | 403 | 435 | 467 | 499 | 115 | s |
| T | 84 | 276 | 308 | 340 | 372 | 404 | 436 | 468 | 500 | 116 | t |
| U | 85 | 277 | 309 | 341 | 373 | 405 | 437 | 469 | 501 | 117 | u |
| V | 86 | 278 | 310 | 342 | 374 | 406 | 438 | 470 | 502 | 118 | v |
| W | 87 | 279 | 311 | 343 | 375 | 407 | 439 | 471 | 503 | 119 | w |
| X | 88 | 280 | 312 | 344 | 376 | 408 | 440 | 472 | 504 | 120 | x |
| Y | 89 | 281 | 313 | 345 | 377 | 409 | 441 | 473 | 505 | 121 | y |
| Z | 90 | 282 | 314 | 346 | 378 | 410 | 442 | 474 | 506 | 122 | z |
| [ | 91 | 283 | 315 | 347 | 379 | 411 | 443 | 475 | 507 | 123 | { |
| \ | 92 | 284 | 316 | 348 | 380 | 412 | 444 | 476 | 508 | 124 | : |
| ] | 93 | 285 | 317 | 349 | 381 | 413 | 445 | 477 | 509 | 125 | } |
| ^ | 94 | 286 | 318 | 350 | 382 | 414 | 446 | 478 | 510 | 126 | ~ |
| _ | 95 | 287 | 319 | 351 | 383 | 415 | 447 | 479 | 511 | 127 | DEL |
| | | ( | ) | * | + | , | - | . | / | | |
| | | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | | |

High X or Y

| X low | | X or Y co-ordinate | | | | | | | | Y Low | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| @ | 64 | 512 | 544 | 576 | 608 | 640 | 672 | 704 | 736 | 96 | ` |
| A | 65 | 513 | 545 | 577 | 609 | 641 | 673 | 705 | 737 | 97 | a |
| B | 66 | 514 | 546 | 578 | 610 | 642 | 674 | 706 | 738 | 98 | b |
| C | 67 | 515 | 547 | 579 | 611 | 643 | 675 | 707 | 739 | 99 | c |
| D | 68 | 516 | 548 | 580 | 612 | 644 | 676 | 708 | 740 | 100 | d |
| E | 69 | 517 | 549 | 581 | 613 | 645 | 677 | 709 | 741 | 101 | e |
| F | 70 | 518 | 550 | 582 | 614 | 646 | 678 | 710 | 742 | 102 | f |
| G | 71 | 519 | 551 | 583 | 615 | 647 | 679 | 711 | 743 | 103 | g |
| H | 72 | 520 | 552 | 584 | 616 | 648 | 680 | 712 | 744 | 104 | h |
| I | 73 | 521 | 553 | 585 | 617 | 649 | 681 | 713 | 745 | 105 | i |
| J | 74 | 522 | 554 | 586 | 618 | 650 | 682 | 714 | 746 | 106 | j |
| K | 75 | 523 | 555 | 587 | 619 | 651 | 683 | 715 | 747 | 107 | k |
| L | 76 | 524 | 556 | 588 | 620 | 652 | 684 | 716 | 748 | 108 | l |
| M | 77 | 525 | 557 | 589 | 621 | 653 | 685 | 717 | 749 | 109 | m |
| N | 78 | 526 | 558 | 590 | 622 | 654 | 686 | 718 | 750 | 110 | n |
| O | 79 | 527 | 559 | 591 | 623 | 655 | 687 | 719 | 751 | 111 | o |
| P | 80 | 528 | 560 | 592 | 624 | 656 | 688 | 720 | 752 | 112 | p |
| Q | 81 | 529 | 561 | 593 | 625 | 657 | 689 | 721 | 753 | 113 | q |
| R | 82 | 530 | 562 | 594 | 626 | 658 | 690 | 722 | 754 | 114 | r |
| S | 83 | 531 | 563 | 595 | 627 | 659 | 691 | 723 | 755 | 115 | s |
| T | 84 | 532 | 564 | 596 | 628 | 660 | 692 | 724 | 756 | 116 | t |
| U | 85 | 533 | 565 | 597 | 629 | 661 | 693 | 725 | 757 | 117 | u |
| V | 86 | 534 | 566 | 598 | 630 | 662 | 694 | 726 | 758 | 118 | v |
| W | 87 | 535 | 567 | 599 | 631 | 663 | 695 | 727 | 759 | 119 | w |
| X | 88 | 536 | 568 | 600 | 632 | 664 | 696 | 728 | 760 | 120 | x |
| Y | 89 | 537 | 569 | 601 | 633 | 665 | 697 | 729 | 761 | 121 | y |
| Z | 90 | 538 | 570 | 602 | 634 | 666 | 698 | 730 | 762 | 122 | z |
| [ | 91 | 539 | 571 | 603 | 635 | 667 | 699 | 731 | 763 | 123 | { |
| \ | 92 | 540 | 572 | 604 | 636 | 668 | 700 | 732 | 764 | 124 | \| |
| ] | 93 | 541 | 573 | 605 | 637 | 669 | 701 | 733 | 765 | 125 | } |
| ^ | 94 | 542 | 574 | 606 | 638 | 670 | 702 | 734 | 766 | 126 | ~ |
| - | 95 | 543 | 575 | 607 | 639 | 671 | 703 | 735 | 767 | 127 | DEL |
| | | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | | |
| | | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | | |

High X or Y

| X low | | X or Y co-ordinate | | | | | | | | Y Low | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| @ | 64 | 768 | 800 | 832 | 864 | 896 | 928 | 960 | 992 | 96 | ` |
| A | 65 | 769 | 801 | 833 | 865 | 897 | 929 | 961 | 993 | 97 | a |
| B | 66 | 770 | 802 | 834 | 866 | 898 | 930 | 962 | 994 | 98 | b |
| C | 67 | 771 | 803 | 835 | 867 | 899 | 931 | 963 | 995 | 99 | c |
| D | 68 | 772 | 804 | 836 | 868 | 900 | 932 | 964 | 996 | 100 | d |
| E | 69 | 773 | 805 | 837 | 869 | 901 | 933 | 965 | 997 | 101 | e |
| F | 70 | 774 | 806 | 838 | 870 | 902 | 934 | 966 | 998 | 102 | f |
| G | 71 | 775 | 807 | 839 | 871 | 903 | 935 | 967 | 999 | 103 | g |
| H | 72 | 776 | 808 | 840 | 872 | 904 | 936 | 968 | 1000 | 104 | h |
| I | 73 | 777 | 809 | 841 | 873 | 905 | 937 | 969 | 1001 | 105 | i |
| J | 74 | 778 | 810 | 842 | 874 | 906 | 938 | 970 | 1002 | 106 | j |
| K | 75 | 779 | 811 | 843 | 875 | 907 | 939 | 971 | 1003 | 107 | k |
| L | 76 | 780 | 812 | 844 | 876 | 908 | 940 | 972 | 1004 | 108 | l |
| M | 77 | 781 | 813 | 845 | 877 | 909 | 941 | 973 | 1005 | 109 | m |
| N | 78 | 782 | 814 | 846 | 878 | 910 | 942 | 974 | 1006 | 110 | n |
| O | 79 | 783 | 815 | 847 | 879 | 911 | 943 | 975 | 1007 | 111 | o |
| P | 80 | 784 | 816 | 848 | 880 | 912 | 944 | 976 | 1008 | 112 | p |
| Q | 81 | 785 | 817 | 849 | 881 | 913 | 945 | 977 | 1009 | 113 | q |
| R | 82 | 786 | 818 | 850 | 882 | 914 | 946 | 978 | 1010 | 114 | r |
| S | 83 | 787 | 819 | 851 | 883 | 915 | 947 | 979 | 1011 | 115 | s |
| T | 84 | 788 | 820 | 852 | 884 | 916 | 948 | 980 | 1012 | 116 | t |
| U | 85 | 789 | 821 | 853 | 885 | 917 | 949 | 981 | 1013 | 117 | u |
| V | 86 | 790 | 822 | 854 | 886 | 918 | 950 | 982 | 1014 | 118 | v |
| W | 87 | 791 | 823 | 855 | 887 | 919 | 951 | 983 | 1015 | 119 | w |
| X | 88 | 792 | 824 | 856 | 888 | 920 | 952 | 984 | 1016 | 120 | x |
| Y | 89 | 793 | 825 | 857 | 889 | 921 | 953 | 985 | 1017 | 121 | y |
| Z | 90 | 794 | 826 | 858 | 890 | 922 | 954 | 986 | 1018 | 122 | z |
| [ | 91 | 795 | 827 | 859 | 891 | 923 | 955 | 987 | 1019 | 123 | { |
| \ | 92 | 796 | 828 | 860 | 892 | 924 | 956 | 988 | 1020 | 124 | : |
| ] | 93 | 797 | 829 | 861 | 893 | 925 | 957 | 989 | 1021 | 125 | } |
| ^ | 94 | 798 | 830 | 862 | 894 | 926 | 958 | 990 | 1022 | 126 | ~ |
| _ | 95 | 799 | 831 | 863 | 895 | 927 | 959 | 991 | 1023 | 127 | DEL |
| | | 8 | 9 | : | ; | < | = | > | ? | | |
| | | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | | |

High X or Y

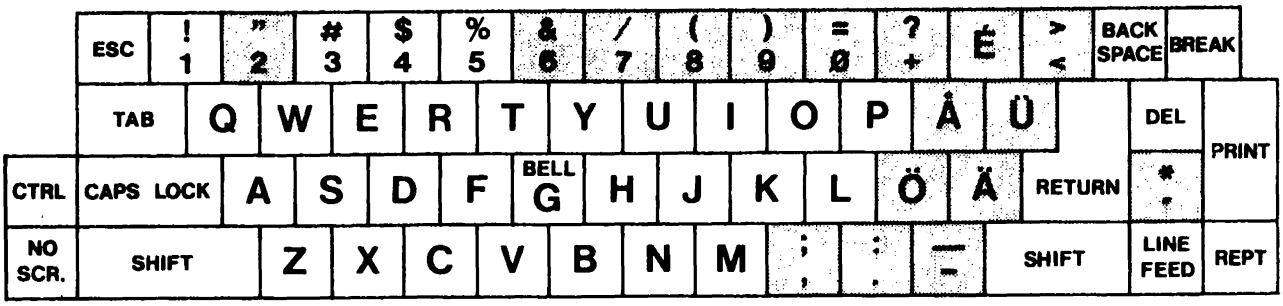
# APPENDIX D

## Character sets

## US/UK Character Set

| B7 B6 B5 / B4 B3 B2 B1 | 0 0 0 | 0 0 1 | 0 1 0 | 0 1 1 | 1 0 0 | 1 0 1 | 1 1 0 | 1 1 1 |
|---|---|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 0 0 0 0 | NUL 0 | DLE 16 | SP 32 | 0 48 | @ 64 | P 80 | ` 96 | p 112 |
| 0 0 0 1 | SOH 1 | DC1 17 | ! 33 | 1 49 | A 65 | Q 81 | a 97 | q 113 |
| 0 0 1 0 | STX 2 | DC2 18 | " 34 | 2 50 | B 66 | R 82 | b 98 | r 114 |
| 0 0 1 1 | ETX 3 | DC3 19 | # 35 | 3 51 | C 67 | S 83 | c 99 | s 115 |
| 0 1 0 0 | EOT 4 | DC4 20 | $ 36 | 4 52 | D 68 | T 84 | d 100 | t 116 |
| 0 1 0 1 | ENQ 5 | NAK 21 | % 37 | 5 53 | E 69 | U 85 | e 101 | u 117 |
| 0 1 1 0 | ACK 6 | SYN 22 | & 38 | 6 54 | F 70 | V 86 | f 102 | v 118 |
| 0 1 1 1 | BEL 7 BELL | ETB 23 | ' 39 | 7 55 | G 71 | W 87 | g 103 | w 119 |
| 1 0 0 0 | BS 8 BACK SPACE | CAN 24 | ( 40 | 8 56 | H 72 | X 88 | h 104 | x 120 |
| 1 0 0 1 | HT 9 | EM 25 | ) 41 | 9 57 | I 73 | Y 89 | i 105 | y 121 |
| 1 0 1 0 | LF 10 | SUB 26 | * 42 | : 58 | J 74 | Z 90 | j 106 | z 122 |
| 1 0 1 1 | VT 11 | ESC 27 | + 43 | ; 59 | K 75 | [ 91 | k 107 | { 123 |
| 1 1 0 0 | FF 12 | FS 28 | , 44 | < 60 | L 76 | \ 92 | l 108 | \| 124 |
| 1 1 0 1 | CR 13 RETURN | GS 29 | - 45 | = 61 | M 77 | ] 93 | m 109 | } 125 |
| 1 1 1 0 | SO 14 | RS 30 | . 46 | > 62 | N 78 | ^ 94 | n 110 | ~ 126 |
| 1 1 1 1 | SI 15 | US 31 | / 47 | ? 63 | O 79 | _ 95 | o 111 | RUBOUT (DEL) 127 |

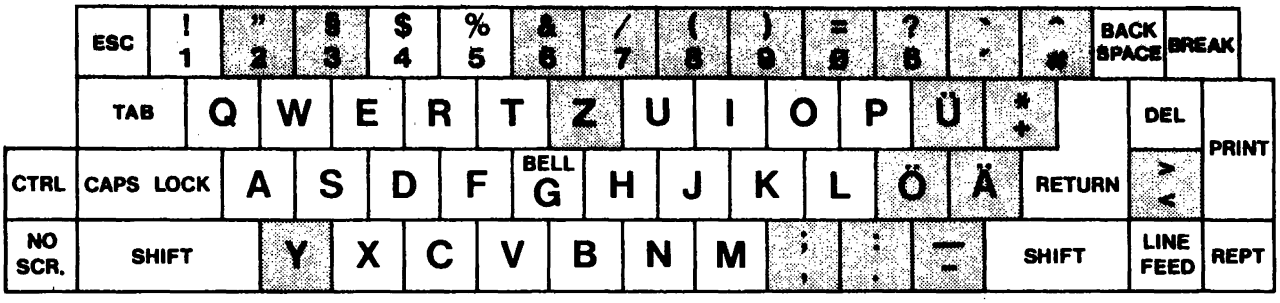
# HiRez 100-XL Swedish Keyboard




# HiRez 100-XL Character Code Table - SWEDISH

| | HEX.NO. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|---|---|
| | BIN. NO. | 0000 | 0001 | 0010 | 0011 | 0100 | 0101 | 0110 | 0111 |
| HEX. NO. | BIN. NO. | CONTROL | | NUMBER SYMBOLS | | UPPER CASE CHARACTERS | | LOWER CASE CHARACTERS | |
| 0 | 0000 | NUL 0 | DLE 16 | SP 32 | 0 48 | É 64 | P 80 | é 96 | p 112 |
| 1 | 0001 | SOH 1 | DC1 17 | ! 33 | 1 49 | A 65 | Q 81 | a 97 | q 113 |
| 2 | 0010 | STX 2 | DC2 18 | " 34 | 2 50 | B 66 | R 82 | b 98 | r 114 |
| 3 | 0011 | ETX 3 | DC3 19 | # 35 | 3 51 | C 67 | S 83 | c 99 | s 115 |
| 4 | 0100 | EOT 4 | DC4 20 | $ 36 | 4 52 | D 68 | T 84 | d 100 | t 116 |
| 5 | 0101 | ENQ 5 | NAK 21 | % 37 | 5 53 | E 69 | U 85 | e 101 | u 117 |
| 6 | 0110 | ACK 6 | SYN 22 | & 38 | 6 54 | F 70 | V 86 | f 102 | v 118 |
| 7 | 0111 | BEL 7 | ETB 23 | ' 39 | 7 55 | G 71 | W 87 | g 103 | w 119 |
| 8 | 1000 | BS 8 | CAN 24 | ( 40 | 8 56 | H 72 | X 88 | h 104 | x 120 |
| 9 | 1001 | HT 9 | EM 25 | ) 41 | 9 57 | I 73 | Y 89 | i 105 | y 121 |
| A | 1010 | LF 10 | SUB 26 | * 42 | : 58 | J 74 | Z 90 | j 106 | z 122 |
| B | 1011 | VT 11 | ESC 27 | + 43 | ; 59 | K 75 | Ä 91 | k 107 | ä 123 |
| C | 1100 | FF 12 | FS 28 | , 44 | < 60 | L 76 | Ö 92 | l 108 | ö 124 |
| D | 1101 | CR 13 | GS 29 | - 45 | = 61 | M 77 | Å 93 | m 109 | å 125 |
| E | 1110 | SO 14 | RS 30 | . 46 | > 62 | N 78 | Ü 94 | n 110 | ü 126 |
| F | 1111 | SI 15 | US 31 | / 47 | ? 63 | O 79 | _ 95 | o 111 | DEL 127 |

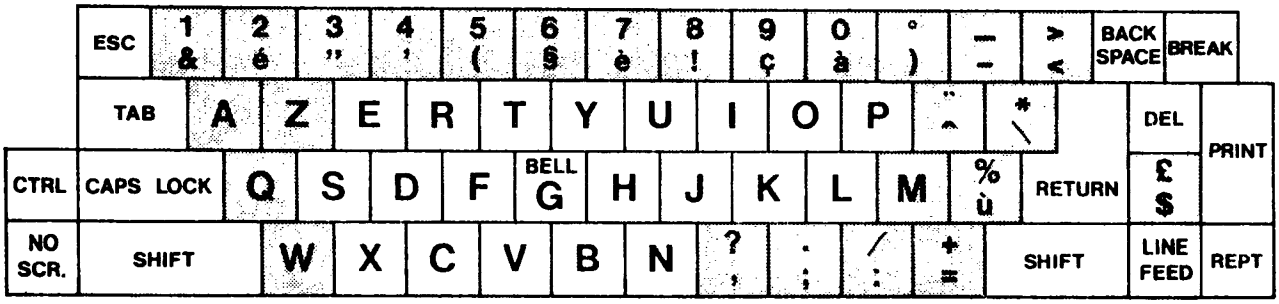
# HiRez 100-XL German Keyboard




# HiRez 100-XL Character Code Table - GERMAN

| | HEX.NO. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|---|---|
| | BIN.NO. | 0000 | 0001 | 0010 | 0011 | 0100 | 0101 | 0110 | 0111 |
| HEX. NO. | BIN. NO. | CONTROL | | NUMBER SYMBOLS | | UPPER CASE CHARACTERS | | LOWER CASE CHARACTERS | |
| 0 | 0000 | NUL 0 | DLE 16 | SP 32 | 0 48 | § 64 | P 80 | ` 96 | p 112 |
| 1 | 0001 | SOH 1 | DC1 17 | ! 33 | 1 49 | A 65 | Q 81 | a 97 | q 113 |
| 2 | 0010 | STX 2 | DC2 18 | " 34 | 2 50 | B 66 | R 82 | b 98 | r 114 |
| 3 | 0011 | ETX 3 | DC3 19 | # 35 | 3 51 | C 67 | S 83 | c 99 | s 115 |
| 4 | 0100 | EOT 4 | DC4 20 | $ 36 | 4 52 | D 68 | T 84 | d 100 | t 116 |
| 5 | 0101 | ENQ 5 | NAK 21 | % 37 | 5 53 | E 69 | U 85 | e 101 | u 117 |
| 6 | 0110 | ACK 6 | SYN 22 | & 38 | 6 54 | F 70 | V 86 | f 102 | v 118 |
| 7 | 0111 | BEL 7 | ETB 23 | ´ 39 | 7 55 | G 71 | W 87 | g 103 | w 119 |
| 8 | 1000 | BS 8 | CAN 24 | ( 40 | 8 56 | H 72 | X 88 | h 104 | x 120 |
| 9 | 1001 | HT 9 | EM 25 | ) 41 | 9 57 | I 73 | Y 89 | i 105 | y 121 |
| A | 1010 | LF 10 | SUB 26 | * 42 | : 58 | J 74 | Z 90 | j 106 | z 122 |
| B | 1011 | VT 11 | ESC 27 | + 43 | ; 59 | K 75 | Ä 91 | k 107 | ä 123 |
| C | 1100 | FF 12 | FS 28 | , 44 | < 60 | L 76 | Ö 92 | l 108 | ö 124 |
| D | 1101 | CR 13 | GS 29 | - 45 | = 61 | M 77 | Ü 93 | m 109 | ü 125 |
| E | 1110 | SO 14 | RS 30 | . 46 | > 62 | N 78 | ^ 94 | n 110 | ß 126 |
| F | 1111 | SI 15 | US 31 | / 47 | ? 63 | O 79 | _ 95 | o 111 | DEL 127 |

# HiRez 100-XL French Keyboard




NOTE: CAPS LOCK ≡ SHIFT (SAME FUNCTION)

# HiRez 100-XL Character Code Table - FRENCH

| | HEX.NO. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|---|---|
| | BIN. NO. | 0000 | 0001 | 0010 | 0011 | 0100 | 0101 | 0110 | 0111 |
| HEX. NO. | BIN. NO. | CONTROL | | NUMBER SYMBOLS | | UPPER CASE CHARACTERS | | LOWER CASE CHARACTERS | |
| 0 | 0000 | NUL 0 | DLE 16 | SP 32 | 0 48 | à 64 | P 80 | ` 96 | p 112 |
| 1 | 0001 | SOH 1 | DC1 17 | ! 33 | 1 49 | A 65 | Q 81 | a 97 | q 113 |
| 2 | 0010 | STX 2 | DC2 18 | " 34 | 2 50 | B 66 | R 82 | b 98 | r 114 |
| 3 | 0011 | ETX 3 | DC3 19 | £ 35 | 3 51 | C 67 | S 83 | c 99 | s 115 |
| 4 | 0100 | EOT 4 | DC4 20 | $ 36 | 4 52 | D 68 | T 84 | d 100 | t 116 |
| 5 | 0101 | ENQ 5 | NAK 21 | % 37 | 5 53 | E 69 | U 85 | e 101 | u 117 |
| 6 | 0110 | ACK 6 | SYN 22 | & 38 | 6 54 | F 70 | V 86 | f 102 | v 118 |
| 7 | 0111 | BEL 7 | ETB 23 | ' 39 | 7 55 | G 71 | W 87 | g 103 | w 119 |
| 8 | 1000 | BS 8 | CAN 24 | ( 40 | 8 56 | H 72 | X 88 | h 104 | x 120 |
| 9 | 1001 | HT 9 | EM 25 | ) 41 | 9 57 | I 73 | Y 89 | i 105 | y 121 |
| A | 1010 | LF 10 | SUB 26 | * 42 | : 58 | J 74 | Z 90 | j 106 | z 122 |
| B | 1011 | VT 11 | ESC 27 | + 43 | ; 59 | K 75 | ° 91 | k 107 | é 123 |
| C | 1100 | FF 12 | FS 28 | , 44 | < 60 | L 76 | ç 92 | l 108 | ù 124 |
| D | 1101 | CR 13 | GS 29 | - 45 | = 61 | M 77 | § 93 | m 109 | è 125 |
| E | 1110 | SO 14 | RS 30 | . 46 | > 62 | N 78 | ^ 94 | n 110 | ¨ 126 |
| F | 1111 | SI 15 | US 31 | / 47 | ? 63 | O 79 | _ 95 | o 111 | DEL 127 |

## Special/line drawing character set

## APPENDIX E

## Index