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USERS MANUAL FOR THE REGENT 200 TERMINAL

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USERS MANUAL FOR

THE REGENT™ 200 TERMINAL

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This is the first revision of the Regent™ 200 Users Manual.

A list of changed pages appears below, with changes noted with a margin bar on affected pages.

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SECTION 1:

OVERVIEW

The Regent™ 200 represents the latest advances in microprocessor technology. This teletypewriter-compatible device is designed to appeal to a broad cross-section of the computer industry. The 200 allows the user to take advantage of the inherent flexibility of a buffered CRT terminal in cutting down on CPU functions and considerably reducing software needs.

The Regent™ 200 displays a total of 1920 highly legible characters arranged in 24 lines with 80 characters per line. In addition, the 25th line is a status line, distinct from the rest of the display that shows at a glance the state of the terminal.

With a choice of either PAGE or MESSAGE operating modes, data can be stored and locally edited before communication to the computer. A third mode, CONVERSATIONAL, transmits data character-by-character exactly like a teletype.

Using the PAGE mode, an entire screen of data may be transmitted to the computer. Or the 200's "partial transmit" feature will send a smaller unit of data. By offering the MESSAGE mode, which generates line-at-a-time transmission, the Regent™ 200 also adapts to systems unable to accept a full screen of data.

Communications with the computer are via a standard EIA RS232C or 20/60 milliampere current loop interface. Eleven transmission rates up to 9,600 baud are available and all are switch-selectable.

Also available as standard are function keys, special operator convenience keys and a buffered serial auxiliary port.

The Regent™ 200 is available in an attractive desk top unit. It combines operative simplicity with the latest in technological sophistication and capability.

MAJOR COMPONENTS

A block diagram of the major components in the Regent™ 200 is shown in Figure 1-1 and described in the following pages.

Microprocessor

The heart of the Regent™ 200 is a microprocessor with Random Access Memory (RAM) and Read Only Memory (ROM).

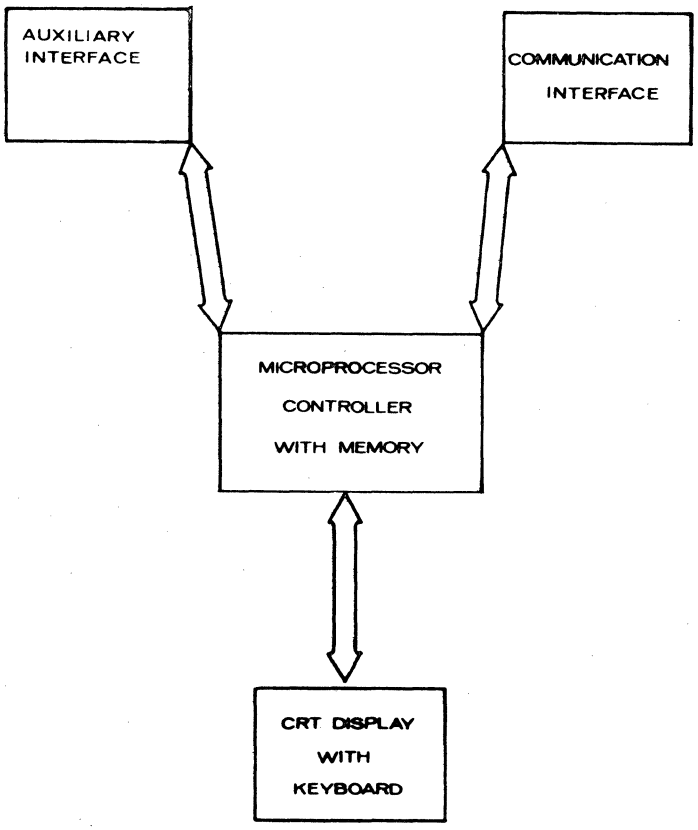


FIGURE 1-1

HARDWARE OVERVIEW

CRT Display

The CRT display presentation is arranged in 24 lines of 80 characters per line (1920 characters total) with an additional line, the "Status Line" at the bottom of the screen. The Status Line contains operating conditions of the terminal (Local mode, Carrier, Send/Receive). To distinguish the Status Line from the data entry portion of the screen, the Status Line is always the half-intensity inverse of the screen's data entry area.

Keyboard

The keyboard is arranged in a standard typewriter layout with a separate 14-key numeric pad. Three clusters of special keys are provided to change operating modes, control the printer, to enter the forms mode, and control the cursor and erase functions. All alphanumeric, tab control, and cursor keys are typ-a-matic. The keyboard can be locked or unlocked under computer control.

Communication Interface

The communication interface is switch-selectable between EIA RS232C/CCITT V.24 and 20/60 MA current loop. Communication rates are switch-selectable at the rear panel.

Both the EIA and 20 Ma Current loop interface operate at 75, 110, 300, 600, 1200, 1800, 2400, 4800, 7200 or 9600 baud. The 20 Ma current loop can operate with either the CPU or the CRT supplying the power.

Bidirectional Serial Interface

An integral part of the Regent™ 200 is a bidirectional serial interface which allows for the attachment of printers or auxiliary storage devices to the Regent™ 200. This interface can be programmed to have an independent speed from the communications interface.

Self-Diagnostic Capability

The Regent™ 200 has a built-in self-diagnostic firmware program that is initiated upon power-up. This program performs a test on memory and the EIA transmit/receive lines. If a failure is detected in either of these areas, a message is written into the Status Line. If the terminal passes the test the message "PASS" is written into the Status Line and the Terminal Status Message is sent to the CPU. (See Section 4 for a description of Status Message.)

EDITING OPTION

A powerful editing option is available on the Regent™ 200. Under operator or CPU control, full lines can be inserted or deleted. The character insert or delete feature can affect either the field or line the cursor is on or from the cursor position through to the end of the page.

Table 2.1. Regent™ 200 Specifications

Feature	Description
Display Memory Size	24 lines by 80 characters per line
Alphanumeric Character Set	128 displayable ASCII codes, each formed by an 8 x 8 dot matrix
Line Drawing Character Set	Eleven special graphics symbols
Display Presentation	Dark characters on a light background (reversible through switch selection)
Visual Attributes	Blinking at 2 frames per second, underline, reverse video, half intensity, zero intensity
Status Line	25th line reserved for terminal status messages, in the inverse of the normal display
Screen Size	12" diagonal
Refresh Rate	60 frames per second (50 for export model)
Operating Mode	Conversational (character at a time) transmission; Message (line at a time) transmission; Page (full or partial screen at a time) transmission
Transmission	Half- or full-duplex, switch-selectable
Communications Interface	EIA RS232C/CCITT V.24 operates through the range of 75 to 9,600 bps, switch-selectable. 20/60 MA current loop operates through the range of 75 to 9600 bps, switch-selectable
Parity	Choice of even, odd, marking or spacing, switch-selectable

Table 2.1. Regent™ Specifications (continued)

Feature	Description
Keyboard	Standard typewriter-like layout plus 14-key numeric pad (all typ-a-matic keys), 8 function keys, local and operating mode keys. Keyboards lock/unlock under computer control.
Test Mode	Self-diagnostic firmware program executes upon power up with result in Status Line
Addressable Cursor	Direct positioning by either discrete or absolute address
Read Terminal Status	Allows CPU to interrogate for terminal status, present cursor address and memory value at cursor position
Editing Features	Erase to end of line and page, character overwrite, backspace, forward and backward tab. Option: character and line insert/delete.
Auxiliary Interface	RS232C operates at speeds up to 9600 baud, and can be programmed to be independent of the baud setting of the communications interface up through 4800 baud.
Cursor Control	Up, down, forward, backward and home from the keyboard.
Special Attributes	Protected constant and print-only fields.
Weight	Approximately 40 pounds
Physical Dimensions	14 5/8" (H) x 21 3/8 (W) x 23 1/8" (D)
Power	110 Volts @ 60 Hz 220 Volts @ 50 Hz, (export model)
Temperature Operating: Storage:	 0° to 50° C 0° to 85° C
Humidity	10 to 95% RH, non-condensing

SECTION 3:

CRT SCREEN AND KEYBOARD

DISPLAY PRESENTATION

Size

The screen is 12" diagonal. Standard presentation of the 24 x 80 data entry area is dark characters on a light background with the Status Line presented in the inverse, as shown in Figure 3-1. A rear panel switch can reverse this presentation.

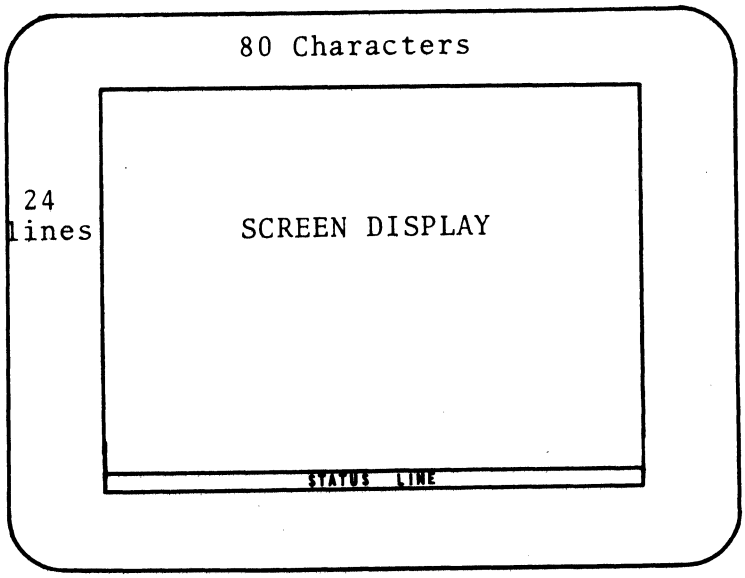


Figure 3-1. CRT Screen

Matrix

Characters are formed with an 8 x 8 dot matrix which allows for display of lower case descended characters.

Status Line

In addition to the 24-line by 80-character data entry area, a 25th line, the Status Line, is provided at the bottom of the display to show the operating condition of the terminal. The Status Line is divided into fields for specific messages. These are described in Section 4.

KEYBOARD

Typing Array and Numeric Pad

The standard keyboard is shown in Figure 3-2. It contains a white alphanumeric typing array, similar to that of a typewriter. It is used for entry of alphanumeric data. Depression of the alpha keys transmits lower (upper) case characters to either the screen memory and/or the communications lines with upper (lower) case characters entered by use of the SHIFT key.

In addition to the white alphanumeric typing and numeric pad arrays, a row of 14 gray half-keys is provided above the typing section. This array has eight pre-programmed function keys (F1 through F8), a Reset key, four mode keys (Conversational, Message, Page and Form) and an Attribute Set key.

A rear panel switch provides a choice of keyboard mode operation:

a) Upper case, SHIFT to lower with full 96-character ASCII display.

b) Lower case, SHIFT to upper with full 96-character ASCII display.

c) Upper case only with 64-character display.

The white numeric 14-key pad to the right of the typing array contains the numerics 0-9 and the period, arranged in the standard layout for ten-key adding machines. An additional three keys are provided that can be used for special applications (minus sign, ENTER and comma).

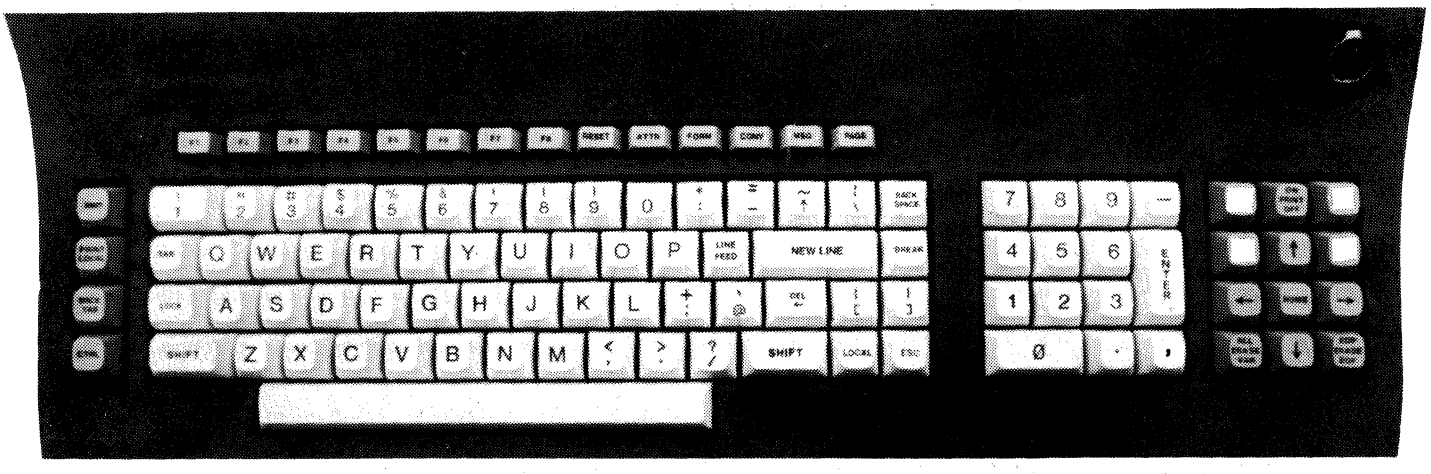


Figure 3-2. Keyboard

A 15-key gray cluster to the right of the numeric pad contains operator convenience keys to: Move the cursor (up, down, left, right and home); erase keys: erase all, variable data (with formatted screen), end of page and end of line or field (with formatted screen), auxiliary interface enable; and the optional editing keys: insert/delete line and character.

To the immediate left of the typing array is a vertical row of 4 keys: Transmit, Backtab, Print Local and Control.

NOTE: All keys are typ-a-matic except F1 through F8, Reset, Break, Local, Lock, Print ON/OFF, Insert Character, and the ERASE keys. Typ-a-matic keys automatically repeat at the rate of 15 per second if the key is held down for a full second.

Unencoded Keys

All 120 keys of the typing array and the 14 keys of the numeric pad generate ASCII codes except six unencoded keys, CONTROL, SHIFT, BREAK, LOCK, XMIT, and RESET.

CONTROL: When held down while any alphanumeric key is depressed, the code structure of that character is changed by forcing the seventh bit to zero. This allows the control codes assigned to columns Ø and 1 of the ASCII Code Chart to be generated.

SHIFT: When held down while any alphanumeric key is depressed, the code structure of that character is changed by inverting the value of the fifth or sixth bit. Note that SHIFT and CONTROL are independent. Either key alone or both may be held down together while depressing an alphanumeric key.

BREAK: When depressed, this key generates a 500-millisecond break (spacing condition) on the transmitted data output line. The BREAK key is interlocked with the CONTROL key.

LOCK: When depressed, it causes all alpha characters to go out as shifted. It is reset (unlocked) when it is depressed again.

XMIT (Transmit): Depending on the mode of operation, either a line or a page of data is transmitted when this key is depressed. See page 4-15 for a detailed discussion.

RESET: When depressed, this key resets the terminal mode of operation to the default operational level. The cursor is moved to the Home position and the keyboard is enabled. RESET also terminates the XMIT and Print functions. The reset function does not erase the display screen.

Interpreting the ASCII Code Chart

Figure 3-3 shows a conventionally arranged ASCII code chart divided into three sections corresponding to Control Codes (columns Ø and 1), Upper Case Characters (columns 2, 3, 4 and 5) and Lower Case Characters (columns 6 and 7).

Bits b_4	b_3	b_2	b_1	Row / Column	0 (0 0)	1 (0 1)	2 (1 0)	3 (1 1)	4 (0 0)	5 (0 1)	6 (1 0)	7 (1 1)
0	0	0	0	0	NUL	DLE	SP	0	@	P	`	p
0	0	0	1	1	SOH	DC1	!	1	A	Q	a	q
0	0	1	0	2	STX	DC2	"	2	B	R	b	r
0	0	1	1	3	ETX	DC3	#	3	C	S	c	s
0	1	0	0	4	EOT	DC4	$	4	D	T	d	t
0	1	0	1	5	ENQ	NAK	%	5	E	U	e	u
0	1	1	0	6	ACK	SYN	&	6	F	V	f	v
0	1	1	1	7	BEL	ETB	'	7	G	W	g	w
1	0	0	0	8	BS	CAN	(	8	H	X	h	x
1	0	0	1	9	HT	EM	)	9	I	Y	i	y
1	0	1	0	10	LF	SUB	*	:	J	Z	j	z
1	0	1	1	11	VT	ESC	+	;	K	[	k	{
1	1	0	0	12	FF	FS	,	<	L	\	l	|
1	1	0	1	13	CR	GS	-	=	M	]	m	}
1	1	1	0	14	SO	RS	.	>	N	↑	n	~
1	1	1	1	15	SI	US	/	?	O	←	o	DEL

Figure 3-3. ASCII Code Chart

Control Codes are not displayable unless preceded by a special store control code sequence (ESC,Z). Some of them affect the state of the terminal when they are received by the display electronics. For example, the code SOH causes the cursor to go to the Home position, and code DC2 turns on the Printer port. Those codes which have no defined function in the Regent™ 200 are ignored if received.

If the terminal is set for upper case only, lower case alpha characters from the keyboard are automatically translated and displayed as their upper-case equivalent (columns 4 and 5). If the DEL code is received, it is ignored. Lower case characters received from the input EIA port are displayed as lower case.

The 7-bit binary code for each character is divided into two parts in the chart, with a four-bit number representing the four least significant bits (b1, b2, b3, b4) and a three-bit number representing the three most significant bits (b5, b6, b7). The chart is also divided into eight columns and 16 rows, offering two ways of indicating a particular character's code, either as a 7-bit binary number or as a column/row number in decimal notation. For example, the character

M is represented by the binary number 1001101 or the alternative 4/13 notation. Similarly, the control code VT is represented by the code 0001011 or the alternative 0/11 notation.

Code Generation

The terminal keyboard can generate all 128 ASCII codes (if not set for upper case only). The extended code generation capability of the terminal may be used by the programmer or the system engineer to create customized codes for a particular application. In the following discussion, it is assumed that the terminal is set for upper case, with SHIFT to lower case.

Upper Case Codes

The codes corresponding to the upper case character set are generated in straightforward fashion by depressing alphanumeric keys in the typing array or the numeric pad.

ASCII Code	N	3	W
Chart Location	4/14	3/3	5/7
Key(s) Depressed	N	3	W

Lower Case Codes

The generation of the lower case codes in columns 6 and 7 of the ASCII chart is accomplished with the depression of both the SHIFT and the alpha key. The code for DEL is generated by depressing SHIFT and the DEL key.

Some keytops in the typing array are labeled to indicate the unshifted and shifted displayable character set. The upper legends are generated by depressing a key in conjunction with the SHIFTkey.

ASCII Code	a	w	#	+
Chart Location	6/1	7/7	2/3	2/11
Key(s) Depressed	SHIFT-A	SHIFT-W	SHIFT-3	SHIFT-;

Control Codes

The control codes in column 0 are obtained by depressing the CONTROL key in combination with the keys which generate the alpha codes in column 4.

The control codes in column 1 are obtained by depressing the CONTROL key in combination with the keys which generate the alpha codes in column 5.

ASCII Code	SOH	VT	CR
Chart Location	0/1	0/11	0/13
Key(s) Depressed	CONTROL-A	CONTROL-K	CONTROL-M

All codes in columns 0 and 1 of the ASCII code chart can be obtained following this procedure. However, to facilitate generation of frequently-used control codes, and to comply with standard teletypewriter usage, various code combinations can also be obtained by depressing a single key. These are summarized in Table 3.1.

Encoded Keys

Special functions have been assigned to the following keys.

LOCAL — The LOCAL key allows the operator to enter a mode whereby the communication interface logically maintains an on-line status condition to the CPU while disabling data transfer. The LOCAL key is interlocked with the CONTROL key. A second depression of the CONTROL and LOCAL keys will return the terminal to the On-Line state.

ERASE ALL/VAR — In non-shifted mode, depression of the CONTROL and ERASE keys causes erasure of all variable data on the screen. The cursor returns to the Home* position. When the SHIFT key is held down while the CONTROL-ERASE keys are depressed, both protected and variable data are erased. The cursor returns to the upper left screen position upon completion of the erase operation.

ERASE EOP/EOF — In non-shifted mode (EOF), depression of this key along with CONTROL causes all characters from the cursor position to the end of the line to be replaced with spaces. The cursor remains in the same position.

With a protected field on the display, depression of this key replaces with spaces all characters from the cursor to the end of the unprotected field in which the cursor is positioned. This key is inoperative when the cursor is located in a protected field. The cursor remains in the same position.

In the shifted mode (EOP), depression of this key along with CONTROL replaces all unprotected characters from the current cursor location to the end of the display with spaces. The cursor remains in the same position. This key serves as an ERASE VAR key if the cursor is placed at the Home* position prior to using this function.

*Home position is the leftmost position of the top line in Form and Page mode (always), and in Conversational and Message modes if Auto Scroll is disabled. Home position is the leftmost position of the bottom line in Conversational and Message mode only if Auto Scroll is enabled.

NEW LINE — Depression of the NEW LINE key places the cursor at the beginning of the same line if Auto Line Feed is not enabled, or at the beginning of the next line if Auto Line Feed is enabled. When the terminal is in Conversational Mode, the ASCII code for CR is also transmitted.

ESCAPE — The ESC key is used as a control character preceding another character to provide code extension (supplementary characters) in the course of transmission to the CPU.

ENTER — Depression of the ENTER key causes the transmission of the CR code in Conversational Mode. When operating in buffered mode, the ENTER key performs a TAB function.

TAB — Depression of the TAB key causes the cursor to skip to the first location in the next unprotected field. The Home position is always a tab stop. When the cursor reaches the end of a variable field during data entry to a formatted screen, an automatic tab is executed to the beginning of the next variable field.

BACK — Depression of the BACK TAB key causes the cursor to move backwards to the first position of the previous unprotected field if it is in a protected field, or to the first position of the current field if it is already in an unprotected field. The Home position is treated as a tab stop.

Table 3.1. Generation of Control Codes

Command	ASCII Code	Generation from Keyboard
Carriage Return	CR	NEW LINE or CONTROL-M
Line Feed	LF	LINE FEED or CONTROL-J or [↓]
Cursor Home	SOH	[HOME] or CONTROL-A
Cursor Up	SUB	CONTROL-Z or [↑]
Cursor Down	LF	LINE FEED or CONTROL-J or [↓]
Cursor Forward	ACK	CONTROL-F or [→]
Cursor Back	NAK	CONTROL-U or [←] or CONTROL-H
Delete Character (Inline)*	ESC, E	DEL CHAR
Delete Character (Page)*	ESC, e	DEL CHARs
Insert Character (Inline)*	ESC, F	INS CHAR
Insert Character (Page)*	ESC, f	INS CHARs
Delete Line*	ESC, 1	DEL LINE
Insert Line*	ESC, M	INS LINE
Printer On	DC2	CONTROL-R or PRINT ON/OFF key
Printer Off	DC4	CONTROL-T or PRINT ON/OFF key
Print Local (Variable and Null)	ESC, X	PRINT LOCAL
Print Local (All)	ESC, x	SHIFT plus PRINT LOCAL
Audible Tone	BEL	CONTROL-G
Keyboard Lock	EM	CONTROL-Y
Keyboard Unlock	STX	CONTROL-BREAK** or RESET key
Self-Diagnostic Test	CAN	Power On
Horizontal Address	DLE, x	CONTROL-P
Vertical Address	VT, x	CONTROL-K
Absolute Address	ESC,Y,r,c	ESC,Y,r,c***
Underline Video	ESC,Ø,`	ESC,Ø,`
Reverse Video	ESC,Ø,P	ESC,Ø,P
Blink	ESC,Ø,B	ESC,Ø,B
Half Intensity	ESC,Ø,A	ESC,Ø,A
Set Video Attribute	ESC,Ø	ESC,Ø
Erase Variable Data	ESC,G	Erase Part
Erase, All	FF	CONTROL plus ERASE
Erase to End of Page	ESC,k	CONTROL and SHIFT plus ERASE: EOP
Erase to End of Line	ESC,K	ERASE: EOF
Erase Field	ESC,K	Forms Mode: EOF
Local Mode	ESC,t	LOCAL**or ESC, t
On-Line Mode	ESC,T	LOCAL**or ESC,T
Read Status	ESC,ENQ	ESC,ENQ
TAB	HT	TAB or CONTROL-I
BACK TAB	ESC,O	BACK TAB
Set Line Drawing Mode	ESC,1	ESC,1
Exit Line Drawing Mode	SEC,2	ESC,2

Table 3.1, continued

Command	ASCII Code	Generation from Keyboard
Store Control Code in Screen Memory	ESC,Z	ESC,Z
Set Transparent Mode	ESC,3	ESC,3
Exit Transparent Mode	ESC,4	ESC,4
Transmit	ESC,DC1	Xmit or CONTROL-Q
Request Retransmission	ESC,DC1	N/A
Reset	ESC, s	RESET
Page Mode	ESC, U	PAGE
Message Mode	ESC, u	MSG
Conversational Mode	ESC, V	CONV
Forms Generation Mode On	ESC, R	FORM
Set Separate Baud Rate For Auxiliary Interface	ESC,A,X	ESC,A,X

where X=Baud Rate for Peripheral Port****

X	Baud Rate
1,A,Q,a,q	110
3,C,S,c,s	300
5,E,U,e,u	1200
6,F,V,F,v	1800
7,G,W,g,w	2400
8,H,X,h,x	4800

*Optional Package only
**The LOCAL key is interlocked with the CONTROL key
***For ESC,Y,r,c - r=row, c=column
****Any one of the characters shown next to the baud rate may be used to set the rate shown.

NOTE: Commas are shown between characters in a code sequence for readability in this text, but are not entered as part of the code sequence.

STORAGE OF CONTROL CODES

All 32 control codes are displayed on the screen as special symbols, as shown in Figure 3-4. These codes can be stored in the terminal's display memory if the control code is preceded by the command ESC,Z.

Figure 3-4. Storage of Control Codes

SECTION 4:

OPERATING CHARACTERISTICS

Operational parameters for the Regent™ 200 (baud rate, parity, half or full duplex, etc.) are conveniently located at the rear of the terminal and can be set by the user before connection to the computer system.

Figure 4-1 shows the locations of two switch modules on the back panel of the terminal, through which the parameters can be selected. The switches on modules A and B are clearly labeled 1 through 8. Each switch is a miniature rocker switch which is pushed down for the "1" state, or pushed up for the "0" state. The effect of the individual mode and parameter settings for switch modules A and B are described in the following pages.

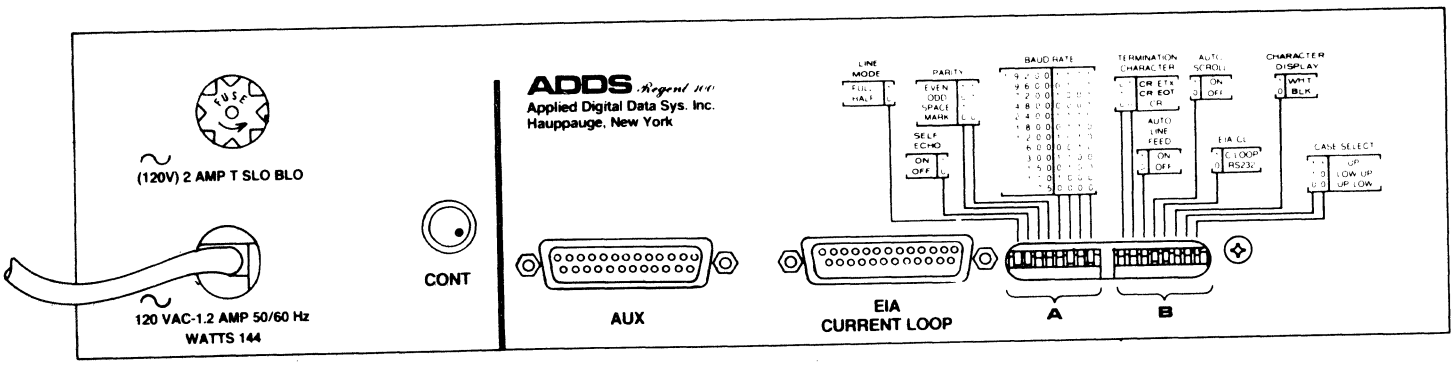


Figure 4-1. Rear Panel

MODE SELECTION

Full or Half-Duplex Selection

Switch A: Position 1 = 1 for Full-Duplex
Switch A: Position 1 = 0 for Half-Duplex*

Full-Duplex should be selected for use with modems or acoustic couplers that support a four-wire circuit, or for direct connection into a CPU.

The terminal should be set to operate in Half-Duplex* only when utilizing line turnaround protocol with modems such as a 202 (see Line Terminator Character).

Self-Echo

Switch A: Position 2 = 1 for Self-Echo ON
Switch A: Position 2 = 0 for Self-Echo OFF

Used in conjunction with Full-Duplex if information from the keyboard is to be simultaneously sent to the CPU and display electronics. Note that in Full-Duplex operating mode without Self-Echo, the CPU must echo each character if the operator is to see the data entered from the keyboard.

Parity Selection

Switch A: Positions 3 = 1, 4 = 1 for Even Parity
Switch A: Positions 3 = 0, 4 = 1 for Odd Parity
Switch A: Positions 3 = 1, 4 = 0 for Spacing
Switch A: Positions 3 = 0, 4 = 0 for Marking

If either EVEN or ODD parity is selected, the terminal appends the proper parity bit (bit 8, in addition to the 7 ASCII bits) to outgoing data, and checks parity on all incoming data. A parity error on incoming data causes an asterisk to be displayed on the screen. NOTE: A break in Half-Duplex mode or disconnecting the data lines may also cause the asterisk to be displayed, since such conditions can cause a framing error.

If the ALWAYS MARK or the ALWAYS SPACE state is selected, the parity bit on outgoing data is always 1 or always 0, and parity is not checked on incoming data.

*not presently supported on the Regent™ 200

Baud Rate Selection

Switch A: Positions 5, 6, 7, 8 (see Table 4.1)

Baud rate change is accomplished through switch selection on the rear panel. The user may select from the following rates: 75, 110, 150, 300, 600, 1200, 1800, 2400, 4800, 7200, or 9600 baud for EIA, and 75, 110, 150, 300, 600, 1200, 1800, 2400, 4800, 7200 or 9600 baud for current loop operation.

Table 4.1. Baud Rate Selection, Switch A

Baud Rate	Switch Position			
	5	6	7	8
9600	0	1	0	1
7200	1	0	0	1
4800	0	0	0	1
2400	1	1	1	0
1800	0	1	1	0
1200	1	0	1	0
600	0	0	1	0
300	1	1	0	0
150	0	1	0	0
110	1	0	0	0
75	0	0	0	0

Line Terminator Character Selection

Switch B: Position 1=0, 2=1 for CR, ETX
Switch B: Position 1=1, 2=0 for CR, EOT
Switch B: Position 1=0, 2=0 for CR

The user can select one of three end-of-line terminator codes from CR, CR EOT or CR ETX.

Auto Line Feed

Switch B: Position 3=1 set Auto Line Feed ON
Switch B: Position 3=0 set Auto Line Feed OFF

In Auto Line Feed mode, an internal line feed is generated within the terminal logic whenever a Carriage Return code (CR) is received, or whenever the cursor advances past the end of a line. A CR code places the cursor in the beginning of the current line; receipt of a CR when Auto Line Feed is enabled positions the cursor to the beginning of the next line. Note also that receipt of a CR code will cause the display to scroll if the cursor is at the bottom line and both Auto Line Feed and Auto Scroll are enabled and the terminal is in Conversational or Message Mode.

Auto Scroll Mode

Switch B: Position 4=1 sets Auto Scroll Mode ON
Switch B: Position 4=0 sets Auto Scroll Mode OFF

When the Auto Scroll Mode is enabled, data scrolls upward (except in Forms or Page mode) if the cursor is in the bottom line and a Line Feed (CONTROL-J) code is received by the display electronics. Data will also scroll if the cursor is in the bottom line and a CR is received, or the New Line key is depressed and Auto Line Feed is enabled. As a result of the upward scroll, all data on the page moves up by one line, with data previously on the top line being lost from memory and a new blank line appearing at the bottom of the page. This simulates the line feed action of a teletypewriter.

If the Auto Scroll option is not enabled, the display page does not scroll. A command which attempts to move the cursor down from the bottom line (Cursor Down or Line Feed) causes the cursor to appear in the top line in the same relative position.

EIA/Current Loop Selection

Switch B: Position 5=1 for Current Loop
Switch B: Position 5=0 for RS232C

This switch selects the communication interface for either EIA RS232C or 20/60 MA current loop operation. The user should note that the baud rate for the current loop interface is limited to 9600 bps.

NOTE: If set for current loop, the terminal will not operate properly unless it is connected to a current loop source. If not connected, the unit will fail the self-test and display an asterisk (*) on the screen if parity is enabled. This is due to an open line in the loop mode, causing a space condition similar to a continuous break.

Character Display

Switch B: Position 6=1 for white characters, dark background
Switch B: Position 6=0 for black characters, light background

The standard video presentation of the terminal is dark characters on a light background for the data entry field. This presentation can be reversed by a switch selection.

Upper/Lower Case Selection

Switch B: Position 7=1, 8=1 selects upper case only
Switch B: Position 7=1, 8=Ø selects lower, Shift to upper
Switch B: Position 7=Ø, 8=Ø selects upper, Shift to lower

The terminal is capable of transmitting and displaying the entire 128 character ASCII code set. However, the user can set the terminal in any of the following modes.

Upper Case Only:	Generates only the standard 64 alphanumeric characters and control codes.
Lower Case, SHIFT to Upper Case:	Generates all 128 ASCII codes. The keyboard will generate lower case codes in the unshifted mode.
Upper Case, SHIFT to Lower Case:	Generates all 128 ASCII codes. The keyboard will generate upper case codes in the unshifted mode.

There is one other switch module present in the terminal that allows the user to set additional parameters. The location of this module is D3.

Parity Check Enable

The parity check feature may be enabled or disabled using Switch 3 on module D3. When the switch is placed in the ON position, the terminal displays detected parity errors as an asterisk (*) on the CRT. In the OFF position, parity errors are ignored, and an interpretation of the received data must be made by the processor.

50 Hz

Switch 3 on module D3 controls the screen refresh rate. It is preset at 60 cycles. Export units operating at 50 cycles should have this switch enabled. The user should note that additional changes are necessary for operation at 50 Hz. These are discussed in detail in the Regent™ 100/200 Maintenance Manual.

Conversational Mode

This mode enables the terminal to transmit and receive data on a character-by-character basis in a manner identical to that of a teletypewriter.

Conversational: Full-Duplex, Self-Echo*

When any key is depressed, the corresponding character is transmitted and if the character is displayable, it is displayed on the screen simultaneously with transmission to the computer. The set of displayable characters which can be generated by means of the terminal keyboard is defined in columns 2-7 in the ASCII code chart. The cursor, which is visible on the screen as a blinking block, indicates the next position into which a displayable character will be entered. Each time a character is entered, the cursor automatically advances one character position.

Note: The ASCII code for space (SP=0100000) is considered to be a displayable character and is displayed as a blank.

Characters received from the computer have exactly the same effect on the terminal as corresponding characters entered by the operator from the keyboard. The only keyboard actions which have no direct equivalent in computer control are those function keys which are strictly local. If the computer or the operator should transmit codes which do not have a defined display or control function, they are simply ignored by the terminal.

Conversational: Full-Duplex, No Self-Echo

When operating in the Conversational mode, all encoded keys on the operator's keyboard cause the corresponding ASCII characters to be transmitted to the computer, but these characters have no effect on the display screen. Characters received from the computer by the terminal have exactly the effect described above. This mode of operation is analogous to that of a Full-Duplex teletypewriter.

*Half-Duplex, Self-Echo modes (rear panel selection) are used only when telecommunications facilities require line turn-around protocol. This feature is not presently supported on the Regent 200.

Page Mode

In this mode an entire page of data may be entered, edited and then transmitted to the computer. Transmission does not take place until the terminal receives a specific transmit command from either the keyboard or the computer.

A Formatting feature may be used in Forms mode. However, the description which follows is for operation on a Null Form. The effect of the Formatting feature is described under Forms Generation mode.

The display page appears stationary in the Page mode rather than scrolling (which can occur in the Conversational mode or Message mode if Auto Scroll is enabled). When a character is entered in the last position of the bottom line, the cursor goes to the beginning of the top line. The "Home" position of the cursor is at the top left corner of the screen when in Page mode.

Data Entry

The operator may use all editing and display control keys, as well as alphanumeric keys to prepare a page of information. No data is transmitted to the computer before a page transmission is initiated.

Similarly, characters received from the computer cause data entry on the display page. Characters sent by the computer which have no defined function in the terminal are simply ignored. Note that the computer can address the cursor to a given line and to a location within that line. Thus, the computer can easily change all or any selected part of the display page.

Data Transmission From a Page (Null Form)

When transmission is initiated, the terminal marks the end of entry with a DEL and moves the cursor automatically to the Home position or the last transmission mark (DEL). The cursor advances through each character position on the screen until it reaches the last DEL character. The line terminator character (CR, CR EOT, or CR ETX) is sent at the end of the message.

Transmission of a page can be initiated in three ways:

- When an ESC DC1 is received from the computer;
- When the operator depresses the TRANSMIT key;
- When the operator depresses ESC, CONTROL-Q.

Transmission time is conserved by a feature that suppresses trailing blanks with each line. A GS code is sent to indicate that suppression of trailing blanks was used for a given line. For example, if the last data character in a line is the letter R and there are 20 blanks between that character and the end of the line, the line will look like the character sequence

... R, GS

when the message is transmitted. If a line is completely blank, the terminal will transmit the GS code only for that line.

During a page transmission from the terminal, inputs from the computer are ignored. After sending the page transmission terminator, the terminal again can receive data from the computer.

Message Mode (Null Form)

The Message mode can be considered a subset of the Page mode. Data is entered into the display page by either the operator or the computer in exactly the same way in Message mode as was described above for Page mode. Scrolling in the last line of the display can be accomplished by setting the Auto-Scroll switch at the rear of the terminal. However, the Page and Message modes differ in the manner in which data is transmitted from the terminal to the computer.

Message mode permits transmission of a page (or any part of a page) as a sequence of line transmissions. This makes it easy to do selective transmission. It also makes transmission of a page compatible with any currently available time-sharing software which basically processes data as a series of line messages rather than as one large block of data.

Transmission in the Message mode is in accordance with the following sequence:

- The cursor goes automatically to the beginning of the current line;
- The line is transmitted as a serial stream of characters.
- Trailing blanks are suppressed.
- The terminator code is transmitted to indicate the end of the line, and the cursor stops at the beginning of the next line.

The line transmitting sequence listed above is initiated in one of three ways:

- An ESC, DC1 (CONTROL-Q) code from the computer or
- Depressing the TRANSMIT key on the terminal keyboard, or
- Depressing ESC, CONTROL-Q on the terminal keyboard.

Thus, the computer or the operator can position the cursor to a particular line and cause that line (and following lines) to be transmitted by issuing a Transmit code (or a sequence of Transmit codes).

A depression of the Transmit key while in Conversational mode will be ignored.

Local Mode

Depressing the Local key in conjunction with the CONTROL key allows the operator to enter a mode whereby the communication interface logically maintains an on-line status condition to the CPU while disabling data transfer. From all operating modes, the terminal enters the Local Mode. If the key is depressed in the Conversational Mode, the code ESC, t is sent to the CPU to indicate the terminal has gone off line. In all modes the message "Local" appears in the Status Line.

Form Generation Mode

Depression of the Form key places the terminal in a state whereby the operator or CPU can generate a formatted screen. A formatted screen is defined as one which contains the following attributes.

Visual

Protected

Forms Generation Mode Enabled

To enable this mode the operator must depress the FORM key or as an alternate, the terminal must receive the sequence ESC,R.

The field attributes described in Table 4.2 can now be entered into the data entry area.

Set Field Attribute

The ATTR key is used only in the Form Generation Mode. Depressing this key indicates to the terminal that the next alphanumeric character entered is a field attribute.

In the Forms mode, the CPU can set the Field Attribute by sending the code ESC,Ø. Fields are defined by entering attribute characters into screen memory. They define the start of one field and the end of the previous field.

Protected fields cannot be entered or changed in the Data Entry Mode, although an operator can access protected fields through cursor controls. Attempts to enter a data character in a protected field will cause the cursor to auto skip to the first unprotected field and write the character in that field.

In Forms mode, any alphanumeric character may be entered into a protected field. In Data Entry mode, these fields may not be entered.

1. Alphanumeric Protected

   These fields appear in the display, but are not transmitted in Data Entry mode. They are typically used in formats to guide the operator by identifying data entry fields.

2. Print-Only Protected*

   These fields do not appear in the display in Data Entry mode. Print-Only fields are not transmitted to the CPU, but are transmitted to the printer as if they were embedded in text. Print-Only Protected fields can be used to print forms longer or wider than the display (e.g., 66 lines long).

3. Constant*

   These fields are protected to the operator and the CPU, so they cannot be altered, but they are transmitted to the CPU. Constant fields are treated as part of the form but are not displayed. This type of field may be used for form titles and identification codes required by a CPU application program.

*Not presently implemented in the Regent™ 200

Format Mode Disabled

To leave Format Mode the user depresses the Page, Message or Conv key or as an alternate, the terminal may receive a command sequence from the CPU to do the same. The RESET key can also be used to exit the Forms Mode and display the message CONV.

Data Entry Under Forms Control

Data is entered into variable fields. Protected fields are "auto-skip," causing the cursor to skip over the field if the operator has entered data into the previous unprotected character position, or if the operator depresses the TAB key when the cursor is in the previous unprotected field.

BACK TAB causes the cursor to scan backward to the first variable position of the previous variable field, or to the first position of the current variable field if it is not already in the first position.

Depression of the NEW LINE key will move the cursor to the first position on the next line if Auto Line Feed is enabled.

Control codes may be entered as data. To store a control code in memory, each control code must be preceded by the transmission of the ASCII sequence ESC,Z. Control codes stored in this manner are ignored by the terminal when transmitted from memory.

Transmission in the Forms Generation Mode will cause all data in the screen memory to be sent to the CPU including Field Attributes preceded by an ESC,Ø sequence. No suppression of trailing blanks occurs. The terminator code is sent upon completion of transmission of all 1920 characters.

Transmission of formatted screens in either Message or Page modes causes only Variable fields to be sent to the CPU. The appropriate terminator code is appended to the end of transmission. If it is necessary in Page or Message Mode that each line must have a control code termination, then the application program should store the appropriate code as data (ESC,Z plus control code).

Cursor Controls

Cursor Home (HOME)

The SOH code places the cursor in the Home position, that is, in the leftmost position of the bottom line in Auto Scroll Mode, and the leftmost position of the top line in non-Auto Scroll Mode. In Page and Forms mode, Home is always the upper left.

Cursor Forward (→)

The ACK code moves the cursor one position forward. If the cursor is at the end of a line, it is placed back at the beginning of the current line in response to ACK. If the terminal is in Auto Line Feed mode and the cursor is at the end of a line, it advances to the beginning of the next line when ACK is received.

Cursor Back (←)*

The NAK code moves the cursor back one position. If the cursor is at the beginning of a line, it goes to the end of the preceding line in response to NAK. The receipt of a NAK when the cursor is at the beginning of the top line causes it to be moved to the rightmost position of the bottom line on the display.

Cursor Up (↑)

The SUB code moves the cursor up to the same relative position in the line above the current line. The receipt of a SUB when the cursor is in the top line causes it to be moved to the bottom line on the display.

Cursor Down (↓)

The LF code causes the cursor to move down one line from its current position. Receipt of LF when the cursor is in the bottom line causes it to be moved to the top line in the same relative position if the Auto Scroll mode is inhibited. When Auto Scroll is enabled, LF causes the display to scroll, except in Page or Forms Mode.

New Line

The CR code places the cursor at the beginning of the same line in non-Auto Line Feed mode, or at the beginning of the next line in Auto Line Feed mode.

Line Feed (LF)

The LF code causes the same cursor downward movement as described above in Cursor Down (↓).

*Standard Configuration. Receipt of the BS code will also move the cursor back.

Erase

Five erase functions are provided for on the Regent™ 200.

Erase to End of Line (Null Form)

ESC,K causes characters from the cursor position to the end of line to be filled with spaces. The cursor remains in the same position.

Erase to End of Field (Formatted Screen)

ESC,K causes all variable characters from the cursor position to the next protected field attribute to the filled with spaces. The cursor remains in the same position.

Erase to End of Page (Null or Formatted Screen)

ESC,k replaces with spaces all unprotected characters from the cursor position to the end of the page. The cursor remains in the same position. The effect is the same as Erase Variable if the cursor is in the Home position.

Erase Variable

ESC,G replaces all unprotected data on the screen with spaces. The cursor returns to the top left-hand corner of the screen.

Erase All

Form Feed causes all characters in the data entry area, protected and unprotected, to be replaced with spaces. The cursor will return to the top left-hand corner of the screen.

Cursor Addressing

Two forms of cursor address capability are available on the terminal. The first scheme allows for separate commands to either the vertical or horizontal address; both commands are absolute. The second address scheme allows a four-byte command to position the cursor to the desired cursor position.

Vertical Cursor Addressing

The Vertical Address Command code is VT (CONTROL-K). The five least significant bits of the character following receipt of a VT code positions the cursor to the desired line by defining, in binary, one of the 24 lines.

Vertically positioning the cursor through use of the Vertical Address command does not affects its horizontal position. For example, the sequence VT,K positions the cursor to line number 11 (the 12th line from the top) without affecting horizontal positioning of the cursor.

Horizontal Cursor Addressing

The horizontal address command code is DLE (CONTROL-P). All seven bits of the character following receipt of a DLE define the desired horizontal position of the cursor. The most significant three bits are used to determine which group of ten positions are to be addressed (0-9, 10-19, ..., 70-79). The least significant four bits make up a BCD number (0-9) which selects which of the ten positions within any one group are to be selected. For example, the sequence DLE, 8 causes the cursor to be positioned to the 38th position in the current line, without affecting vertical positioning of the cursor.

Absolute Cursor Addressing

The address scheme ESC,Y,r,c can position the cursor to any position on the screen, where r,c is the address of a position within the 1920-character data entry field. In this command r represents the row position and c represents the column. A chart of absolute screen addresses used with this command sequence is given in the last 2 pages of this manual.

Audible Tone

An audible tone is sounded in the terminal if the BEL character is received. This is consistent with the bell control of teletypewriters.

Keyboard Lock

When the control code EM is received, the keyboard locks and remains locked until an unlock command (STX) is received. If Self-Echo is enabled when the operator generates an EM code using the CONTROL-Y keys, he will not be able to depress any key. The keyboard will lock, and the message "KEYBOARD LOCK" will be displayed in the Status Line when an attempt is made to depress any key (except RESET or CONTROL-BREAK).

Depression of the RESET key or the CONTROL-BREAK keys will unlock the keyboard.

Reset

Receipt of the code sequence ESC,s resets the terminal to the Conversational Mode of operation. In addition, the terminal will abort any active buffered transmission or Print Local functions and will reply with the Status Message. The screen display is unaffected by the Reset command.

Forms Generation Mode

When the code sequence ESC,R is received, the terminal is placed in the Forms Generation Mode. The CPU can now generate a formatted screen in the display area using Field Attribute codes (see Table 4.2).

Field Attributes

The sequence ESC,Ø precedes the alphanumeric code that will cause the display to take on the appropriate protected or visual effect, from the cursor position through to the end of the screen. This command has an effect only when the terminal is in the Forms Generation Mode.

Transmit

Transmission characteristics vary according to the mode of the terminal (Page, Message, Conversational and Form) and the type of screen display (Null form or Formatted Screen). The CPU can command the terminal to transmit with the code sequence ESC,DC1. The response from the terminal will be identical to that of the depression of the XMIT key on the keyboard.

Back Tab

Receipt of the code sequence ESC,O causes the cursor to move backward to the first position of the previous unprotected field.

Tab

When the HT code is received, the cursor moves to the first position in the next unprotected field. Home is always a tab stop.

Print On/Off

The CPU can enable the auxiliary serial port through the command DC2. The code DC4 will turn the port off.

Print Local

The Print Local function varies according to the command and mode. In Conversational, Message and Page modes, ESC,X causes the printing of all variable and print-only data on the attached peripheral via the auxiliary port. Attributes and protected data are output as space codes. The code sequence ESC,x causes the printing of all data, both protected and variable. In Forms mode, all data including attribute information is sent.

Once the Print Local function has been started, the CPU can send a "request status" command which will cause status to be sent on completion of the print function.

Field Attributes

Field attribute codes determine visual effects and the following field characteristics: constant or print-only. The visual effects are reverse video, half intensity, zero intensity, blinking and underline. The remote command codes to cause these effects are given in Table 4.2 below. The user must enter the SET ATTRIBUTE command sequence ESC,Ø preceding the attribute code to have it affect the display.

Table 4.2. Field Attribute Codes

	Variable		Protected	
Field Characteristic	Code	Hex	Code	Hex
Normal (black on white)	@	40	H	48
Half intensity	A	41	I	49
Blinking	B	42	J	4A
Half intensity, blinking	C	43	K	4B
Zero intensity	D	44	L	4C
Reverse video	P	50	X	58
Reverse video, half intensity	Q	51	Y	59
Reverse video, blinking	R	52	Z	5A
Reverse video, half intensity, blinking	S	53	[	5B
Reverse video, zero intensity	T	54	\	5C
Normal, underlined	`	60	h	6B
Underlined, half intensity	a	61	i	69
Underlined, blinking	b	62	j	6A
Underlined, half intensity, blinking	c	63	k	6B
Underlined, reverse video	p	70	x	78
Underlined, reverse video, half intensity	q	71	y	79
Underlined, reverse video, blinking	r	72	z	7A
Underlined, reverse video, blinking, half intensity	s	73	{	7B
Constant, black on white	d	64		
Constant, reverse video	t	74		
Print-only	l	6C		
Print-only, reverse video	;	7C		

Function Keys

Function keys labelled F1 through F8 are provided in the first eight positions of the half-key row. Table 4.3 gives the codes generated by these keys. Sixteen unique codes can be transmitted by using the keys in conjunction with the SHIFT key. The end-of-line terminator code in use (selected on the rear panel) is automatically appended to the function sequence transmitted. The function keys transmit their sequence in Message and Page mode as well as in Conversational mode. The function keys remain operational even when the Keyboard Lock function has been enabled.

Table 4.3 Function Code Sequences

Function Key	UnSHIFTed Mode	SHIFTed Mode
F1	STX 1	STX !
F2	STX 2	STX "
F3	STX 3	STX #
F4	STX 4	STX $
F5	STX 5	STX %
F6	STX 6	STX &
F7	STX 7	STX '
F8	STX 8	STX (

Line Drawing

The Line Drawing mode is enabled when the terminal receives the control code sequence ESC,1 from the computer or the keyboard. In this mode, the characters defined in Table 4.4 cause the video logic of the terminal to generate the appropriate special symbols. The receipt of any legal control code terminates the mode, and characters are displayed in the usual manner. (The line drawing mode can also be exited by entering the ESC,2 code.) Thus, simultaneous presentation of graphic and alphanumeric data is possible.

As shown in Table 4.4, the line drawing symbols consist of small lines within the total field area of a standard character position. The dot matrix or character field used in this mode is an 8 x 10 dot area.

There are 11 distinct symbols to select from, giving an almost unlimited number of combinations when using the full screen area. Each individual graphics character can be displayed in normal video, blinking, half intensity, or half-intensity blink.

Table 4.4. Line Drawing Symbol Generation

Symbol	Position	Visual Effect			
		Normal	Half Inten.	Blink	Half, Blink
	Lower Right Corner	@	A	B	C
	Lower Left Corner	D	E	F	G
	Upper Right Corner	H	I	J	K
	Upper Left Corner	L	M	N	O
	Bottom Intersect	P	Q	R	S
	Left Intersect	T	U	V	W
	Right Intersect	X	Y	Z	[
	Top Intersect	\	]	^	←
	Horizontal Line	`	a	b	c
	Vertical Line	d	e	f	g
	Cross Lines	h	i	j	k

Status Line

As shown in Figure 4-2, the Status Line always contains a beginning and ending rectangular block character. Other field division blocks are presented only when the field contains a displayable message. All messages are displayed in half-intensity in the inverse presentation of the display. A summary of the Status Line fields is given below.

Table 4.5. Status Line Fields

Field #	Horizontal Position	Message
1	2-7	Mode
2	8-16	SHIFT
3	17-23	LOCAL
4	24-30	AUX
5	31-37	PASS/FAIL
6	38-60	Terminal Status Message
6a	61-62	Message Terminator Code(s)
7	63-71	CARRIER
8	72-79	SEND/RECEIVE

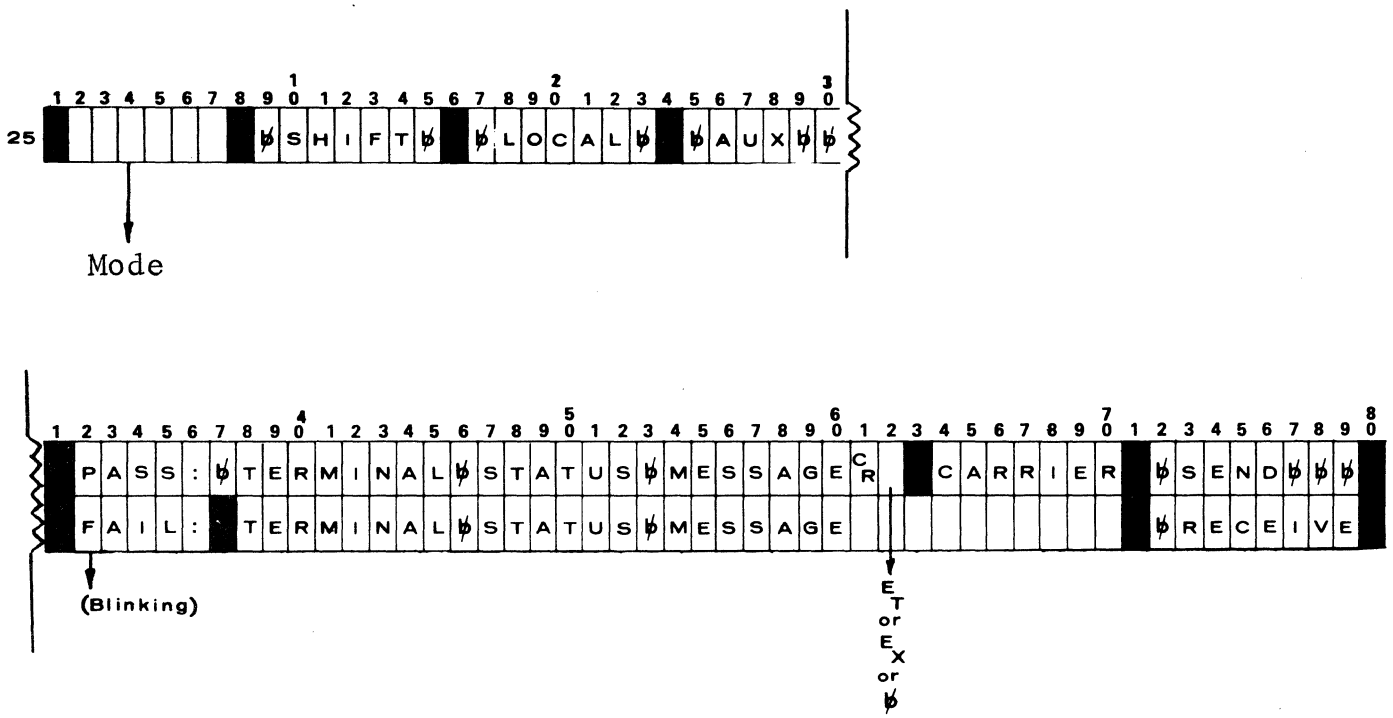


Figure 4-2 REGENT 200 STATUS LINE

Field 1: Mode 6 characters

This field contains one of the following words indicating the current mode of operation.

MSG	Message Mode
CONV	Conversational Mode
PAGE	Page Mode
FORM	Form Generation Mode

Field 2: SHIFT 9 characters

The SHIFT message appears in positions 8 to 16 beginning with a rectangular display block and space, and ending with a space and display block when the LOCK key is depressed to lock the keyboard into an alpha (A-Z) shifted operation.

Field 3: LOCAL 7 characters

The LOCAL message is displayed when the operator has depressed the LOCAL key to place the terminal in an Off-Line condition. This message is removed when the terminal is restored to the "On-Line" mode.

TRANSPARENT

The "TRNPRNT" message appears in Field 3, when the CPU has sent ESC,3 to enter transparent mode (or ESC,3 has been entered at the keyboard). The message disappears when the code ESC,4 to exit transparent mode is received by the terminal.

Field 4: AUX 7 characters

Positions 25-30 are used to display the AUX message to indicate if the auxiliary serial interface has been enabled by the operator or the computer. The field starts with a blank, and two blanks follow the AUX message.

Field 5: PASS/FAIL 7 characters

After power-up, the self-diagnostic firmware performs a memory and EIA communication test. If the test is successful, the message PASS: appears in positions 31-37; if it is unsuccessful, the blinking message FAIL: appears. In either case, this is followed by a terminal status message in Field 6.

Field 6: Terminal Status Message 12 characters

After the self-diagnostic test, positions 38-60 contain a message describing the terminal's status. The configuration of the status message is fully described in the following pages. During terminal operation, other messages appear in this field. If the mode shown in Field 1 is MSG, CONV or PAGE, the word PROTECTED will be displayed when the cursor is in a "protected" field. If the mode shown in Field 1 is FORM, then VARIABLE, PROTECTED or CONSTANT is displayed, followed by ATTR="x" where "x" is the attribute code controlling the field at the cursor location.

Field 6a: Message Terminator Code(s) 1 or 2 characters

The characters of Field 6, in positions 61 and 62, may be one of the following:

CR	Carriage Return
CR ET	Carriage Return/EOT
CR EX	Carriage Return/ETX

Field 7: CARRIER 9 characters

If Data Set Ready is present on the communication channel, the message CARRIER is displayed in positions 63 to 71.

Field 8: SEND/RECEIVE 8 characters

To indicate to the operator whether the CRT or the CPU has control of the communication channel, the message SEND or RECEIVE is displayed in positions 72-79.

Status Message

The terminal's status can be displayed on the CRT or transmitted via the modem port. The terminal status message gives the operating mode (Local, keyboard lock, etc.), the back panel switch settings, error conditions, current cursor position, and the data at that position.

The status message is transmitted when the operator enters the ESC,ENQ sequence at the keyboard in On-Line Mode or when the ESC,ENQ sequence is received from the modem port in On-Line or Local Mode. It is also transmitted when the RESET or CTRL-X keys are depressed.

The ability to read the status of the terminal provides two important features uncommon in this class of terminal. The terminal status indicates whether or not all software-encoded functions have executed correctly. The terminal response to a Read Status command is delayed for a minimum of 16 ms to allow for possible delays in the Master CPU. Thus, if the interface is not being controlled by the EIA RS232 signals (CTS,SCF), this accommodation should allow most master stations sufficient time to turn around and receive the status message with no loss of data.

The status message consists of 11 or 12 bytes of data. Each byte transmitted from the modem port has its most significant bit set according to the terminal's parity (odd, even, marking or spacing). Each byte displayed on the screen has its most significant bit set to Ø, so that a visual attribute character (data with its most significant bit set to 1) will not be displayed in the status message on the CRT. There are seven bits remaining for information in each of the bytes of the status message. Table 4.6 provides the sequence of status bytes.

Table 4.6 Status Message Byte Sequence

Byte	Function
1	STX
2	Mode 1
3	Switch 1
4	Switch 2
5	Switch 3
6	Error Condition 1
*7	Error Condition 2
8	Cursor x
9	Cursor y
10	Data at cursor position
11	Terminator character 1
12	Terminator character 2

The CPU may use the Status Message to be sure the terminal is working properly or that it has been set up properly.

The following figures give the bit settings and meanings for specified bytes.

*This byte is not presently implemented in the Regent™ 200 terminal.

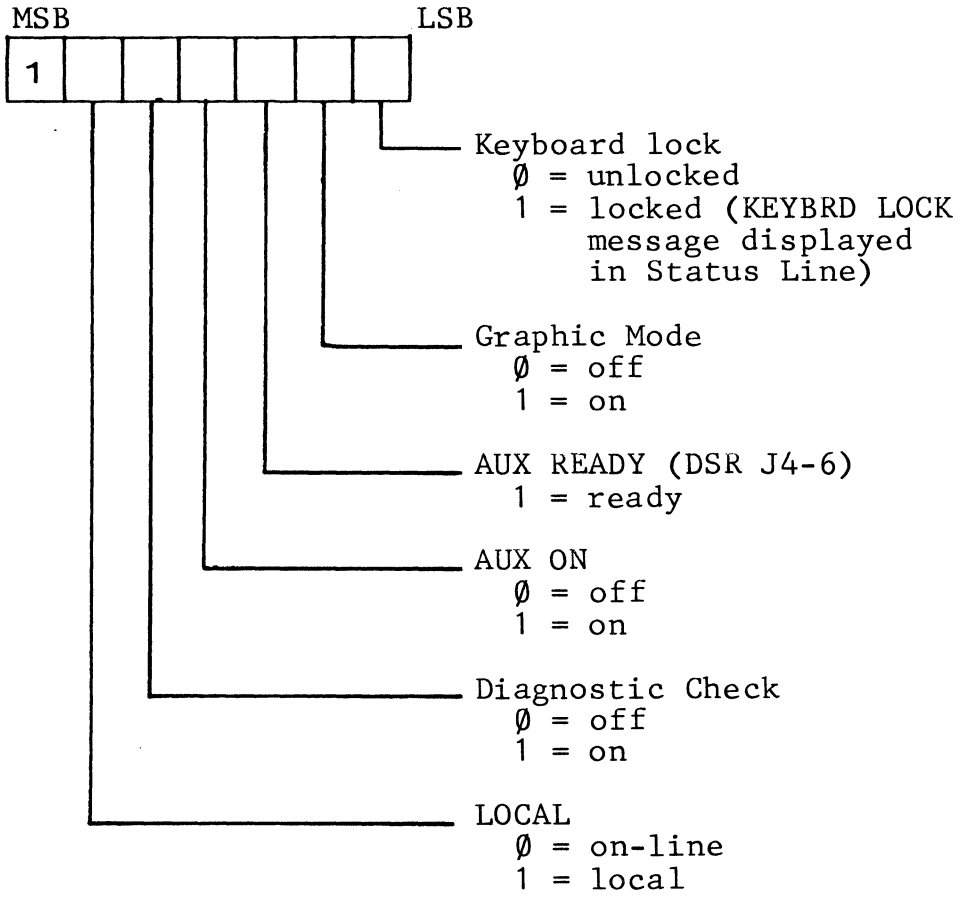


Figure 4-3. Byte 2: Mode 1

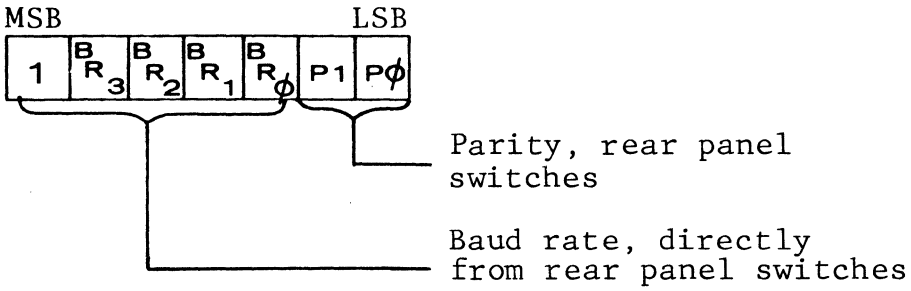


Figure 4-4. Byte 3: Switch 1

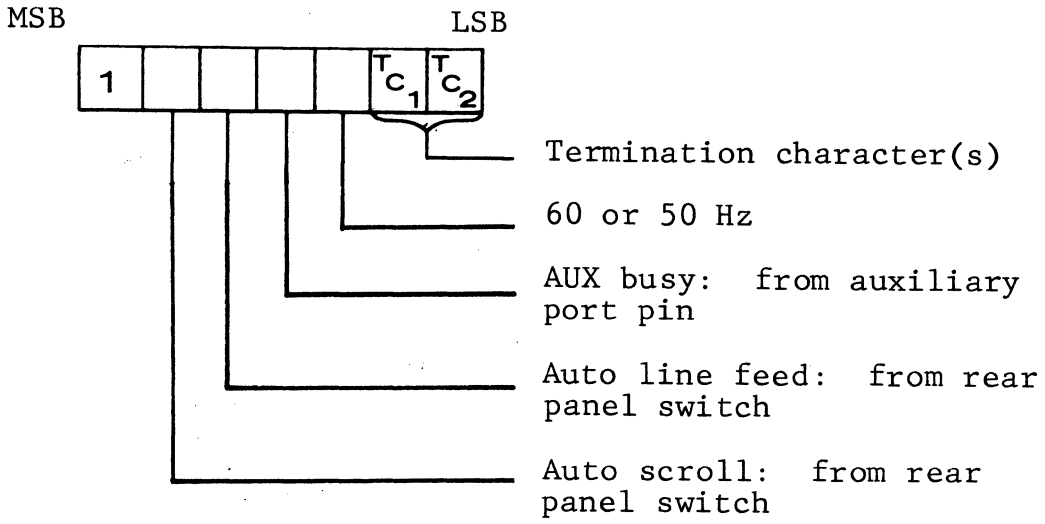


Figure 4-5. Byte 4: Switch 2

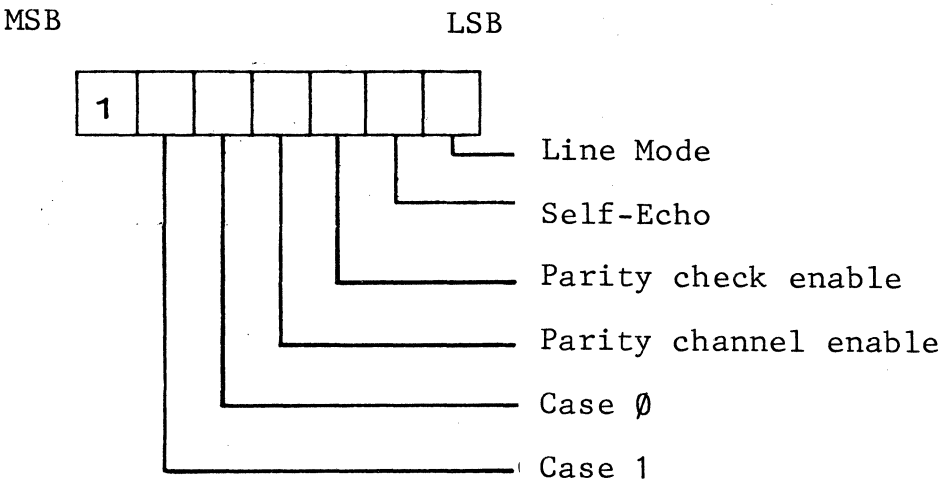


Figure 4-6. Byte 5: Switch 3

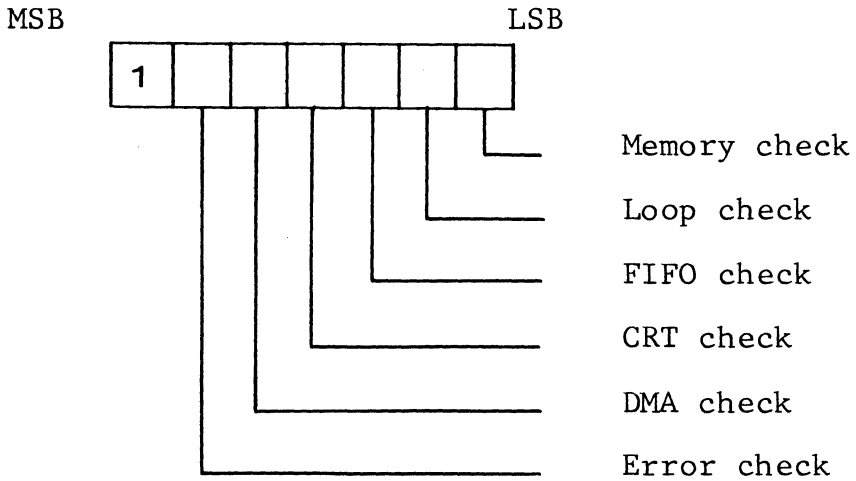


Figure 4-7. Byte 6: Error Condition 1

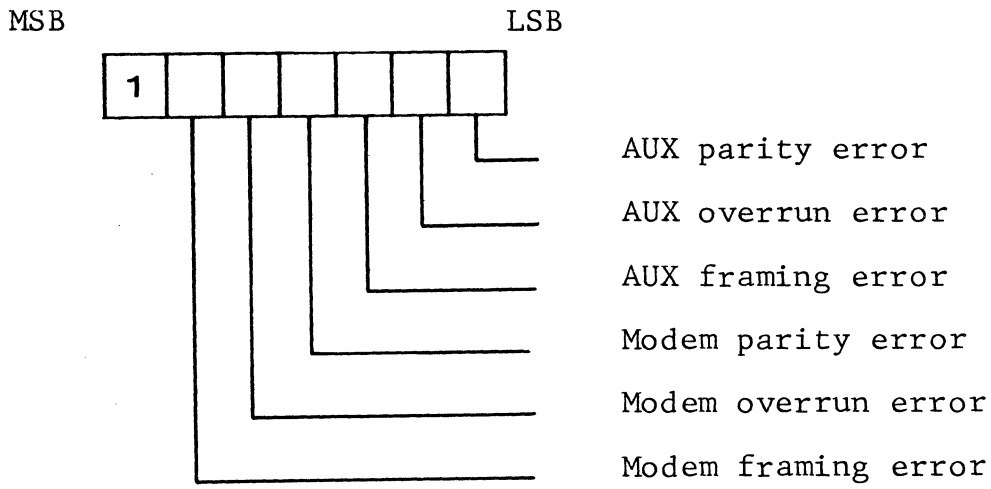


Figure 4-8. Byte 7: Error Condition 2

SECTION 5:

BIDIRECTIONAL PERIPHERAL SERIAL INTERFACE

A serial peripheral interface is integral to the package of function and special keys. The bidirectional interface allows connection of a serial EIA peripheral to the terminal. Thus, in addition to printers, rotating storage devices such as diskettes can be attached to the terminal to meet specific needs for on- or off-line recording of data, at speeds of up to 9600 baud.

Print Transparent Mode

Print Transparent Enable is a remote command from the computer which tells the CRT to ignore the entire data stream including all command codes, which then are directed to the peripheral (printer or other device). Likewise, the peripheral device may communicate directly with the CPU while in transparent mode (see Table 3.1, Control Codes).

Peripheral Speed Setting

A command from the CPU or keyboard can set the baud rate of the auxiliary interface to be independent of the communications interface.

Upon power up, both the communications and peripheral interface baud rates are equal to those set by the switches at the rear of the terminal. The receipt of an ESC,A command followed by any ASCII character in rows 1,3,5-8 and in columns 2-7 can be utilized to set the peripheral port baud rate to a speed independent of the communications interface (see Table 5.1). This initialization is required each time the terminal is powered up. This feature allows the use of a serial peripheral with the Regent™ 200 that is slower than the communications line. A screen of data can be sent to the 200 at a higher speed from the host CPU and, utilizing the Print Local function, the data can be transferred to the peripheral at the slower speed.

Table 5.1. Peripheral Port Baud Rate Settings

ASCII Row	ASCII Columns 2-7	Baud Rate
1	! 1 A Q a q	110
3	# 3 C S c s	300
5	% 5 E U e u	1200
6	& 6 F V f v	1800
7	' 7 G W g w	2400
8	(8 H X h x	4800

Bidirectional Interface Description

The serial peripheral interface is available to the user who has a requirement to support local peripheral devices that interface in accordance with EIA RS232 signal conventions. The serial port pin assignments are shown in Table 5.2 The reader should note that data can be transferred from the terminal as well as to the terminal via the Auxiliary Serial Interface.

Table 5.2. Auxiliary Interface Pin Assignments

Pin	Signal
1	Protective Ground
2	Transmitted Data (from peripheral to terminal)
3	Received Data (from terminal)
5	Clear to Send (to peripheral)
6	Data Set Ready (to peripheral)
7	Signal Ground
8	Carrier Detect (to peripheral)
20	Data Terminal Ready (from peripheral to terminal)
	NOTE: Pins 1 and 7 are electrically common in the 200.

SECTION 6:

OPTION PACKAGE

A single option package is available on the Regent™ 200 for users who wish to extend the capability of the 200 to meet specific operator or application needs.

The INS CHAR key is an alternate action key. The function is enabled by the first depression and remains enabled until the key is depressed again.

Insert Character (Within Line)

When the insert state is enabled, any activation of an alphanumeric key will cause the corresponding character to be entered at the current cursor location, the cursor to advance forward one position, and the data on the current line to move to the right one position with the rightmost character on the line being lost.

In protected format use, only the data within the unprotected field is affected and any character at the right limit of the field is lost. When the cursor reaches the end of the unprotected field the cursor will remain at that last variable field position. The message "INSERT EOL" appears in the Terminal Status Message field.

Insert Character (Within Display)

When the keyboard is in the shift mode (SHIFT key depressed), the Insert Character (in display) function is activated. When an alphanumeric key is depressed, all data to the right of the cursor move one position to the right. The character keyed is inserted and the cursor moves one position to the right. Characters at the end of the line in the data being moved are shifted to the beginning of the next line. The character in the last position on the screen is lost. In protected format use, only the data within one unprotected field is affected. The message "INSERT EOF" is displayed in the Terminal Status Message field.

Delete Character (Within Line)

This key causes the deletion of the character in the cursor position, and all the characters to the right of the cursor to shift one position to the left (the cursor does not move). If the keyboard is in unshifted mode, only the characters in the line containing the cursor move to the left, and a space is inserted at the end of the line.

Delete Character (Within Display)

If the keyboard is in upper-case mode (SHIFT key is depressed), all characters from the cursor to the end of the display shift to the left, and a space is inserted in the last position on the display, i.e., characters in the first position of each line are moved to the last position of the previous line.

In protected format use, this key limits the code sequence to one unprotected field rather than to the end of the line or display.

Line Insert

The depression of this key causes the current cursor line and all succeeding lines to be moved down one line. The bottom line is scrolled off the display. The cursor then moves to the beginning of the new blank line.

Line Delete

This key generates the ASCII character sequence that causes erasure of the current cursor line. All succeeding lines are moved up one line. The cursor moves to the beginning of the current line.

Note: None of the editing keys are enabled if the cursor is positioned in a Field Attribute or Protected area, unless the terminal is in Forms Generation mode. Line Insert/ Delete is not operational if any attributes are stored in the screen memory.

SECTION 7:

DATA INTERFACE DESCRIPTION AND CABLING

Interfaces available with the Regent™ 200 are described in this section. Connector pin assignments, interface signal descriptions and recommended cable practice are presented in sufficient detail to enable the systems engineer to construct appropriate cables and to design interfaces to special equipment, if required.

CONNECTOR COMPLEMENT

Two connectors are located on the rear panel of the Regent™ 200, a Data connector and an Auxiliary Connector.

Mating connectors (Cinch or Cannon type DB-25P, or equivalent) are shipped with each terminal.

A 25-pin female connector (Cinch or Cannon type DB-25S, or equivalent) is the data connector for both EIA signals and Current Loop signals. The same type of connector is used for the Auxiliary interface.

PIN ASSIGNMENTS

Those EIA signals which apply to the 200 class of terminal (asynchronous data communication) are assigned to pins in accordance with EIA Specification RS232C for interfacing data communication equipment, with one exception as noted in Table 7.1. Both the standard EIA circuit name and the circuit name used in Europe (CCITT Specification V24) are shown in Table 7.1. Pins which are unassigned by RS232C for asynchronous data communication are used by the Regent™ 200 for the Current Loop interface.

Table 7.1. Regent™ 200 Data Connector Pin Assignments

Pin No.	EIA RS232 Circuit	CCITT V24 Circuit	Signal	Description
1	AA	101	GND	Protective Ground
2	BA	103	EIAOUT	Transmitted Data
3	BB	104	EIAIN	Received Data
4	CA	105	RQSND	Request to Send
5	CB	106	CLSND	Clear to Send
6	CC		DSR	Data Set Ready
7	AB	102	GND	Signal Ground
8	CF	109	CARDET	Received Line Signal Detector
11	*SCA/SA	120	SCA	Secondary Request to Send
12	*SCF/SB	122	SCR	Secondary Received Line Signal Detector
15	-	-	LBIAS2	Current Loop Bias (+)
17	-	-	LIN+	Current Loop Input (+)
18	-	-	LIN-	Current Loop Input (-)
20	CD	108.2	DATTRY	Data Terminal Ready
22	-	-	LBIAS1	Current Loop Bias (+)
24	-	-	LOUT+	Current Loop Output (+)
25	-	-	LOUT-	Current Loop Output (-)

*There is a discrepancy between RS232C and standard assignments on a Bell System 202 modem, as shown below:

202 Name	202 Pin #	RS232 Name	RS232 Pin 3
SA	11	SCA	19
SB	12	SCF	12

The Regent™ 200 uses RS232 signal names and a pin assignment for SCA/SA in accordance with Bell 202 modems.

THE EIA DATA INTERFACE

Signal Definition and Description

All signals at this interface are not required for most applications. Signal descriptions are grouped from most commonly used to least frequently used.

1. Protective Ground and Signal Ground (AA and AB)

   Pins 1 and 7 should be carried in a cable to a device such as a modem which is wired in accordance with RS232C. Internally in the Regent™ 200, these signals are tied together at one point.

2. Transmitted Data and Received Data (BA and BB)

   The "primary channel" data lines (Pins 2 and 3) are the lines on which data goes to and from the 200.

   Data can be output on BA when Clear to Send (CB) is in the ON state. The 250 millisecond "long space" is forced on this line when the operator's BREAK key is depressed.

   Data received on BB goes to the display electronics.

3. Request to Send and Clear to Send (CA and CB)

   These control lines (Pins 4 and 5) are normally used in either of two situations:

   a) when operating on a half-duplex channel such as a two-wire 202 modem, or

   b) when hardwired to a computer which senses CA to determine when the 200 wants to transmit and controls CB to permit the 200 to transmit only at the CPU's discretion.

   Signal CA is turned ON when the 200 has data to transmit. In Conversational mode CA goes ON when the first character is typed and goes OFF when a New Line function occurs. A New Line function is either a CR code when in Auto Line Feed or an LF when Auto Line Feed is not enabled.

   CA goes ON when a Function key is depressed and goes OFF automatically about two bit times after the last bit of the line termination character sequence is transmitted.

   CA goes ON when the XMIT key is activated and goes OFF when the line terminator is output at the end of a transmission in Page, Message, or Forms mode.

   Data will not be transmitted until CB is ON. If CB is OFF the first character from the keyboard is buffered and then permitted to go out when CB goes to the ON state again.

   CB is assumed ON if left open (disconnected) at the interface.

4. Data Set Ready (CC)

   This signal from the MODEM is ON when the Data Set is conditioned to operate. In order to operate with character turnaround (half duplex) this signal must be true.

5. Received Line Signal Detector (CF)

   If this signal on Pin 8 goes to the ON state, the CARRIER message appears in the Status Line. If CF is left open (disconnected) the CARRIER message does not appear.

6. Secondary Request to Send and
   Secondary Received Line Signal Detector (SCA and SCF)

   These signals are normally of interest only to the users of a two-wire 202 modem equipped with the "Supervisory Channel" option. Pin assignments are 11 (SCA) and 12 (SCF).

   SCA and SCF are used for circuit assurance and interrupt capability between the CPU and the terminal.

   SCA is controlled by the terminal to inform the CPU of circuit assurance. It may also be used to interrupt the CPU. SCA is held ON when the 200 is receiving data (is in half-duplex mode and Request to Send is OFF), except that if the operator depresses the BREAK key, a 250-millisecond OFF condition occurs on the SCA.

   SCF to the 200 can force the terminal from a transmit state to a receive state and keep the 200 in a receive state. If SCF is ON, the 200 can transmit, but if SCF goes to the OFF state, the 200 is forced to a receive state and cannot send data until SCF goes ON again.

   NOTE: If SCF is open (not connected), it is assumed by the interface to be ON.

Voltage Conventions

Signal CD on Pin 20 (DATTRY) is held ON whenever power is on. The following signal levels apply:

For CA, CB, CF, SCF, SCA and CD: ON = +3V to +15V
OFF = -3V to -15V

For BA and BB: MARK = -3V to -15V = Logical 1
SPACE = +3V to +15V = Logical Ø

Circuits CB and SCF are assumed to be true if no signal is applied, e.g., open input.

Recommended EIA Cabling

The recommeded method of constructing cables varies, depending on the baud rate and distances involved. The limitation on cable length is set by the capacitance of the cable. When a pulse which represents a bit is transmitted down a line, the edges of the pulse become less sharp (rise and fall time get longer) as the capacitance of the line increases.

Since line capacitance is a linear function of length, it follows that probability of correctly detecting a bit will eventually deteriorate to an unacceptable value as the line length is increased. Table 7.2 below lists cable lengths which can be safely assumed.

Table 7.2 Recommended EIA Cabling Lengths

Baud Rate	Maximum Cable Length (feet)
300	4000 feet
1200	1000 feet
1800	650 feet
2400	500 feet
4800	250 feet
9600	125 feet

These figures are conservative in the sense that they might be exceeded by a factor of two and still provide an acceptable error rate. However, ADDS does not recommend going beyond those figures. The table is based on several assumptions. Readily available wire is used; that is, special low-capacitance cable was not utilized in deriving these numbers. In addition, no special line drive or receiver circuits were assumed and the terminal was not operating over telephone facilities.

Table 7.3 gives recommended cable construction for two cases: distances of less than 50 feet and transmission speed of 2400 baud or less, and distances of more than 50 feet and transmission speeds up to 9600 baud.

For the shorter distance and lower speed, only signals BA and BB (Transmitted Data and Received Data) need be carried as two twisted pairs, with a ground return in each pair. For the longer distance and higher speed, signals CA and CB (Request to Send and Clear to Send) should also be carried as twisted pairs with a ground return in each pair.

If one purchases off-the-shelf cable containing twisted pair, the cable usually consists of all twisted pairs with no other single conductors in the cable. The tables on the following page show the signals which must be carried as twisted pair and those which are carried in pairs as a matter of convenience is using readily available cable.

Table 7.3 EIA Cable Lengths

I. Distances less than 50 feet, speeds up to 2400 baud

PIN	SIGNAL	PAIR
1	BA-EIAOUT	Pair
2	AA-GND	
3	BB-EIAIN	Pair
7	GND	
4	CA-RQSND	Pair or
8	CF-CARDET	single
5	CB-CLSND*	Pair or
20	CD-DATTRY	single
11	SCA	Pair or
12	SCF*	single
6	DSR	Data Set Ready

II. Distances greater than 50 feet, speeds more than 2400 baud

PIN	SIGNAL	PAIR
2	BA-EIAOUT	Pair
1	AA-GND	
3	BB-EIAIN	Pair
1	GND	
4	CA-RQSND	Pair
7	GND	
5	CB-CLSND*	Pair
7	GND	
8	CF-CARDET	Pair or
11	SCA	single
12	SCF*	Pair or
20	CD-DATTRY	single
6	DSR	Data Set Ready

*CLSND and SCF are assumed true if the line is left open.

THE CURRENT LOOP INTERFACE

The Regent™ 200 Current Loop Interface is implemented by means of opto-isolators which can operate at any speed up to 9600 baud.

Cabling

As shown in Figure 7-1, two cases are possible, one where ADDS supplies the 20 Ma. current or the customer supplies it. Frequently one has to employ a hybrid of the two parts, e.g., the customer provides 20 Ma. to ADDS but expects a "contact closure" output from ADDS. (Most TTYs are strapped to accept a loop current and provide contact closure outputs.) IMPORTANT: The polarities shown in Figure 7-1 must be followed.

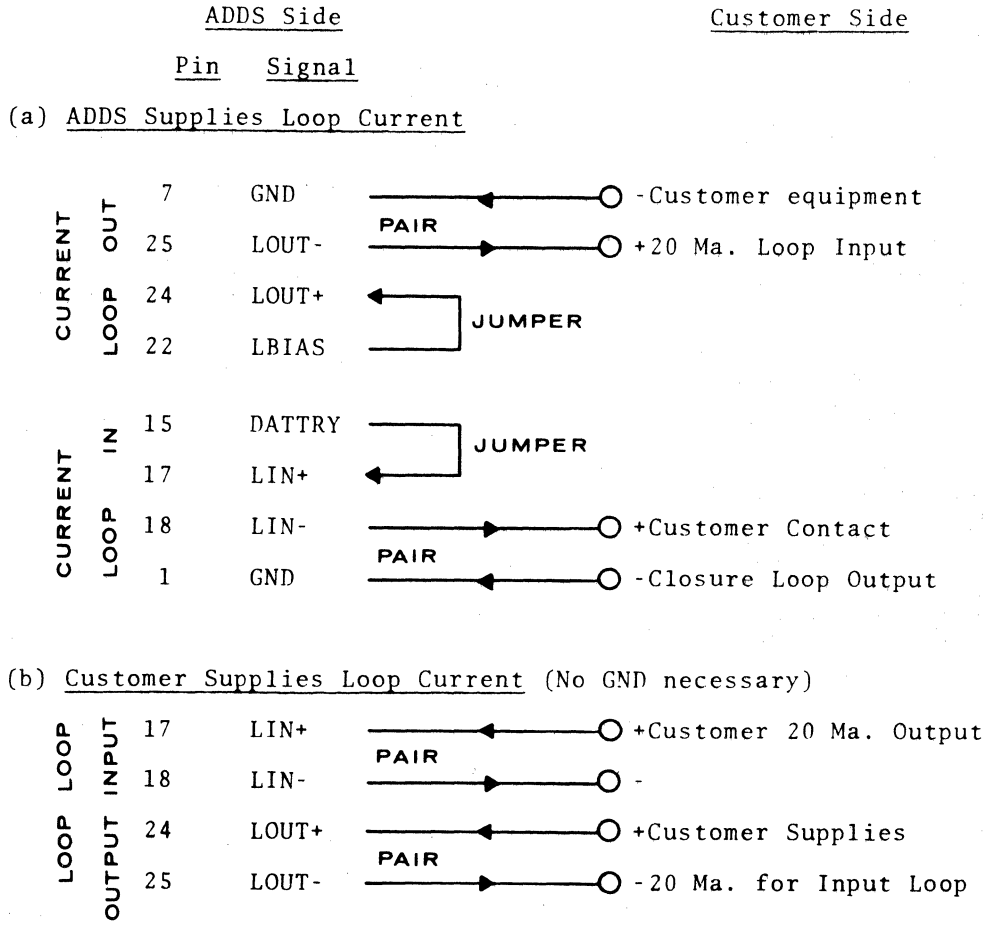


Figure 7-1. Current Loop Cabling

High Noise Environments

Since the current loop interface provides a true floating pair of input wires and a floating pair of output wires, the system designer may utilize this interface to achieve very high common mode noise rejection. A suggested technique is depicted in Figure 7-2.

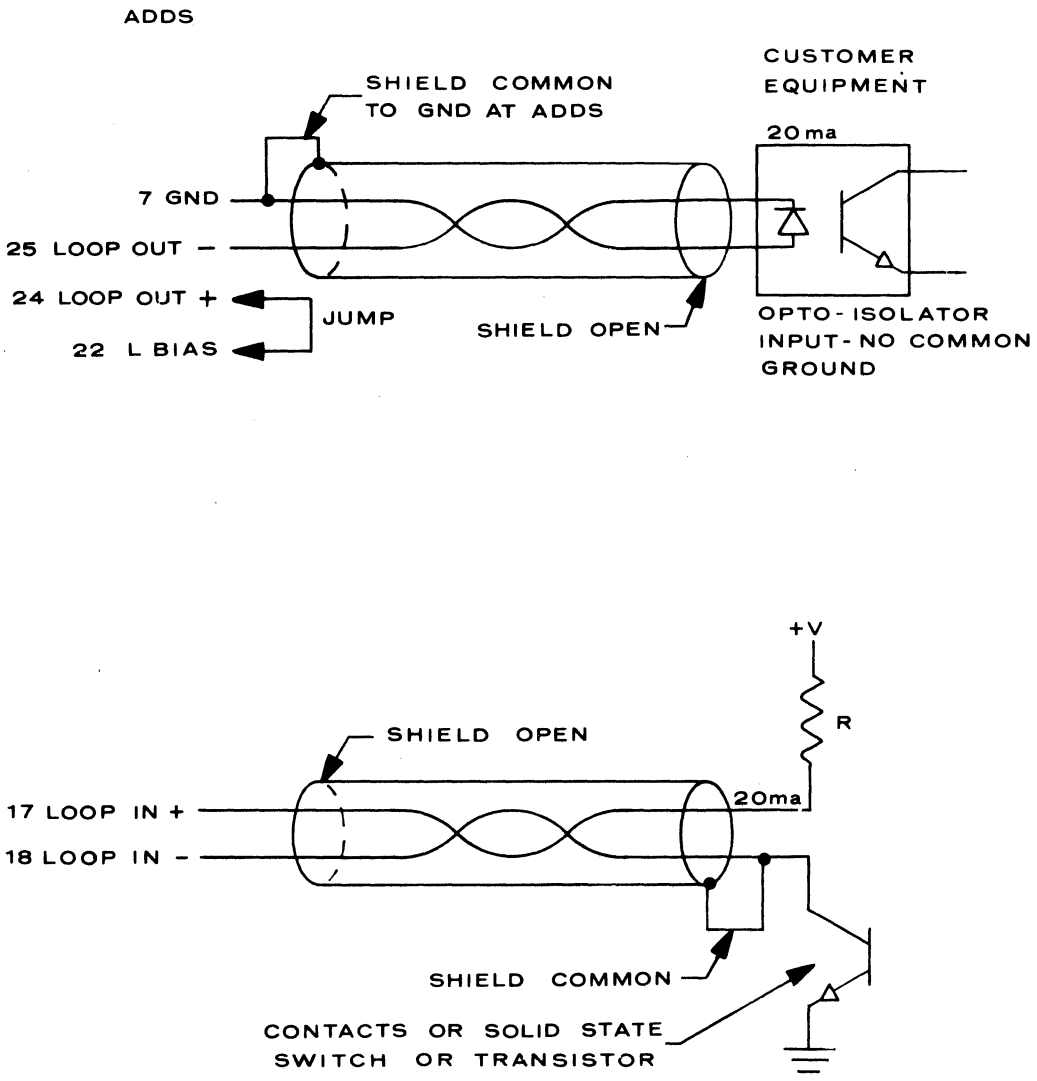


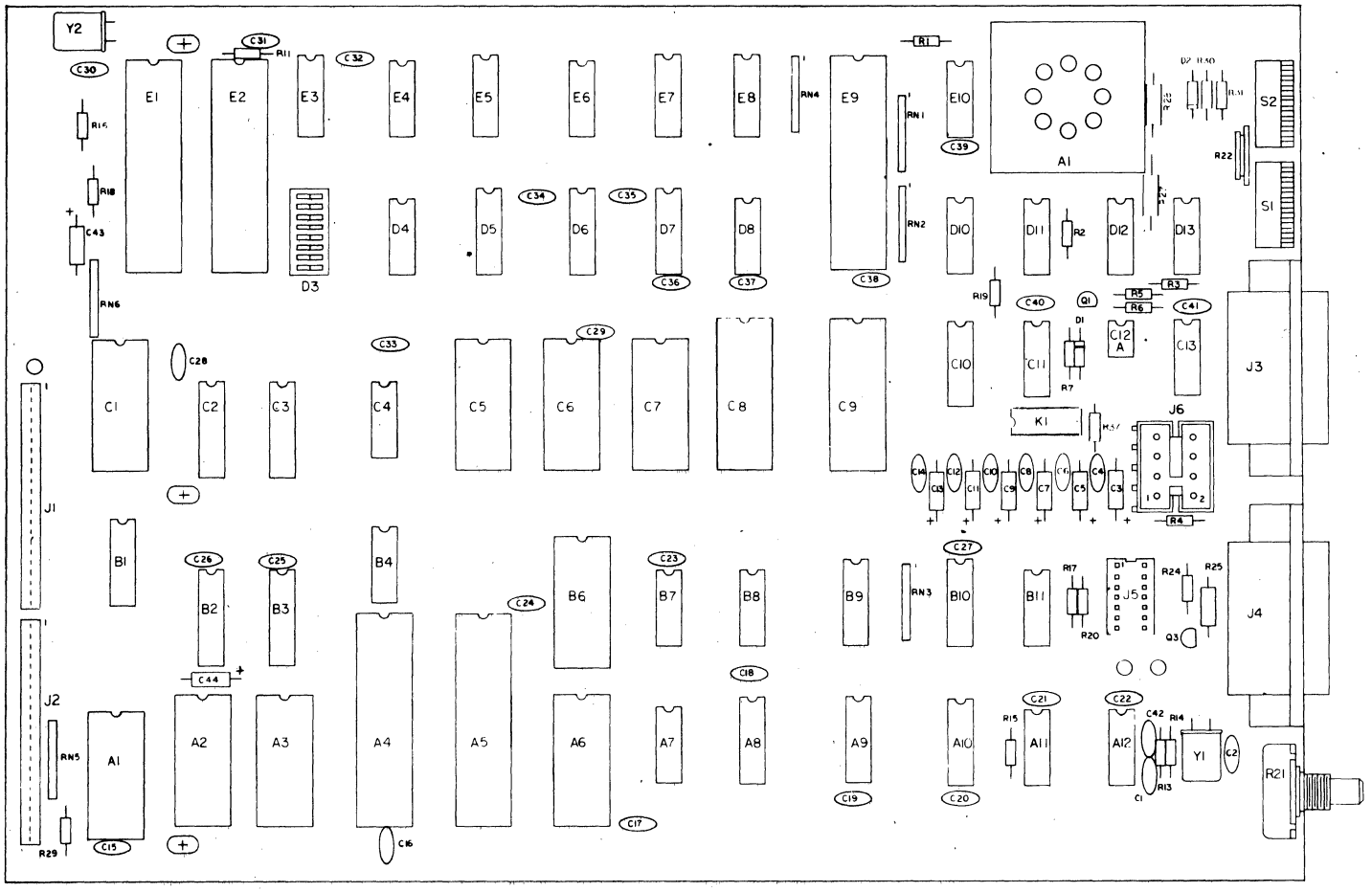
Figure 7-2

CURRENT LOOP IN HIGH NOISE ENVIRONMENT

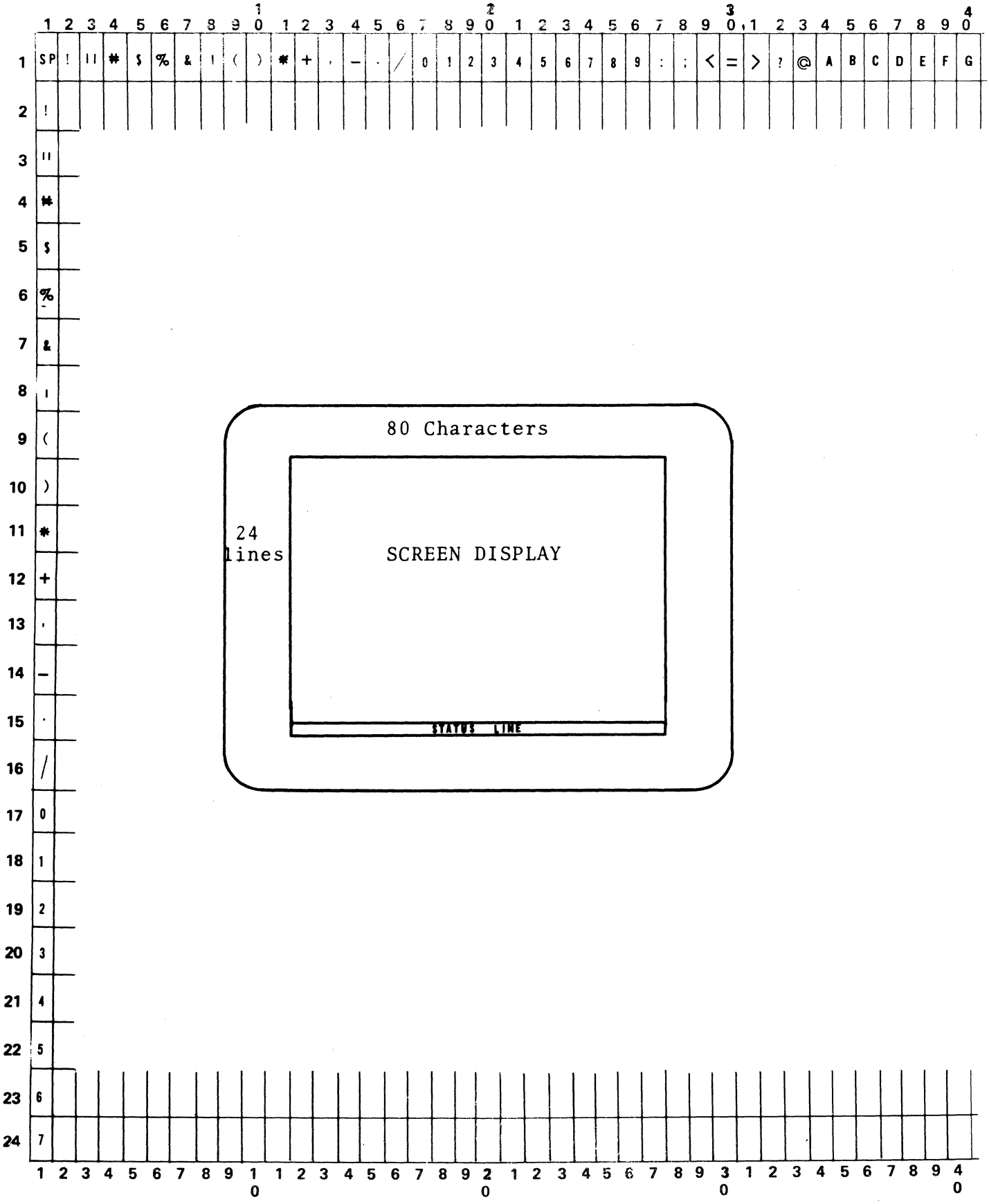
Figure 7-2. Current Loop in High Noise Environment

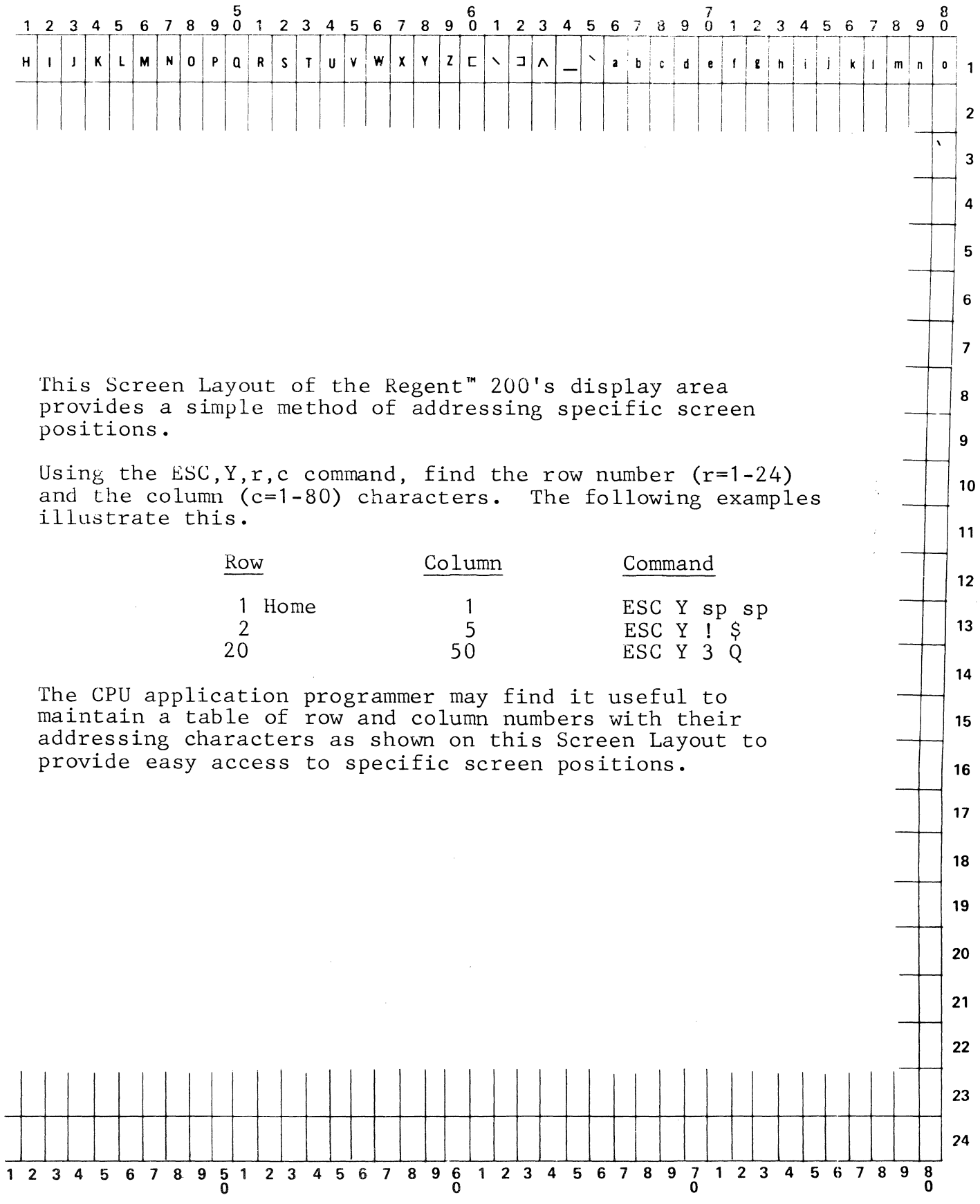
APPENDIX A:

PCB ASSEMBLY DRAWING



REGENT 200
SCREEN LAYOUT





This Screen Layout of the Regent™ 200's display area provides a simple method of addressing specific screen positions.

Using the ESC,Y,r,c command, find the row number (r=1-24) and the column (c=1-80) characters. The following examples illustrate this.

Row	Column	Command
1 Home	1	ESC Y sp sp
2	5	ESC Y ! $
20	50	ESC Y 3 Q

The CPU application programmer may find it useful to maintain a table of row and column numbers with their addressing characters as shown on this Screen Layout to provide easy access to specific screen positions.

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