PRELIMINARY

TD 830 INPUT AND DISPLAY SYSTEM

TECHNICAL MANUAL
VOLUME 1:

OPERATION AND MAINTENANCE

Burroughs

FIELD ENGINEERING

FSSG
Printed in U.S.A. 5/76

Correspondence regarding this document should be forwarded using the Remarks Form at the back of the manual, or may be addressed directly to Systems Documentation, Technical Information Organization, TIO-Central, Burroughs Corporation, Burroughs Place, Detroit, Michigan 48232.

TABLE OF CONTENTS

SECTION 1

FUNCTION AND OPERATION

GENERAL DESCRIPTION

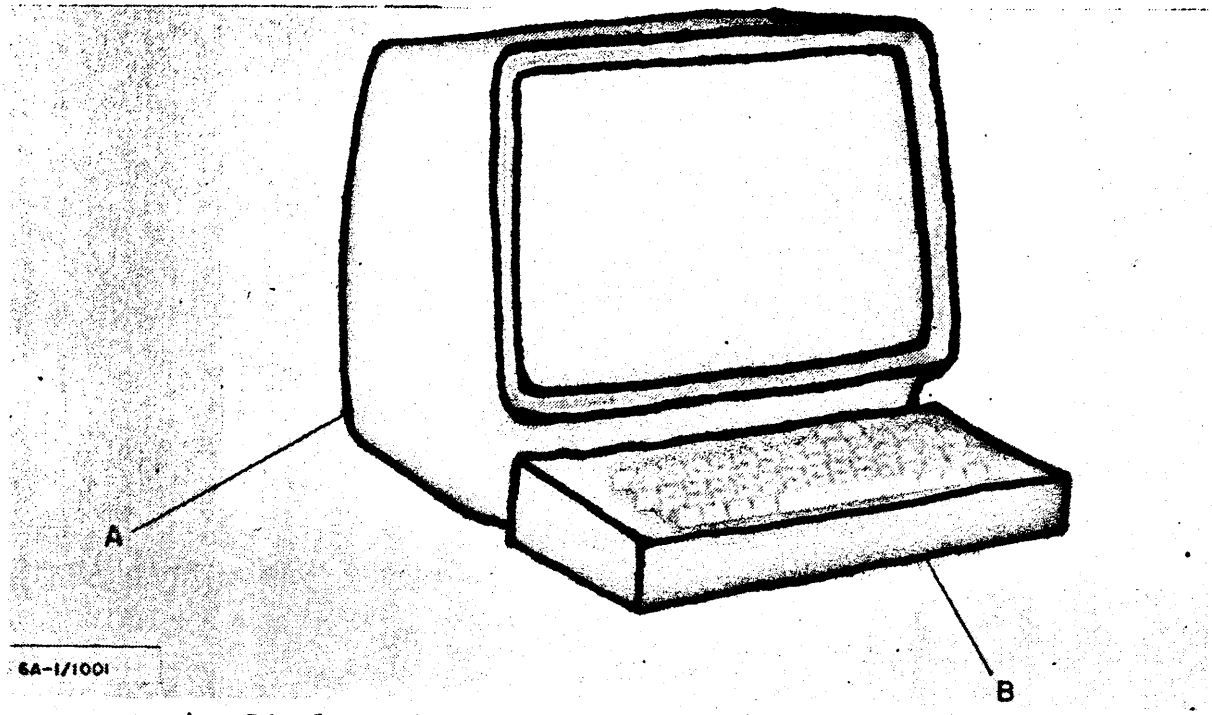
The Burroughs TD 830 Input and Display System (figure 1.1) is a free-standing, self-contained, cathode-ray tube (CRT) display terminal which accepts and displays information that is compiled either locally (from the keyboard) or remotely (from a central processor (CP) or another terminal. The TD 830 has the capacity to display 1920 characters in a format of 24 lines of 80 characters plus an additional 80 character status line.

The TD 830 can exchange information with a central processor or another terminal over half duplex lines which are operated in an asynchronous, synchronous, or direct-connect mode that uses certain multipoint or point-to-point communication procedures.

The TD 830 has two physically separate assemblies: The display unit monitor assembly; and the keyboard unit assembly. The two units are designed to operate as separate units that are connected together with cables. The cabling permits the keyboard unit to be located up to six feet away from the display unit.

DIMENSIONS, WEIGHT, COOLING AND POWER

The dimensions and weight of the terminal are given in table 1.1. The terminal generates 500 Btu's per hour while in the operational mode. The display unit is cooled by a fan which forces air into the bottom and out the top of the cover. The keyboard unit is cooled by convection. The terminal dissipates 150 watts of ac-input power.



A - Display Unit Monitor Assembly (Display Unit)
B - Keyboard Unit Assembly (Keyboard)

Fig. 1.1 TD 830 INPUT AND DISPLAY SYSTEM (TERMINAL)

Table 1.1
DIMENSIONS AND WEIGHT

Unit	Height	Width	Depth	Weight	Shipping Weight
Display	15.0 inches (38.1 cm)	16.12 inches (40.8 cm)	13.0 inches (33.1 cm)	35 lb (15.9 kg)	61 lb 27.8 kg)
Keyboard	3.2 inches (8.1 cm)	14.3 inches (36.3 cm)	6.9 inches (17.5 cm)	6 lb (2.7 kg)	7 lb (3.18 kg)
Auxiliary Keypad (Optional)	3.5 inches (8.9 cm)	5.6 inches (14.2 cm)	6.6 inches (16.8 cm)	2 lb (.91 kg)	3 lb (1.36 kg)

MAIN FEATURES

By installation option, the TD 830 can be programmed to operate with many features which effect the movement of data within the terminal. A list of these features and a general description of each is given in table 1.2.

Table 1.2
MAIN FEATURES

Feature	Description
Configuration Control	The TD 830 has 32 bytes of permanently stored data which are used to program the terminal's configuration. When power is turned on, the permanently stored data is automatically loaded into a read/write memory where it is used as the active configuration program. The permanently stored data can only be changed by the field engineer or by special escape (ESC) sequences from a remote controller. The active configuration program in read/write memory can be changed by operator CTRL control or thru data communication escape (ESC) sequence control. If the active configuration program is changed by CTRL or ESC control, the next power off-on

Table 1.2
MAIN FEATURES (Cont)

Feature	Description
	sequence will erase the read/write memory and write the permanently stored data back into the read/write memory.
Escape (ESC) Functions	The TD 830 has the ability of accepting a software control message to enable or disable many of its display functions. The software control escape sequence contains a two, three, four, or five character sequence which produces a specific function code. In a received control message, the escape sequence would be contained in the text section of the message. The CTRL key on the keyboard also produces the ESC code, with the result that most of the software controllable ESC function that can be initialized by the central processor can also be initialized thru the keyboard.
Data-Comm Pointer	The data-comm pointer is a memory-position marker from which all data are transmitted or received. In single page operation or when the data-comm pointer and cursor are on the same page, moving the cursor within the limits of the page will cause a like movement of the data-comm pointer with the result that the data-comm pointer and the cursor will remain aligned. In multiple-page operation, the data-comm pointer and the cursor can be operated on different pages with the result that data can be received on the page containing the data-comm pointer while, at the same time, data can be entered from the keyboard on the page containing the cursor. Moving The Cursor Without Moving The Data-Comm Pointer: a. When the cursor and the data-comm pointer are on different pages, the control sequence CTRL > or ESC & will cause the cursor to move to the position of the data-comm pointer. b. The control sequence for page advance (CTRL →) or page back (CTRL ←) will cause the cursor to move to another page independent of the data-comm pointer.

Table 1.2
MAIN FEATURES (Cont)

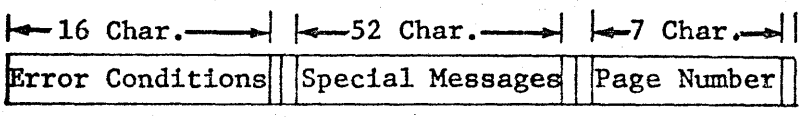
Feature	Description
	c. When the cursor is located on the last line of the page containing the data-comm pointer, the control sequence for scroll up (CTRL ↑) will cause the cursor to move to the next page page without moving the data-comm pointer. d. When the cursor is located on the first line of the page containing the data-comm pointer, the control sequence for scroll down (CTRL ↓) will cause the cursor to move to the preceding page without moving the data-comm pointer. Moving The Data-Comm Pointer: a. The page select escape sequence (ESC $ PAGE) causes the data-comm pointer to be moved to the home position of the selected page. b. Pressing the transmit (XMT) key causes the data-comm pointer to be moved to the cursor position.
Display Capacity (Working Data Field)	The TD 830 has a variable working data field of up to 1920 characters. The configuration program selects one of four basic configurations: 12 lines of 40 or 80 characters, and 24 lines of 40 or 80 characters. Selection of one of the four basic configurations can be temporarily changed by CTRL or ESC control.
Status Line Display	The status line is displayed on the 25th line position of the screen and is 80 characters in length. The status line provides information to the operator as shown below:  The first 16 characters of the status line are used to display error messages. For example: POWER FAULT, DATA COMM ERROR, KYBD DATA LOST, PRINTER ERROR, or CASSETTE ERROR.

Table 1.2
MAIN FEATURES (Cont)

Feature	Description
	The next 52 characters of the status line are used to display special messages from the central processor. Special messages are used to inform the operator of computer or system status, identification of non-displayed pages, or special instructions. To write a special message for display, the fast select, group select, or broadcast select procedure is used in conjunction with escape sequence ESC RA (a) (b) (c). The (a), (b), and (c) are interpreted as follows: (a) The four character hexadecimal memory address used to identify the starting address assigned for special messages. (b) The two character hexadecimal byte count used to identify the number of bytes of data contained in part (c) of the ESC sequence. (c) The ASCII data to be displayed as the special message. This data may contain up to 52 characters. The last seven characters of the status line are used to identify the page number on which the cursor is located. If the terminal is configured for single page operation, the last seven character positions of the status line are blank. GETS RID OF "PAGE 1"
Negative Video (Non-forms)	The TD 830 has the capacity to display white characters on a black background (normal video) or black character on a white background (negative video). When power is turned on, the display is in normal video. Negative video is enabled and disabled thru keyboard CTRL control or software ESC control.
Negative Video (In forms)	When both negative video and forms mode are enabled, only protected data are displayed in negative video.

Table 1.2
MAIN FEATURES (Cont)

Feature	Description
Data Highlights	The TD 830 has the capacity of displaying five modes of data highlighting as listed below: a. Underline video (SI) b. Bright video (SUB) c. Reverse video (SO) d. Blink video (CAN) e. Secure video (EM) Data highlighting is enabled by receiving one or more of the five data highlighting control characters (SI, SUB, SO, CAN, or EM) within the text section of a message. The RS control character is used to cancel all data highlighting. The data highlighting modes are independent which permits a combined action upon the video data. The active data highlighting modes are not displayed beyond an RS character or the end of the display line in which the highlight is used. The data highlight control characters are stored in memory but they are not displayed. If the terminal is in the negative video mode, the effects of data highlighting are reversed.
Cursor Display	The TD 830 generates a visual cursor which indicates the location of data entry from the keyboard. The cursor is displayed as the negative image of the character at the cursor location. The configuration program selects one of three basic configurations: a blinking cursor at a 1.5 Hz. rate, a non-blinking cursor, or no cursor displayed. Selection of one of the three basic configurations can be temporarily changed by CTRL or ESC control.
Cursor Positioning	The cursor position is stored in the cursor counter and not in the display memory. After each character is loaded into the display memory from the keyboard, the cursor is advanced one position to the right. When the line is

Table 1.2
MAIN FEATURES (Cont)

Feature	Description
	filled, the cursor is advanced to the first position of the next line down. The cursor can also be positioned by presetting the cursor counter thru CTRL or ESC control.
Page Roll Up/Down	The TD 830 has the ability thru CTRL or ESC control of causing the data on a displayed page to roll up or down while the cursor remains in a fixed position in relation to the page. During a roll-up function, all the data on the screen is simultaneously transferred line-for-line up the screen. The data transferred from the top of the page will appear at the bottom of the page causing a "wrap-around" effect. For a roll-down function, the movement of data is opposite to that of a roll-up function. In the forms mode, the page roll function is inhibited.
Display Scroll Up/Down	The TD 830 has the ability thru CTRL or ESC control of causing the data on the display to scroll up or down while the cursor remains in a fixed position on the display screen. During a scroll up function, all the data on the display are simultaneously transferred line-for-line up the display. Data on the top line of the display will shift off the display and new data will appear on the bottom line of the display. This function can be repeated until the last line of display memory is displayed. When the last line is displayed, additional scroll-up functions are ignored. For a scroll-down function, the movement of data is opposite to that of a scroll-up function. Scroll functions operate in either forms or non-forms mode.
Tabulation	The TD 830 has the ability of both forward and reverse tabulation using either fixed tab stops, variable tab stops, or tab field identifiers. The fixed tab stops are located at every eighth character position (1st, 9th, 17th, and so on). The variable tab stops are set/reset thru CTRL or ESC control in any of up to 80 column positions. The configuration program selects either

Table 1.2
MAIN FEATURES (Cont)

Feature	Description
	fixed or variable tabulation. This selection may be temporarily changed by CTRL or ESC control so that the terminal can be operated with fixed tab stops or variable tab stops but not both. The tab field identifier option can be operated with either fixed or variable tabulation in either forms or non-forms mode. In forms mode, the TAB key causes a field identifier (→) to be written into memory at the cursor location. If the field is also a right justify field, the field identifier (→) will be written into memory at the first position following a left delimiter. During transmission, the character spaces between the field identifier (→) and the next field are not transmitted. In non-forms mode, the TAB key causes a field identifier (→) to be written into memory at the cursor location. The cursor will then automatically advance to the next tab stop. During transmission, the character spaces between the field identifier (→) and the next tab stop are not transmitted. The writing of the field identifier (→) into memory can be disabled thru CTRL or ESC control.
Forms Delimiters	The TD 830 has the ability, thru the configuration program, to accept any two characters as additional forms delimiters. When in forms mode, the TD 830 will convert the additional delimiters to the US (▷) and RS (◁) symbols. The US (▷) character is used to signal the start of an unprotected data field and the RS (◁) character is used to signal the end of an unprotected data field. In addition to the basic forms delimiters, the GS (Δ) character is used to signal the start of an unprotected right justify field and the FS (◇) character is used to signal the start of a protected data field that can be transmitted. Both of these special fields are terminated with the RS (◁) character.
Right Justify Field	The TD 830 has the ability of right justification in the forms mode. The GS (Δ) character is used to signal the start of a right justify field and the RS (◁) character is used to signal the end of

Table 1.2
MAIN FEATURES (Cont)

Feature	Description
	the field. When a right justify field is entered, the cursor automatically moves to the right most position of the field. As data are entered at the cursor position, the data are shifted to the left as shown below: Δ - - - - -⊟◁ Δ - - - - -1◁ Δ - - - 1 2◁ Δ - - 1 2 3◁
Search Mode	The TD 830 has the ability of operating a character search for either the error character (¦), a leading delimiter in forms, or any alphanumeric character selected thru software control. The search mode is enabled/disabled thru keyboard CTRL control or software ESC control. If enabled, placing the terminal in forms mode causes an immediate search for either the error character or a leading delimiter. If the cursor stops on an error character in a protected data field, a character can be written into that one location. Either entering a character or pressing the SKIP key will cause a skip to the next field or error character. After correction of data, with the terminal still in forms mode and search mode, pressing the transmit key will cause the total form (protected and unprotected data) to be transmitted.
Field Overflow Inhibit	The field overflow inhibit function operates in forms mode only. If this function is disabled, then a data character that is entered into the last position of an unprotected data field will cause an automatic cursor advance to the first position of the next unprotected data field. If the field overflow inhibit function is enabled, then the entered alphanumeric data will not cause an automatic cursor advance to the next unprotected data field, but the cursor will sit in the last data position and overwrite data characters as they are entered. The field overflow inhibit allows only the TAB, SKIP, or Reverse Tab keys to move the cursor between unprotected data fields.

Table 1.2
MAIN FEATURES (Cont)

Feature	Description
Lower-Case Lockout	The TD 830 has the ability thru keyboard CTRL control or software ESC control to inhibit the display of lower-case letters. When the lower-case lockout is enabled, all upper and lower-case letters are displayed in upper case.
Transmission of Control Messages	The terminal has the ability of transmitting two types of control messages; the cursor position message and the numeric control message. The cursor position message is initialized by pressing the SPCFY key. Then, when the terminal is polled, the terminal will respond with its normal heading, followed by STX, ESC, ", POS, LINE, ETX, BCC. The POS character represents the cursor column position plus 32 and the LINE character represents the cursor row position plus 32. The 32 bit is added to the column and row counts in order to prevent the generation of a communication control character such as ETX. The numeric control message is initialized by pressing the CTRL key, followed by a numeric code (00-99), followed by XMT. Then when the terminal is polled, the terminal will respond with its normal heading, followed by STX, ESC, NUM, NUM, ETX, BCC. The two NUM's are the numeric code. The numeric control message is not displayed on the screen and the significance of the numeric code will be defined at the central processor.
Data Transmission Variable	The terminal has the capability of selectable start and stop positions for the transmission of data in both forms and non-forms as follows: FORMS 1. Cursor to ETX or beginning of form to cursor if no ETX (unprotected data only). Standard for TD 820, TD 730, and TD 830 operation. 2. Beginning of form to end of form (unprotected data only). 3. Total form when in forms and search mode.

Table 1.2
MAIN FEATURES (Cont)

Feature	Description
	4. Beginning of form to cursor position (unprotected data only) - TD 700 DL2 thru DL4 and TD 800 operation. 5. Variable tab field identifier (→) causes a skip of transmitted data in forms. NON-FORMS 1. Cursor to ETX or home to cursor if there is no ETX. Standard for TD 820, TD 730, and TD 830 operation. 2. Cursor to ETX or end-of-screen if there is no ETX. 3. Home to cursor-TD 700 DL1 thru DL4 and TD 800 operation. 4. Home to cursor, or cursor to GS (Δ) or end-of-screen when GS is not used.

CAPABILITIES

The TD 830 contains the following assemblies; the display subsystem, the microprocessor unit, the communications (I/O) interface, and the power supply. The terminal is designed to operate with or without the keyboard in the processing of messages between the operator and the central processor.

I/O INTERFACE

The I/O interface contains the circutiry needed to interface the transmitted or received data with the display subsystem. The terminal is operable with acceptable asynchronous and synchronous and data communication interfaces that are compatible with EIA Standard RS232C, CCITT, and with Two-Wire Direct (TDI) or Burroughs Direct Interface (BDI). (See table 1.3.)

Table 1.3
I/O DATA TRANSFER RATE

Type of Interface	Characteristic
Asynchronous Data Set (EIA RS232C or CCITT)	Up to 1800 bps
Synchronous Data Set (EIA RS232C or CCITT)	Up to 9600 bps
Two-Wire Direct Interface (TDI) (Asynchronous)	Up to 9600 bps at 1000 feet
Burroughs Direct Interface (BDI) (Asynchronous)	Up to 38,400 bps and up to 15,000 feet (but not concurrently). Maximum of 20 terminals on a single multipoint BDI line.
Concatenation from a Single Asynchronous Data Set	Maximum of 1000 feet of concatenated cable between terminals.
Concatenation from a Single Synchronous Data Set	The maximum total concatenation cable length from first to last terminal is based on data rate as follows: 9600 bps - 400 feet 4800 bps - 800 feet 2400 bps - 1600 feet 2000 bps - 2000 feet 1200 bps - 3200 feet 600 bps - 6400 feet

Asynchronous Data Communication

Asynchronous (RS232, TDI, or BDI) data communication uses even parity. Each character is serially transmitted using 10 bits per character. The meaning of each bit of the character is, in order; a space bit, seven ASCII code bits with the least significant bit first, a parity bit, and a mark bit. When data are received or transmitted, the baud rate and baud timing sequence are produced by a baud rate counter in the terminal.

Synchronous Data Communication

Synchronous data communication uses odd parity. Each character is serially transmitted using eight bits per character. The meaning of each bit of the character is, in order; seven ASCII code bits with the least significant bit first, and a parity bit. When data are received or transmitted, the baud rate timing is received over separate timing lines from the communications interface. The SYN character is used to provide a signal on the line to establish and maintain synchronism between the terminal and the central processor. When a synchronous transmission is started, at least four SYN characters must be transmitted before any other character to enable synchronization.

Character Format

A modified ASCII seven-bit code is used as the standard transmission code set for the TD 830 (see figure 1.2). These codes are of two general categories: communication characters and graphic characters. A complete list of the communication characters and their function is given in table 1.4. 96 graphic characters which include both upper and lower case letters, the numerals zero thru nine, and 27 other symbols are those characters which can be displayed. In addition to the 96 display characters, the terminal can also produce the control character symbols for US (▷), RS (◁), GS (△), FS (◇), ETX (X), TAB (→), and CR (▽). When the lower-case lockout feature is enabled, the ASCII character codes for the lower-case alphabetical letters, that are generated at the keyboard or received during the text portion of the message, are encoded and displayed as the like upper-case character. This is done when the data are being transferred to memory by inverting data bit b7 and using it in place of data bit b6.

Hexadecimal Coding

The memory address locations and the configuration data stored in the memory locations are formatted in hexadecimal code. An example of hexadecimal coding is given in figure 1.3 and a conversion chart for USASCII and hexadecimal is given in figure 1.4.

b_7 b_6 b_5 →					0 0 0	0 0 1	0 1 0	0 1 1	1 0 0	1 0 1	1 1 0	1 1 1
b_4 ↓	b_3 ↓	b_2 ↓	b_1 ↓	COL → / ROW ↓	0	1	2	3	4	5	6	7
0	0	0	0	0	NUL	DLE	SP	Ø	@	P	`	p/POL
0	0	0	1	1	SOH	DC 1	!	1	A	Q	a	q/SEL
0	0	1	0	2	STX	DC 2	"	2	B	R	b	r
0	0	1	1	3	ETX	DC 3	#	3	C	S	c	s/FSL
0	1	0	0	4	EOT	DC 4	$	4	D	T	d	t/BSL
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

* CON - ALTERNATE CODE FOR CONTENTION
COLUMN 7, ROW 11-OPTIONAL POLL CHARACTER
COLUMN 7, ROW 12-OPTIONAL SELECT CHARACTER

6A-1/1002

Fig. 1.2. USASCII CHARACTER CODING

Digit Values	Hexadecimal Codes
0	Ø
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
10	A
11	B
12	C
13	D
14	E
15	F

EXAMPLE

SCRATCHPAD MEMORY ADDRESS DISPLAYED F64D

1 1 1 1	0 1 1 0	0 1 0 0	1 1 0 1	16-Bit Binary Equivalent
15	6	4	13	Digit Values
F	6	4	D	Hexadecimal Codes
HEX-1	HEX-2	HEX-3	HEX-4	Character Positions

6A-1/1003

Fig. 1.3. HEXADECIMAL CODING

LEAST SIGNIFICANT HEX CODE ↓ / MOST SIGNIFICANT HEX CODE →	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	0 NUL	16 DLE	32 SPACE	48 0	64 @	80 P	96 `	112 p	128	144	160 SPACE	176 0	192 @	208 P	224 `	240 p
1	1 SOH	17 DC1	33 !	49 1	65 A	81 Q	97 a	113 q	129	145	161 !	177 1	193 A	209 Q	225 a	241 q
2	2 STX	18 DC2	34 "	50 2	66 B	82 R	98 b	114 r	130	146	162 "	178 2	194 B	210 R	226 b	242 r
3	3 ETX	19 DC3	35 #	51 3	67 C	83 S	99 c	115 s	131	147	163 #	179 3	195 C	211 S	227 c	243 s
4	4 EOT	20 DC4	36 $	52 4	68 D	84 T	100 d	116 t	132	148	164 $	180 4	196 D	212 T	228 d	244 t
5	5 ENQ	21 NAK	37 %	53 5	69 E	85 U	101 e	117 u	133	149	165 %	181 5	197 E	213 U	229 e	245 u
6	6 ACK	22 SYN	38 &	54 6	70 F	86 V	102 f	118 v	134	150	166 &	182 6	198 F	214 V	230 f	246 v
7	7 BEL	23 ETB	39 '	55 7	71 G	87 W	103 g	119 w	135	151	167 '	183 7	199 G	215 W	231 g	247 w
8	8 BS	24 CAN	40 (	56 8	72 H	88 X	104 h	120 x	136	152	168 (	184 8	200 H	216 X	232 h	248 x
9	9 HT	25 EM	41)	57 9	73 I	89 Y	105 i	121 y	137	153	169)	185 9	201 I	217 Y	233 i	249 y
A	10 LF	26 SUB	42 *	58 :	74 J	90 Z	106 j	122 z	138	154	170 *	186 :	202 J	218 Z	234 j	250 z
B	11 VT	27 ESC	43 +	59 ;	75 K	91 [	107 k	123 {	139	155	171 +	187 ;	203 K	219 [	235 k	251 {
C	12 FF	28 FS	44 ,	60 <	76 L	92 \	108 l	124 |	140	156	172 ,	188 <	204 L	220 \	236 l	252 |
D	13 CR	29 GS	45 -	61 =	77 M	93]	109 m	125 }	141	157	173 -	189 =	205 M	221]	237 m	253 }
E	14 SO	30 RS	46 .	62 >	78 N	94 ^	110 n	126 ~	142	158	174 .	190 >	206 N	222 ^	238 n	254 ~
F	15 SI	31 US	47 /	63 ?	79 O	95 _	111 o	127 DEL	143	159	175 /	191 ?	207 O	223 _	239 o	255

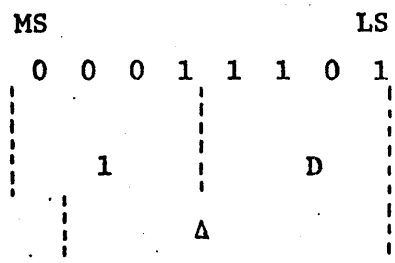
REFER TO EXPLANATORY NOTES

8A-1/1004

Fig. 1.4. CONVERTING AN EIGHT-BIT BINARY VALUE INTO USASCII OR HEXADECIMAL CODE

Explanatory Notes For Figure 1.4

Example:



1. Locate the exampled decimal value (29) on the conversion chart. The character at the top of this location and to the left of this location indicate that the two character hexadecimal code for a decimal value of 29 is 1D. If a request is made to display this memory location in hexadecimal, the characters 1D would be displayed.

2. The scratchpad memory can be written into or displayed in either ASCII or two-character hexadecimal. Since the ASCII character is only seven bits, all decimal values from 128 thru 255 must be coded in hexadecimal. Also when converted to ASCII, the decimal values from 0 to 31 are equivalent to data comm control character. Most of these control characters are not available from the keyboard and they initiate control functions when received thru data comm. Therefore, decimal values from 0 thru 31 should be coded in hexadecimal.

3. The symbol display and ASCII character given in the conversion chart are valid only when a USASCII keyboard and character generator are used. If a modified ASCII or international keyboard and character generator are used, the differences must be noted and interpreted into the chart.

Table 1.4
FUNCTION OF COMMUNICATION AND CONTROL CHARACTERS

Character	Function
ACK	Acknowledgment: The affirmative response to selections and messages directed to or from the terminal.
AD1, AD2	A special two character address which is assigned to each terminal in the network for identification. AD1 and AD2 are not special ASCII codes and are not listed on the ASCII code chart.
AD1, AD2 (Group Poll)	A special two character address which is assigned to a group of terminals that are in one concatenated string. Group polling allows any or all of the terminals in a concatenated string to sequentially answer a single polling sequence without the necessity for polling each terminal address in the group separately.
BCC	Block Check Character: A longitudinal parity check character. For example; bit 1 of the BCC character is a parity summation of the first bit contained in all characters following the SOH or STX character and including the ETX character. BCC represents an even parity count. The BCC character is used in all received or transmitted messages containing text data. Start of block check on either SOH or STX is an installation option in the terminal.
BEL @2F@	Bell character: Receiving the BEL character will cause the audible alarm in the terminal to sound momentarily.
BSL	Broadcast Select: Causes all terminals to accept the message. However, only the terminal that is being addressed will respond to a BSL message.
BS @16@	Backspace: When containing within the text portion of the message, causes the terminal cursor to be moved one space to the left. When the cursor is located in the first character position of a line, character BS will cause the cursor to move to the last character position of the preceding line. When in forms mode, the cursor can be backspaced into a protected data field. However, data cannot be written into memory until the cursor is tabbed into an unprotected data field.

Table 1.4
FUNCTION OF COMMUNICATION AND CONTROL CHARACTERS (Cont)

Character	Function
CAN @18@ EBCDIC & ASCII	Blink Video: When the data highlights option is enabled, receipt of the CAN character will initiate the blink video of data highlighting. In character locations where blink video mode is active, a solid matrix and the entered character will be alternately displayed at a 1.5-Hertz rate.
CON	Contention: (Listed as BEL on ASCII code chart). Used to place all terminals in a standby or idle mode.
CR (▽) @0D@	Carriage Return: When contained within text portion of message causes the terminal cursor to be moved to the first position of the next line. Storage and display of the carriage return symbol (▽) is an installation option in the terminal.
DC1 @11@	If contained in a received message immediately following the STX character, causes the terminal to remain in the receive mode after the message is received. By installation option, the DC1 character can be interpreted as a line erase function. When this option is selected, receipt of the DC1 character will cause the terminal to execute a line erase function by erasing all data from and including the cursor position to the end of the line.
DC2 @12@	Forms control option or space right option. By installation option, the DC2 character is interpreted as a set/reset forms function. When this option is selected, receipt of a DC2 character that is contained within the text portion of the message causes the terminal to be placed in the forms mode. Forms mode prevents the operator from editing any data which is not contained between a left and right delimiter. Receiving a second DC2 character within the text portion of a message will reset the forms mode. As an alternate option, the DC2 character is interpreted as a space-right function. When this option is selected, receipt of the DC2 character will cause the terminal to execute a cursor advance function.
DC3 @13@	Reverse Line Feed (Cursor Up): When contained within the text portion of the message, causes the terminal to execute a reverse line feed by moving the cursor one line up. If the cursor is on the top line, character DC3 will cause the terminal cursor to appear in the bottom line.

Table 1.4
FUNCTION OF COMMUNICATION AND CONTROL CHARACTERS (Cont)

Character	Function
DC4 @3C@	Home: When contained within the text portion of the message, causes the terminal cursor to be moved to the home position (position one, line one).
DLE	Data Link Escape: When followed by an EOT during switched line Point-to-Point procedure, causes a mandatory disconnect of communications.
EM @19@	Secure Video: When the data highlights option is enabled, receipt of the EM character will initiate the secure video mode of data highlighting. In character locations where secure video mode is active, a fully lighted matrix inhibits the entered data from being readable. The secure video highlight is able to highlight any area without regard to in-process highlighting or forms mode.
ENQ	Enquiry: This is the last character in a poll-selection message and requires an ACK, NAK or EOT reply from addressed terminal.
EOT	End-of-Transmission: This character indicates either the end of a communications sequence or the first character in a poll or selection message. If the terminal receives a poll message and it is not ready to transmit, it automatically responds with an EOT character meaning "no traffic".
ESC @27@	Escape: Used to initiate a software controllable escape function sequence. (See table 1.5.)
ETX	End-of-Text: Used to terminate the text portion of all received or transmitted messages containing text data. ETX is immediately followed by BCC.
FF @0C@	Home and Clear: When contained within the text portion of the message, causes the terminal to initiate a combined home and clear function by moving the cursor to the home position and erasing all data (except protected data in forms mode) from the display. As an installation option, the FF character can be used to initiate a combined home and clear function and also clear the variable tab stop positions.

Table 1.4
FUNCTION OF COMMUNICATION AND CONTROL CHARACTERS (Cont)

Character	Function
FS (◇)	Form Separator: Used in forms mode as the opening delimiter for a protected data field that can be transmitted. The RS character is used as the closing delimiter for the transmittable protected data field.
FSL	Fast Select: The fast select character, when used, is immediately followed by the text message without inquiry as to the ready status of the terminal.
GS (△)	Group Separator: Used in forms mode with right justification option as the opening delimiter followed by an RS (◁) as the closing delimiter. When a right-justify field is entered, the cursor automatically moves to the right most position of the field. As data are entered at the cursor position, the data are shifted to the left. If the field is filled with data, additional information that is entered will cause the data to be shifted out of the left side of the field and lost.
GSL	Group Select: (Any selected character, assigned to a group of terminals). Causes all terminals in the group to accept the message. However, only the terminal that is being addressed will respond to a GSL message.
HT @05@	Tab: When contained within the text portion of the message, causes the terminal cursor to advance to the next tab stop. Operates with either fixed or variable tabulation. In forms mode, the tab character causes the cursor to advance to the first character position of the next unprotected data field.
LF @25@	Line Feed (Cursor Down): When contained within the text portion of the message, causes the terminal cursor to move down to the next line. If the cursor is on the bottom line, character LF will cause the cursor to advance to the top line. If the LF character is received immediately following a CR character, the LF character will be ignored. By installation option, the LF character can be interpreted as a new line function which will cause the terminal to execute a carriage-return line-feed (CR-LF).

Table 1.4
FUNCTION OF COMMUNICATION AND CONTROL CHARACTERS (Cont)

Character	Function
NAK	Negative Acknowledgment: A negative response is produced for either of the following two conditions: (a) A selection is recognized and the terminal is not ready to receive. (b) A text message containing parity errors is received.
NUL	Null or Time-Fill: When received in contention message (EOT, NUL, NUL, CON), the NUL character is used to null out the terminal address characters so that all terminals can be placed in the contention mode. The NUL character is also used as time-fill. However, time-fill characters are not required for TD 830 operation.
POL	Poll: This character is part of a polling message which causes the addressed terminal to answer. If the terminal is in the transmit mode, it responds with a text message or control message. If the terminal is not in the transmit mode, it responds with an EOT character.
(RS) (◁) @IE@ (830) @OF@ (820)	Forms delimiter: When received in text portion of message, produces a right delimiter which precedes protected data in forms mode. The RS character is also used to terminate data highlighting.
SEL	Selection: Used to indicate a selection message which causes the addressed terminal to respond either with an ACK character if the terminal is in the receive mode, or with a NAK character if the terminal is not in the receive mode.
(SI) @OF@	Underline Video: When the data highlights option is enabled, receipt of the SI character will initiate an underline data highlight. The underline highlight appears on the ninth (9th) scan line and consists of a solid video line that is opposite to the background mode of video. The underline highlight operates in any area without regard to in-process highlighting or forms mode. When initiated, the underline highlight will operate until either an RS character or an end-of-line is detected.

Table 1.4
FUNCTION OF COMMUNICATION AND CONTROL CHARACTERS (Cont)

Character	Function
SO @0E@	Reverse Video: When the data highlights option is enabled, receipt of the SO character will initiate the reverse video mode of data highlighting. If the overall screen video is already reversed (negative video), then the SO character will cause normal video to be displayed in the data highlight area.
SOH	Start-of-Heading: Used to indicate the start of a text message.
STX	Start-of-Text: Used to indicate the start of text data.
SUB @3F@ EBCDIC @1A@ ASCII	Bright Video: When the data highlights option is enabled, receipt of the SUB character will initiate a bright video data highlight. The bright video highlight causes the characters to be displayed with increased illumination. The bright video highlight operates in any area without regard to in-process highlighting or forms mode. When initiated, the bright video highlight will operate until either an RS character or an end-of-line is detected.
SYN	Synchronous Idle: A coded timing character used only in synchronous communication to produce character synchronization between the terminal and the central processor.
US (▷)	Forms delimiter: When received in text portion of message, produces a left delimiter which precedes unprotected data in forms mode.
VT @0B@	Variable tab: As an option, the VT character can be used as a command to set the variable tab positions.
XMN (optional)	Transmission Number (1 or 0): Transmission numbers are assigned by alternately numbering transmissions on an even/odd basis. The XMN, when used, immediately precedes the STX character. Except for block check calculation, the XMN in a received message is ignored. Thru keyboard CTRL control, the transmission number can be changed to operate with A and @ in place of 1 and 0.

Software Controllable Escape (ESC) Functions

The software controllable ESC functions given in table 1.5 consist of a two, three, four, or five character sequence which produces a specific function code. The first character of the function code is always the ESC character.

Table 1.5
SOFTWARE CONTROLLABLE ESC FUNCTIONS

Notes:
1. ESC - Used as a prefix in a control sequence from communication interface.
2. COL - Column = $(32)_2 + (n)_2$ where $0 \leq n \leq$ one less the number of characters per line.

   ROW - Row = $(32)_2 + (n)_2$ where $0 \leq n \leq 95$ (or less, dependent upon the memory option selected).
3. N* - Identifies tape drive: 0 = Drive 1, 1 = Drive 2.
4. N_1, N_2, N_3 - File numbers on tape range from 000 to 999.
5. PAGE - Page = $(32)_2 + (n)_2$ where $1 \leq n \leq$ the maximum number of pages of memory.
6. (Char) - Insert character for which a search is to be made.

Character Sequence					Function
1	2	3	4	5	
ESC	Space	A			Spare
ESC	Space	B			Spare
ESC	Space	C			Display resident character set
ESC	Space	D			Initiate confidence test
ESC	Space	E			Spare
ESC	Space	F			Initiate printer test
ESC	Space	G			Initiate cassette test

Table 1.5
SOFTWARE CONTROLLABLE ESC FUNCTIONS (Cont)

Character Sequence					Function
1	2	3	4	5	
ESC	Ø				Spare
ESC	1				Spare
ESC	2				Spare
ESC	3				Spare
ESC	4				Spare
ESC	5				Spare
ESC	6				Spare
ESC	7				Spare
ESC	8				Spare
ESC	9				Spare
ESC	:				Print unprotected data
ESC	;				Print complete page
ESC	<				Line movement down
ESC	=				Prefix code for TC 4000 format commands
ESC	>				Line movement up
ESC	?				Sound audible alarm
ESC	@				Character insert by page
ESC	A	N*			Write tape mark (see note 3)
ESC	B	N*			Backspace one tape record (see note 3)
ESC	C				Space right
ESC	D				Spare

Table 1.5
SOFTWARE CONTROLLABLE ESC FUNCTIONS (Cont)

Character Sequence					Function
1	2	3	4	5	
ESC	E				Search enable
ESC	F				Search enable
ESC	G	N*			Write receive data to tape (see note 3)
ESC	H	N*			Read record from tape (see note 3)
ESC	I	N*			Rewind tape (see note 3)
ESC	J				Clear to end of page
ESC	K				Clear to end of line
ESC	L				Line insert
ESC	M				Line delete
ESC	N				Negative video "on"
ESC	O				Negative video "off"
ESC	P				Character delete by page
ESC	Q	N*			Write unprotected data to tape (see note 3)
ESC	R				Configuration control
ESC	S				Roll up
ESC	T				Roll down
ESC	U	N_1	N_2	N_3	Search tape drive 1 for file (see note 4)
ESC	V	N_1	N_2	N_3	Search tape drive 2 for file (see note 4)
ESC	W				Forms enable
ESC	X				Forms disable

Table 1.5
SOFTWARE CONTROLLABLE ESC FUNCTIONS (Cont)

Character Sequence					Function
1	2	3	4	5	
ESC	Y				Lockout lower case
ESC	Z				Lower case enable
ESC	[				Spare
ESC	\				Spare
ESC	]				Spare
ESC	^				Spare
ESC	—				Spare
ESC	`				Spare
ESC	a				Spare
ESC	b				Spare
ESC	c				Spare
ESC	d				Spare
ESC	e				Spare
ESC	f				Spare
ESC	g				Spare
ESC	h				Spare
ESC	i				Spare
ESC	j				Spare
ESC	k				Spare
ESC	l				Spare
ESC	m				Spare
ESC	n				Spare

Table 1.5
SOFTWARE CONTROLLABLE ESC FUNCTIONS (Cont)

Character Sequence					Function
1	2	3	4	5	
ESC	o				Spare
ESC	p				Spare
ESC	q				Spare
ESC	r				Spare
ESC	s				Spare
ESC	t				Spare
ESC	u				Spare
ESC	v				Spare
ESC	w				Spare
ESC	x				Spare
ESC	y				Spare
ESC	z				spare
ESC	{				Spare
ESC	|				Spare
ESC	}				Spare
ESC	~				Spare
ESC	DEL				Spare
ESC	$	PAGE			SELECT PAGE # <PAGE>

Remote Controller Initiated Configuration Changes

After the terminal has been installed and configured so that communication thru data comm is possible, the terminal configuration can be changed from the remote controller thru the use of the following escape (ESC) sequences:

Sequence	Function

Note:

The ESC RA sequence is used to write data in ASCII code and the ESC RH sequence is used to write data in hexadecimal code. When writing in ASCII code, bit eight is assumed to be a logic 0. Therefore, if bit eight has a literal significance, the data must be written in hexadecimal by using the ESC RH sequence.

ESC R A (a) (b) (c)

The ESC R A (a) (b) (c) sequence enables the data comm to enter data into any read/write memory area. The (a), (b), and (c) are interpreted as follows:

(a) The four character hexadecimal memory address used to identify the starting address at which the data comm will begin to write data.

(b) The two character hexadecimal byte count used to identify the number of bytes of data contained in part (c) of the ESC sequence.

(c) The ASCII data to be written into memory. This data may contain up to 255 characters.

ESC R H (a) (b) (c)

The ESC R H (a) (b) (c) sequence enables the data comm to enter data into any read/write memory area. The (a), (b), and (c) are interpreted as follows:

(a) The four character, hexadecimal memory address used to identify the starting address at which the data comm will begin to write data.

(b) The two character, hexadecimal byte count used to identify the number of hexadecimal characters contained in part (c) of the ESC sequence.

Sequence	Function
	(c) The hexadecimal configuration data to be written into the memory. This data may contain up to 254 characters which would load a maximum of 127 memory locations.
ESC R C	The ESC RC sequence will cause the terminal to initiate a restart program and is used following an ESC R H sequence that contains configuration data changes. The ESC R C sequence allows the terminal to be operated using the changed data. Thus, the changed data may be checked for accuracy prior to transferring it to permanent storage.

Note

The ESC R P sequence should be preceded by the ESC R C sequence. However, it is not required.

ESC R P	The ESC R P sequence will cause the terminal to perform the following operations: 1. Enter off-line mode. 2. Transfer the data, that was previously loaded by the ESC R A or ESC R H sequence, into the permanent (EAROM) storage. 3. Return the terminal to the on-line condition (local mode).
ESC R E H1 H2 H3 H4	The ESC RE sequence will cause the terminal to execute any program, that was loaded by the ESC R H equence, starting at the memory address (H1 H2 H3 H4) indicated. The ESC R E sequence is used only when a special program has been loaded into the terminal thru data comm. This program capability is provided for such things as special diagnostic tests for peripherals.

KEYBOARD SUBSYSTEM

The TD 830 contains a keyboard assembly which provides for the manual entry of data to the display subsystem. The data entered thru the keyboard are stored in the display subsystem memory circuits and then displayed. The keyboard subsystem functionally consists of the keyboard and the keyboard interface circuit.

Keyboard

Each key on the keyboard contains a magnetically-triggered key amplifier. When a key is depressed, a small permanent magnetic is lowered into the key amplifier with the result that a signal is produced. The key signal is applied to an encoder circuit which produces a nine-bit code representing that particular key. The first six bits of the code are configured the same as those presented on the ASCII code chart. However, bits 7, 8, and 9 may be coded with all 0's to indicate an alphanumeric from columns 2, 3, 4, or 5 or bits 7, 8, and 9 may be configured to something other than all 0's to indicate a function or an alphanumeric from column 0, 1, 6, or 7. In addition to the encoded outputs, the keyboard produces a strobe signal and two non-coded function lines (insert and reverse tab). The keyboard characteristics are given in table 1.6.

Table 1.6
KEYBOARD CHARACTERISTICS

Feature	Characteristic
Keystroke	0.2 inches (approximate) (5.08 mm)
Keypressure:	
Alphanumeric and function keys	3 ounces (approximate) (85.2 grams)
Mode control keys	9 ounces (approximate) (255.6 grams)
Output levels:	
Logic 0	+2.6 to 5.0 volts
Logic 1	0 to 0.45 volts
Two key rollover	Two key rollover maintains the data code produced when the first key is depressed and a second key is depressed before the first key is released. When the first key is released, the data code produced by the second key is applied as the output. During any multi-key action, the strobe output is a logic 0.

Table 1.6
KEYBOARD CHARACTERISTICS (Cont)

Feature	Characteristic
Shift key	Electronic, non-locking
Shift lock	Mechanical alternate action: Locks shift key in shift position.
Keyboard security lock (where applicable)	Locks keyboard in receive or local mode only. Inhibits unauthorized use of keyboard by disabling the MOS encoder outputs.

DISPLAY SUBSYSTEM

The display subsystem can be divided into two function sections; the display monitor section and the display logic section. The display monitor section contains a cathode ray tube (CRT) and all of the solid-state electronics (video amplifier, sync amplifiers, high voltage rectifier, and deflection circuits) that are needed to generate a television-type display. The display logic section provides the horizontal and vertical timing, and the character generator dot pattern that is needed to operate the display monitor section. The display characteristics are given in table 1.7. The combinations of display refresh memory and page size are given in table 1.8.

Table 1.7
DISPLAY CHARACTERISTICS

Feature	Characteristic
CRT Dimensions:	
Diagonal Size	12 inches (305 mm)
Overall Size	74 square inches

Table 1.7
DISPLAY CHARACTERISTICS (Cont)

Feature	Characteristic
CRT Viewing Area:	
Width	9.0 inches (228 mm)
Height	7.5 inches (191 mm)
Display Format	5 x 7 dot matrix, 7 x 9 dot matrix (optional)
Line Length	40/80 characters
Display Character Capacity	1920 Maximum + 80 character status line
Lines (Working Field)	24 Maximum
Lines (Status Line)	1 (25th display screen line)
Character Size:	
Width	0.09 inches (Double for 40 character line length) (2.28 mm)
Height	0.20 inches (5.08 mm)
Row Spacing	3 blank rows of dots between successive rows
Refresh Rate	Input line frequency (50 Hz to 60 Hz)
Flicker	None observable
CRT Brightness	50 foot Lamberts (maximum)
Contrast Ratio	20:1 (approximate)
Color of Displayed Image	White characters on a black background (normal video)
Viewing Angle	100° (minimum)
Deflection	Magnetic
Focus	Electrostatic
X-ray Radiation	0.5 milliroentgens per hour (maximum)

Table 1.8
DISPLAY MEMORY CHARACTERS AND PAGE COMBINATIONS

Characters per Line	Maximum Displayable Characters	Maximum Pages at Lines per Page of:					
		4	8	12	16	20	24
80	1920 (Standard)	6	3	2	-	-	1
80	3840 (Optional)	12	6	4	3	-	2
40	1920 (Standard)	12	6	4	3	-	2
40	4000 (Optional)	25	-	-	-	5	-
40	3840 (Optional)	24	12	8	6	-	4

Notes:
1. The number of displayable characters and display size does not include the status line which contains 80 characters.
2. A page must consist of a minimum of four lines of refresh memory and can be increased to the limits of refresh memory in increments of four lines. All pages in the terminal must contain an equal number of lines.

OPTIONAL CAPABILITIES

Several optional interfaces are available for the TD 830. These interfaces permit the TD 830 to operate with several different peripheral equipments as follows:

a. Printer Interfaces

1. 20 or 60 mA Current Loop Interface (serial data). For use with Burroughs B 9354-6 (or equivalent) printer.
2. A 9249 Printer Interface (parallel data with TTL voltage levels). For use with the A 9249 Printer in either a dedicated or shared environment. In the shared environment, up to three TD 830 terminals can operate with a single A 9249 printer on a random-access, non-priority basis.
3. TC 4000 Read-Only Printer Interface (serial data using Burroughs Direct Interface). For use with the TC 4000 RO Auxiliary Printer in either a dedicated or shared environment. In the shared environment, up to 15 TD 830 terminals can operate with a single TC 4000 printer on a first-in/first-out basis.

OPTIONAL CAPABILITIES (Cont)

b. Magnetic Card Reader Interface

The Magnetic Card Reader (1691 5548) is a separate unit which accepts magnetic cards that conform to ABA standards. When the card is inserted and the read button on the reader is pressed, the data on the card are read into a peripheral memory in the terminal. This data is not displayed. The terminal is automatically set to the transmit mode and the data in the peripheral memory are transmitted by the terminal to the central processor. DC power for the magnetic card reader is supplied from the power supply in the TD 830 terminal.

c. Magnetic Tape Cassette Controller Interface.

The magnetic tape cassette controller interface permits the TD 830 terminal to be connected to a TD 076 Magnetic Tape Unit Controller. This interface enables the terminal to operate, thru the controllers, with the A 9490 or A 9497-11 Magnetic Tape Cassette Drive Units which provide on-site storage and retrieval capability. The TD 076 controller permits the terminal to operate with two tape drive units in a shared configuration.

d. Bisynchronous Interface

The bisynchronous Interface produces a communication procedure that permits the terminal to be compatible with bisynchronous multipoint IBM 3270 type equipment.

e. Auxiliary Keypad

An auxiliary keypad is available for connection to any of the standard domestic or international alphanumeric keyboards. The keypad contains a 13 key format which permits convenient numeric inputs to the terminal.

OPERATOR CONTROLS AND FUNCTIONS

The TD 830 terminal can be operated in any of three basic modes: The local (LOCAL) mode which is used to enter information from the keyboard; the transmit (XMT) mode which is used to transmit information from the terminal; and the receive (RCV) mode which is used to receive information from the central processor or another terminal. While in the local mode, the operator can generate CTRL control sequences which are used to manipulate data in the terminal, control peripherals, and cause temporary changes in the terminal configuration. Table 1.9 provides a list of all of the controls and indicators and their operating function and table 1.10 provides a list of the CTRL control sequences that can be initiated by the operator.

LOCATION OF OPERATING CONTROLS

The ON-OFF switch and BRIGHTNESS control are located on the front bezel below the CRT.

All of the function keys are located on the keyboard.

Table 1.9
OPERATING CONTROLS AND INDICATORS

Control or Indicator	Function
ON-OFF switch	The ON-OFF switch provides the control for activating the terminal with ac-line voltage.
BRIGHTNESS control	The BRIGHTNESS control is used to adjust the display intensity for optimum viewing level.
XMT mode key and indicator	When the XMT key is pressed, the terminal is set to the transmit mode of operation and all keyboard keys except LOCAL are disabled. The transmit (XMT) mode indicator is illuminated when the transmit (XMT) key is pressed. The indicator is extinguished when a transmission from the terminal has been positively acknowledged by the receiving station or the terminal is changed to the local mode by the operator.
RCV mode key and indicator	The receive (RCV) mode indicator, which indicates that the terminal is ready to receive data, is illuminated when the receive (RCV) key is pressed. The indicator is also illuminated when a transmission from the terminal has been successfully completed. The RCV indicator is extinguished when the terminal is switched to local mode, or transmit mode.
LOCAL mode key and indicator	The local mode indicator is illuminated when the LOCAL key is pressed or by the use of the keyboard when the terminal is in the receive mode with no data being received into the terminal. It is also illuminated following the successful completion of received message if that received message did not contain the DC1 mode-control character. The indicator is extinguished when the terminal is switched to the receive mode or transmit mode.
SPCFY key	The specify (SPCFY) key is used to initiate the transmission of a cursor position message. When the SPCFY key is pressed, the current cursor location is stored. Then, when the terminal is polled, the terminal will automatically respond

Table 1.9
OPERATING CONTROLS AND INDICATORS (Cont)

Control or Indicator	Function
	with its normal heading, followed by STX, ESC, ", CHAR, CHAR, ETX, BCC. The first CHAR represents the cursor column position and the second CHAR represents the cursor row position.
CTRL key and indicator	The control (CTRL) key is used to initiate a software control function from the keyboard. (See table 1.10.) In the shifted mode, pressing the CTRL key will lock the system in the control mode until the CTRL key is pressed in the unshifted mode. The CTRL indicator will be illuminated upon activation of the CTRL key and will remain illuminated until the control sequence is completed.
ERROR indicator	The error indicator is illuminated when a parity error or block check error is detected by the terminal in the data being received or when buffer overflow is caused by the receipt of more characters than the display memory capacity. The error indicator is extinquished by the successful retransmissission to the terminal, the receipt of a new message, or by pressing the clear key after the terminal is switched from the receive mode to the local mode.
ENQ indicator	The enquiry (ENQ) indicator is illuminated when the terminal detects the central processor (CP) attempting to transmit a message to the terminal while the terminal is not in the receive mode. The indicator is extinguished by the operator placing the terminal in the receive or local mode. Also, the audible alarm momentarily sounds when the ENQ indicator is illuminated.
FORMS indicator	The FORMS indicator is illuminated when the terminal is operating in the forms mode. The terminal is placed in the forms mode either by the receipt of the proper ESC control code from the CP or by CTRL control code from the keyboard and having at least one leading delimiter in the in the displayable text. The FORMS indicator is

Table 1.9
OPERATING CONTROLS AND INDICATORS (Cont)

Control or Indicator	Function
	extinguished either by the receipt of a CP message with no ESC control code, with ESC control code, for cancelling forms, or by CTRL control code from the keyboard for cancelling forms.
LTAI indicator	The line terminal activity indicator (LTAI) is illuminated when data is transmitted from the CP to any terminal on the line. When the addressed terminal responds to the CP, the LTAI indicator is extinguished. In normal operation, the LTAI will blink due to the data line activity. An LTAI which is not illuminated indicates that the CP is not transmitting on that line. An LTAI which remains illuminated indicates that the addressed terminal is not responding.
Keyboard function Keys:	
Key	
↓ (Line feed)	Line feed is used to move the cursor one line down. When the cursor is in the bottom line, pressing the line feed key causes the cursor to reappear in the top line.
↑ (Reverse Line feed)	Reverse line feed is used to move the cursor one line up. When the cursor is in the top line, pressing the reverse line feed key causes the cursor to reappear in the bottom line.
← (Backspace)	Backspace is used to move the cursor one character to the left. When the cursor is in the first character position (left edge) of the display, pressing the backspace key causes the cursor to reappear in the last character position (right edge) of the next higher line. When the cursor is in the "home" position (top line, left edge), pressing the backspace key causes the cursor to reappear in the last character position (bottom line, right edge).

Table 1.9
OPERATING CONTROLS AND INDICATORS (Cont)

Control or Indicator	Function
→ (Forward space)	Forward space is used to move the cursor one character position to the right. If the cursor is at the right edge of a line, pressing the forward space key causes the cursor to reappear at the left edge, down shifted one line. If the cursor is located in the last character position of the bottom line, pressing the forward space key causes the cursor to reappear in the home position.
HOME	The HOME key is used to move the cursor to the upper left (home) position.
CLEAR	Pressing the CLEAR key and the SHIFT key will cause all data on the display to be erased, except protected data while in the forms mode. If the forms erase option is selected in the terminal configuration, the protected data in forms will also be erased.
RET (V)	Pressing the RET (return) key causes the terminal to perform a combined CR-LF (carriage return/line feed) function by moving the cursor from its position in a line to the first position of the following line. By terminal configuration option, the terminal can be programmed to write or not write the carriage-return symbol (V) into memory. Also the terminal can be programmed to interpret the RET key as a carriage return request without a line feed.
TAB	TAB is used to move the cursor forward to the next fixed or variable tab stop location. In the forms status, TAB causes the cursor to move forward to the first unprotected character position following the leading delimiter of the next unprotected character field. If the tab-field-identifier option is activated in the terminal, pressing the TAB key will cause the field-identifier symbol (→) to be written into memory at the cursor location after which the cursor will automatically advance to the next field (in forms) or the next tab stop (in non-forms).

Table 1.9
OPERATING CONTROLS AND INDICATORS (Cont)

Control or Indicator	Function
SKIP	TAB shifted. With the variable tab option installed, alternate depressions of the SKIP key will cause the setting and resetting of a tab stop at the cursor location. With search mode enabled, the SKIP key causes a skip to the next field or error character.
RTAB	Reverse Tab. In non-forms, the RTAB key causes a reverse tab function to the tab stop preceding the present cursor position. In forms, the RTAB key causes a reverse tab function to the preceding unprotected data field. The RTAB key will operate with either fixed or variable tab stops.
EOP CLR	Clear to End of Page. The shifted EOP key will cause the clearing of all data (or unprotected data in forms) from the cursor position to the end of the page.
EOL CLR	Clear to End of Line. In non-forms, the EOL key will cause the clearing of all data from the cursor position to the end of the line. In forms, the EOL key will cause the clearing of all data from the cursor position to the next RS or GS character.
DEL LINE	Delete Line. The shifted DEL LINE key will cause the erasure of the line in which the cursor is positioned and all data in the lines below will be moved up one line. This function is inhibited in forms.
INS LINE	Insert Line. The unshifted INS LINE key will cause all data in the lines below and all data in the line in which the cursor is positioned, to be moved down one line. Any data that was in the bottom line is lost. This function is inhibited in forms.
GS (Δ)	Group Separator. The shifted GS key causes the GS symbol (Δ) to be written into memory at the cursor position. With forms mode enabled, this symbol is interpreted as the leading delimiter of a right justified field.

Table 1.9
OPERATING CONTROLS AND INDICATORS (Cont)

Control or Indicator	Function
ETX (X)	End-of Text. The ETX key causes the ETX symbol (X) to be written into memory at the cursor position and the cursor is then automatically moved to the home position. This symbol is interpreted as the end-of-text character.
US (▷)	Leading (Left) Delimiter. With the forms mode enabled, the US key causes the symbol (▷) to be written into memory at the cursor position. This symbol is interpreted as the leading delimiter of an unprotected data field.
RS (◁)	Trailing (right) Delimiter. With the forms mode enabled, the RS key causes the symbol (◁) to be written into memory at the cursor position. This symbol is interpreted as the trailing delimiter of an unprotected data field.
CHARS INS	Character Insert. When the CHAR INS key is pressed, the terminal is placed in a character insert mode. While in the character insert mode, pressing an alphanumeric key (including space) causes the alphanumeric character to be inserted at the cursor location. The succeeding characters within the line are moved one space to the right. Surplus characters, if any, are shifted off the end of the line and lost. Pressing the CTRL key prior to pressing the CHAR INS key causes the succeeding characters on the page to be shifted one space to the right and down line to line. When in the forms mode, the succeeding character shift that takes place during an insert function is limited to the unprotected data field in which the cursor is located.
CHAR DEL	The character delete (CHAR DEL) key is used to remove a displayed character from the cursor location. When the CHAR DEL key is pressed, the succeeding characters within the line (or unprotected data field in forms) are moved one space to the left. Pressing the CTRL key prior to pressing the CHAR DEL key causes the succeeding characters on the page to be shifted one space to the left and up line to line.

Table 1.10
SOFTWARE CONTROL CTRL SEQUENCES

Notes:
1. CTRL - Used as a prefix in a control sequence from the keyboard.
2. COL - Column = $(32)_2 + (n)_2$ where $0 \leq n \leq$ one less than the number of characters per line.

   ROW - Row = $(32)_2 + (n)_2$ where $0 \leq n \leq 95$ (or less, dependent upon the memory option selected).
3. N* - Identifies tape drive: 0 = Drive 1, 1 = Drive 2.
4. N_1, N_2, N_3 - File numbers on tape range from 000 to 999.
5. N_1, N_2 - Numeric control messages range from 00 to 99.
6. (Char) - Insert character for which a search is to be made.

Character Sequence					Function
1	2	3	4	5	
CTRL	Space	@	CTRL		Spare
CTRL	Space	A	CTRL		Spare
CTRL	Space	B	CTRL		Spare
CTRL	Space	C	CTRL		Display resident character set
CTRL	Space	D	CTRL		Initiate confidence test
CTRL	Space	E	CTRL		Spare
CTRL	Space	F	CTRL		Initiate printer test
CTRL	Space	G	CTRL		Initiate cassette test
CTRL	Space	H	CTRL		Set data rate to 600 bps
CTRL	Space	I	CTRL		Spare
CTRL	Space	J	CTRL		Set data rate to 1200 bps
CTRL	Space	K	CTRL		If asynchronous data interface, sets data rate to 1800 bps. If synchronous data interface, sets data rate to 2400 bps.

Table 1.10
SOFTWARE CONTROL CTRL SEQUENCES (Cont)

Character Sequence					Function
1	2	3	4	5	
CTRL	Space	L	CTRL		Spare
CTRL	Space	M	CTRL		Memory saturation test
CTRL	Space	N	CTRL		Spare
CTRL	Space	O	CTRL		Spare
CTRL	!	N_1	N_2	N_3	Search tape drive 1 for file (see note 4)
CTRL	"	N_1	N_2	N_3	Search tape drive 2 for file (see note 4)
CTRL	#	N*			Read page from tape (see note 3)
CTRL	$	N*			Read record from tape (see note 3)
CTRL	%	N*			Read page from tape and transmit (see note 3)
CTRL	&	N*			Read file from tape and transmit (see note 3)
CTRL	'	N*			Write data to tape (see note 3)
CTRL	(	N*			Write unprotected data to tape (see note 3)
CTRL	)	N*			Backspace one tape record (see note 3)
CTRL	*				Spare
CTRL	+				Spare
CTRL	,				Spare
CTRL	-				Spare
CTRL	.				Spare
CTRL	/				Spare

Table 1.10
SOFTWARE CONTROL CTRL SEQUENCES (Cont)

Character Sequence					Function
1	2	3	4	5	
CTRL	N_1	N_2			Numeric control message (see note 5)
CTRL	:				Print unprotected data
CTRL	;				Print complete page
CTRL	<	COL	ROW		Program cursor position (see note 2)
CTRL	=				Prefix code for TC 4000 format commands
CTRL	>				Align display cursor to data-comm pointer
CTRL	?				Sound audible alarm
CTRL	@				Transmit page
CTRL	A				Search enable
CTRL	B				Line movement down
CTRL	C				Spare
CTRL	D				Spare
CTRL	E	(Char)			Search character change (see note 6)
CTRL	F				Spare
CTRL	G				Spare
CTRL	H				~~Spare~~ (SEE BACK)
CTRL	I				Negative video "off"
CTRL	J				Spare
CTRL	K				Spare
CTRL	L				Spare
CTRL	M				Roll down

Table 1.10
SOFTWARE CONTROL CTRL SEQUENCES (Cont)

Character Sequence					Function
1	2	3	4	5	
CTRL	N				Roll up
CTRL	O				Clear all variable tab stops
CTRL	P				Set/reset variable tab stop
CTRL	Q				Forms disable
CTRL	R				Configuration control
CTRL	S				Search disable
CTRL	T				Enable lower case
CTRL	U				Negative video "on"
CTRL	V				Line movement up
CTRL	W				Forms enable
CTRL	X				Spare
CTRL	Y				Lockout lower case
CTRL	Z				Spare
CTRL	[				Spare
CTRL	\	N*			Write tape mark (see note 3)
CTRL	]				Spare
CTRL	^	N*			Rewind tape (see note 3)
CTRL	—				Spare
CTRL	`				Spare
CTRL	{				Spare
CTRL	}				Spare
CTRL	~				Spare

Table 1.10
SOFTWARE CONTROL CTRL SEQUENCES (Cont)

Character Sequence					Function
1	2	3	4	5	
CTRL	↑				Scroll up
CTRL	↓				Scroll down
CTRL	→				Page advance
CTRL	←				Page back

OPERATOR CLEANING PROCEDURES

Cleaning of the terminal should be done on an as-needed basis depending on environmental conditions at the terminal location.

CAUTION

To prevent any shock hazard while cleaning, the terminal should be turned off and the ac-power cord should be removed from the wall receptacle.

Vacuum the air vent screens at the top and bottom of the display cabinet.

CAUTION

Do not use ammonia type window cleaners as this will discolor the plastic lens on the face of the CRT.

Use a damp cloth and mild soap to clean the face of the CRT and the top of the keyboard. Ensure that the keyboard is completely dry before applying power to the terminal

SECTION 2

INSTALLATION

SITE REQUIREMENTS

The TD 830 Input and Display System is designed for desk top operation. The TD 830 requires approximately 15 inches in height, 17 inches in width, and 20 inches in depth (including keyboard). However, the keyboard may be positioned up to six feet from the display unit. The TD 830 requires 150 watts of either 115 or 230 volts of single phase ac-power. The TD 830 is fan cooled using ambient air.

UNPACKING INSTRUCTIONS

(To be supplied)

UNIT PREPARATION PROCEDURES

POWER SUPPLY SETUP

(To be supplied)

KEYBOARD SETUP WITHOUT NUMERIC KEYPAD OPTION

If cable W2 is packed separately from keyboard unit, remove bottom cover of keyboard unit and slide J1 end of cable W2 thru the entrance hole in bottom cover. Install cable and cable clamp as shown in figure 2.1. Replace bottom cover.

KEYBOARD SETUP WITH NUMERIC KEYPAD OPTION

Remove bottom cover from keyboard and keypad unit. Remove encoder module from socket XA17 in keyboard and insert module in socket XA1 in keypad. Connect cables as shown in figure 2.2. Replace bottom covers.

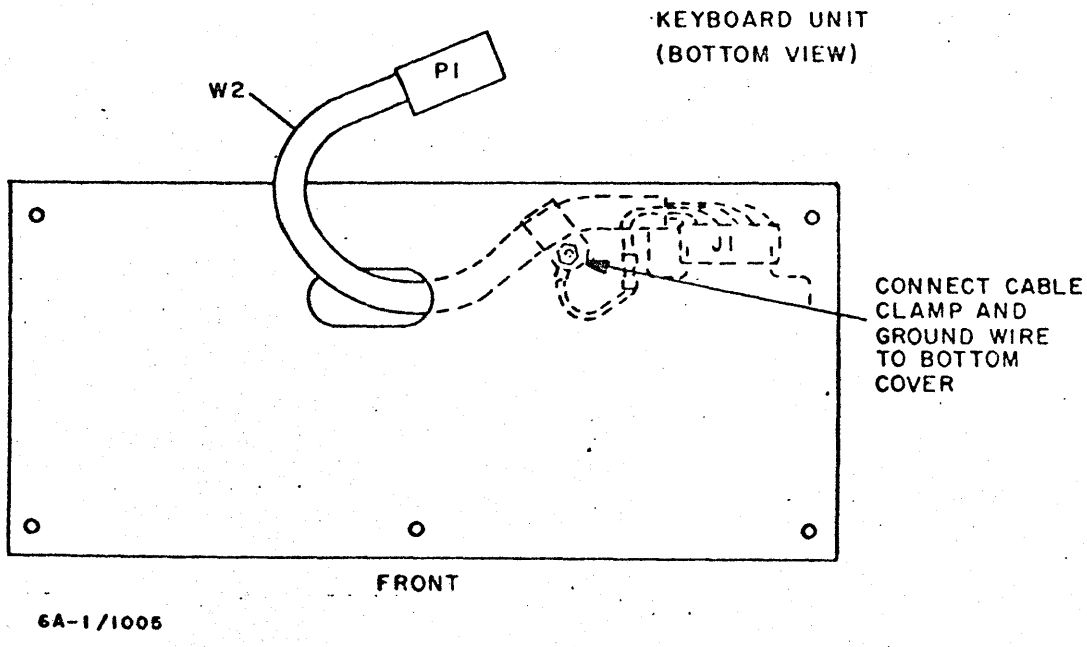


Fig. 2.1. KEYBOARD CABLING WITHOUT KEYPAD OPTION

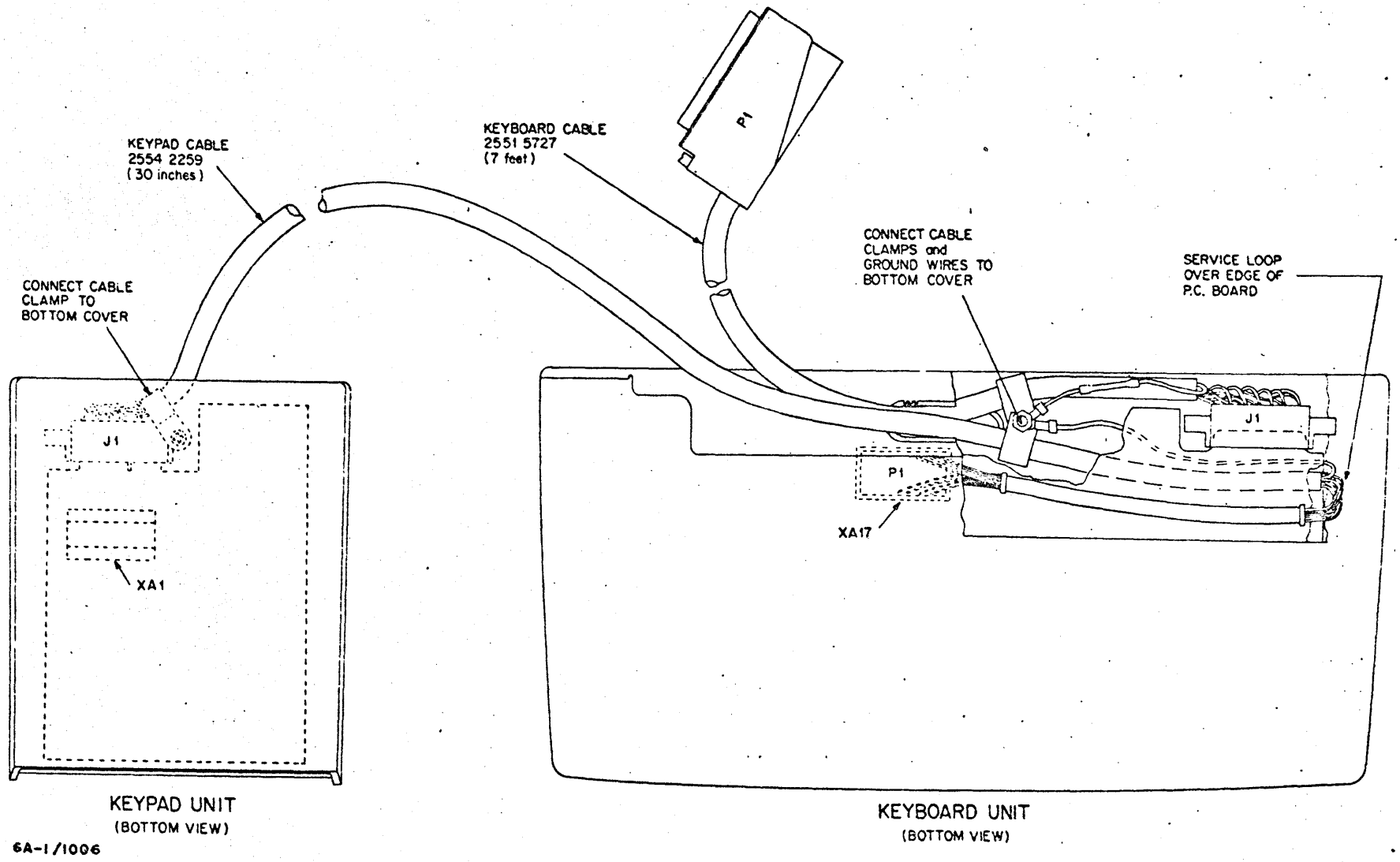


Fig. 2.2. NUMERIC KEYPAD OPTION

CABLE CONNECTIONS

Connect cables from keyboard, data comm, and peripherals as indicated in figure 2.3.

INSTALLATION OF BASIC FEATURES AND OPTIONS

After all of the cables have been connected, plug in the ac-power cord and apply power. During the power-on sequence, a confidence test is automatically performed in the terminal. If the confidence test is performed successfully, a message of asterisks (******) will be displayed. If the confidence test is not successful, an error message will be displayed. (Refer to Section 4 "Maintenance".)

After the confidence test is performed successfully, check the terminal configuration and make configuration changes as required.

Terminal Configuration Changes

During manufacture, a standard terminal configuration sequence is loaded into the permanent storage (EAROM). When the TD 830 is installed an power is turned on, a copy of the terminal configuration sequence is automatically transferred from the EAROM into scratchpad memory. Since the operating requirements at each installation site are different, some changes will have to be made to the basic terminal configuration. The following keyboard control sequences are used to make changes to the terminal configuration sequence:

Keyboard Sequence	Function
CTRL R W MODE	The CTRL R W MODE sequence causes the terminal to enter an off-line mode which clears the display memory and initializes the logic for making configuration changes.
CTRL R H H1 H2 H3 H4 or CTRL RA H1 H2 H3 H4	The CTRL R H sequence followed by the four-character hexadecimal scratchpad memory address (H1, H2, H3, and H4) will cause the terminal to display a 32-character hexadecimal message which represents 16 sequential bytes of stored data starting at the selected memory address. The CTRL RA sequence followed by the four-character hexadecimal scratchpad memory address (H1, H2, H3, and H4) will

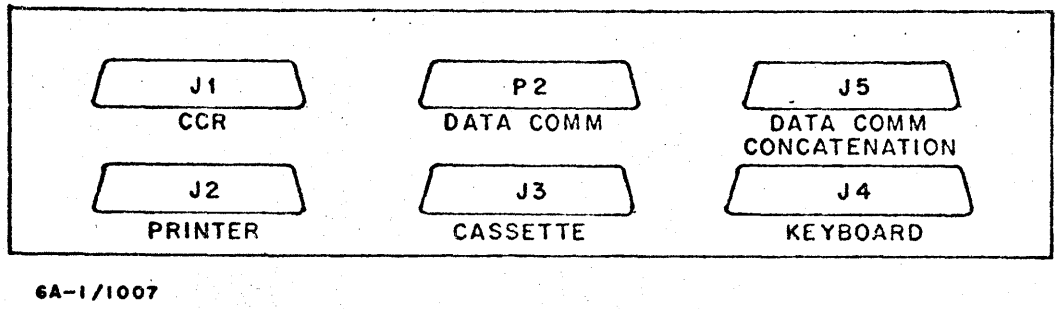
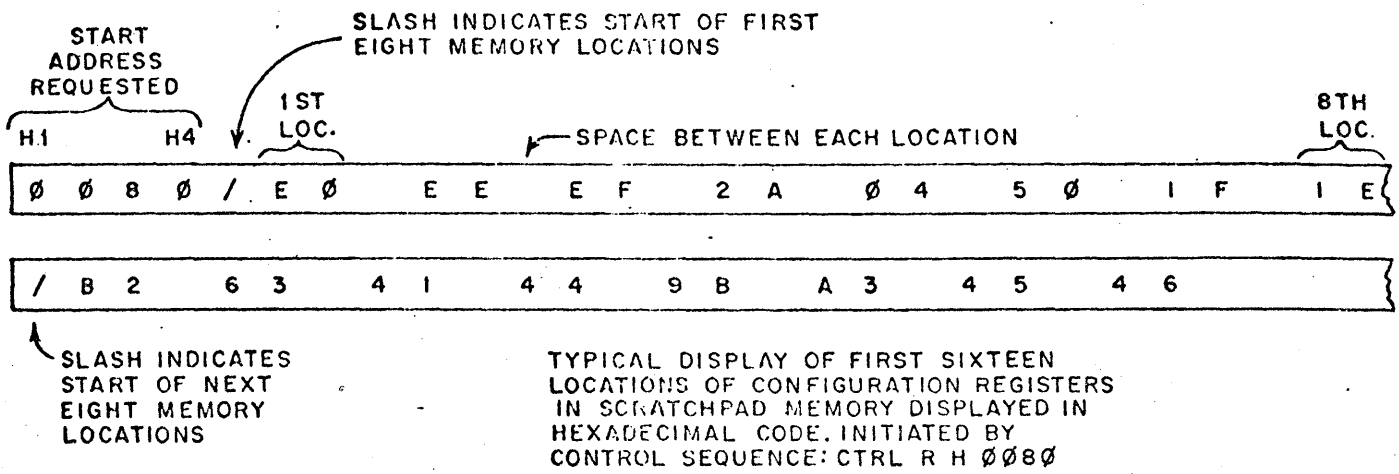


Fig. 2.3. CABLE CONNECTOR PLATE

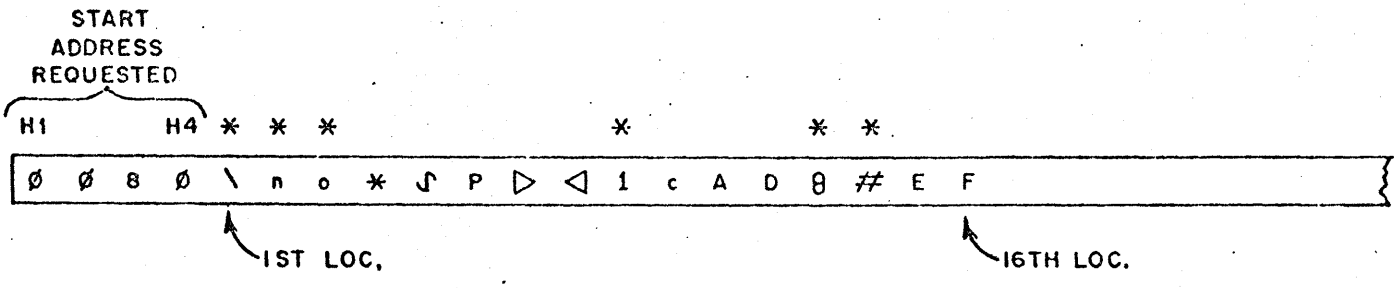
INSTALLATION OF BASIC FEATURES AND OPTIONS (Cont)

Keyboard Sequence	Function
	cause the terminal to display a 16-character ASCII message which represents 16 sequential bytes of stored data starting at the selected memory address. An example of the display for control sequence CTRL RH or CTRL RA is given in figure 2.4. Once the message is displayed, changes can be made by using normal edit operations from the keyboard. The significance of each memory location is defined in table 2.1 and a conversion chart for interpreting the ASCII or hexadecimal code is given in figure 1.4. Note that if bit eight in the memory location to be changed has some significance, the displayed message and the edit change should be done in hexadecimal and not in ASCII.
CTRL R C XXXX	After the CTRL RA or CTRL RH sequence has been checked and edited, the CTRL RC sequence will cause the terminal to write the displayed message back into its proper location in the scratchpad memory. The four (XXXX) characters are required fill characters and have no literal significance.
CTRL R P XXXX	The CTRL R P sequence will cause the terminal configuration sequence stored in the scratchpad memory to be written into the permanent EAROM storage.* In addition, this sequence forces the terminal back into an on-line mode and disables the configuration change mode. The four (XXXX) characters are required fill characters and have no literal significance.
LOCAL	At any time prior to a CTRL RP sequence, the configuration change mode can be cancelled by pressing the LOCAL key.

* GOES THRU 'CONFIG CHECK OUT'



TYPICAL DISPLAY OF FIRST SIXTEEN LOCATIONS OF CONFIGURATION REGISTERS IN SCRATCHPAD MEMORY DISPLAYED IN HEXADECIMAL CODE. INITIATED BY CONTROL SEQUENCE: CTRL R H ØØ8Ø



TYPICAL DISPLAY OF FIRST SIXTEEN LOCATIONS OF CONFIGURATION REGISTERS IN SCRATCHPAD MEMORY DISPLAYED IN USASCII. INITIATED BY CONTROL SEQUENCE: CTRL R A ØØ8Ø

*-IN LOCATIONS WHERE BIT EIGHT IS A LOGIC 1, THE USASCII CHARACTER DISPLAYED REPRESENTS A BINARY COUNT THAT IS 128 LESS THAN THE ACTUAL BINARY COUNT THAT IS STORED AT THAT LOCATION.

6A-1/1008

Fig. 2.4. SAMPLE OF TERMINAL CONFIGURATION DISPLAY

Table 2.1
TERMINAL CONFIGURATION

Scratchpad Memory		Bit	State	Function	Remarks
Register	Address				
XCR00	0080	0	1	Inhibit parity check	Maintenance aid
			(0)	Check parity	
		1	(1)	TD 830 series terminal	
	A		0	TD 730 series terminal	
		2	1	ODT environment enabled	
			(0)	ODT environment disabled	
		3	(1)	DC1 = Programmatic mode control	(refer to XCR27 bit 3)
			0	DC1 = NOP (no operation)	
		4	1	EBCDIC line data	option with 3270 only
			(0)	ASCII line data	
		5	1	SOH = clear screen	
	O		(0)	SOH = NOP	
		6	1	Point-to-point network	
			(0)	Multipoint network	
		7	1	Synchronous data comm	
			(0)	Asynchronous data comm	
XCR01	0081	-	-	Baud rate	Refer to table 2.2
XCR02	0082	-	-	Clear-to-send delay	Refer to table 2.3
XCR03	0083	-	-	Transmit-to-receive delay	Refer to table 2.4
XCR04	0084	-	-	Lines per page	Load the number of lines per page in hexadecimal code (Refer to table 1.8)
XCR05	0085	-	-	Characters per line	Load the number of characters per line in hexadecimal code. (Refer to table 1.8)
XCR06	0086	-	-	Left delimiter	
XCR07	0087	-	-	Right delimiter	
XCR08	0088	0	1	NWB environment enabled	National Westminister Bank
			(0)	NWB environment disabled	
	O	1	1	AID enabled (3270 only)	
			(0)	AID = NOP	

Table 2.1
TERMINAL CONFIGURATION (Cont)

Scratchpad Memory		Bit	State	Function	Remarks
Register	Address				
		2	1	Circuit 111/126 enabled	Required for certain CCITT data sets
			(0)	Circuit 111/126 disabled	
		3	1	Circuit 116 enabled	
			(0)	Circuit 116 disabled	
		4	(1)	Internal clear-to-send enabled	Refer to table 2.3
			0	Internal clear-to-send disabled	
		5	(1)	Transmit-to-receive delay enabled	Refer to table 2.4
			0	Transmit-to-receive delay disabled	
		6	1	Enable transmit number	Option in point-to-point and multipoint data comm procedures
			(0)	Disable transmit number	
		7	1	Switched network	
			(0)	Point-to-point network	
XCR09	0089	-	-	AD1 (Burroughs)/Select address (3270)	
XCR10	008A	-	-	AD2 (Burroughs)/Poll address (3270)	
XCR11	008B	-	-	Group Select (GSL) address (Burroughs)/ Device address (3270)	
XCR12	008C	-	-	Data comm ACIA control	Refer to table 2.2
XCR13	008D	-	-	Transmit clear delay	Refer to table 2.4
XCR14	008E	-	-	Group Poll GPL-AD1 (Burroughs)/Dummy Byte 1 (3270)	
XCR15	008F	-	-	Group Poll GPL-AD2 (Burroughs)/Dummy Byte 2 (3270)	

Table 2.1
TERMINAL CONFIGURATION (Cont)

Scratchpad Memory		Bit	State	Function	Remarks
Register	Address				
XCR16	0090	-	-	Dummy Byte 3 (3270)	
XCR17	0091	-	-	Total lines per system	Load the number of lines per system excluding the status line. (Refer to table 1.8)
XCR18	0092	0	1	Non-blinking cursor	BIG LETTERS = 0092 > 49 . . .
			0	Blinking cursor	
		1	1	Blink video enabled	
			0	Blink video disabled	
	C	2	1	40 character line display	
			0	80 character line display	
		3	1	12 line display	
			0	24 line display	
		4	1	Field overflow inhibited	Forms mode pile-up option
			0	Field overflow allow	
		5	1	Cursor display inhibited	
			0	Cursor display enabled	
	4	6	1	Write carriage return into memory	
			0	Do not write carriage return into memory	
		7	1	Interpret CR as carriage return without line feed	
			0	Interpret CR as carriage return with automatic line feed	
XCR19	0093	-	-	Lines per display	Load in hexadecimal either 12 or 24 line display
XCR20	0094	-	-	End address of display memory	Load two most significant bytes (refer to table 2.5)

Table 2.1
TERMINAL CONFIGURATION (Cont)

Scratchpad Memory		Bit	State	Function	Remarks
Register	Address				
XCR21	0095	-	-	End address of display memory	Load two least significant bytes (refer to table 2.5)
XCR22	0096	0	1	Spare	
			0	Spare	
		1	1	Spare	
			0	Spare	
		2	1	Spare	
			0	Spare	
		3	1	Interpret CLEAR key to erase entire form	
			0	Interpret CLEAR key to erase only unprotected data	
		4	1	Write ETX into memory	
			0	Do not write ETX into memory	
		5	1	Variable tab enabled	
			0	Fixed tab enabled	
		6	1	Tab-field-identifier option enabled	
			0	Tab-field-identifier option disabled	
		7	1	Cursor wrap-around inhibit (operates in non-forms only)	Inhibits cursor from going beyond last position on page.
			0	Cursor wrap-around enabled	
XCR23	0097	-	-	End-of-page alarm column detector	Load in hexadecimal, the column in which the alarm is to sound
XCR24	0098	-	-	End-of-page alarm row detector	Load in hexadecimal, the row in which the alarm is to sound
XCR25	0099	-	-	Starting address of display memory	Load two most significant bytes (refer to table 2.5)

Table 2.1
TERMINAL CONFIGURATION (Cont)

Scratchpad Memory		Bit	State	Function	Remarks
Register	Address				
XCR26	009A	-	-	Starting address of display memory	Load two least significant bytes (refer to table 2.5)
XCR27	009B	0	1	Printer baud rate = 300 bps	
			0	Printer baud rate = 110 bps	
		1	1	Spare	
			0	Spare	
		2	1	Spare	
			0	Spare	
		3	1	DC1 = hold in receive mode	Refer to XCR00 bit 3
			0	DC1 = line erase	
		4	1	Security data option enabled	
			0	Security data option disabled	
		5	1	Printer in extended-line mode	Used for TC 4000 printer (150 character per line mode) Inhibits the automatic carriage return to printer that occurs at the end of each display line
			0	Printer in non-extended-line mode	Allows automatic carriage return to printer
		6	1	Enable A 9249 (ODEC) printer interface	
			0	Disable A 9249 (ODEC) printer interface	
		7	1	Enable TC 4000 printer interface	
			0	Disable TC 4000 printer interface	
XCR28	009C	-	-	Starting address of data comm buffer	Load two most significant bytes (refer to table 2.5)

Table 2.1
TERMINAL CONFIGURATION (Cont)

Scratchpad Memory		Bit	State	Function	Remarks
Register	Address				
XCR29	009D	-	-	Starting address of data comm buffer	Load two least significant bytes (refer to table 2.5)
XCR30	009E	-	-	End address of data comm buffer	Load two most significant bytes (refer to table 2.5)
XCR31	009F	-	-	End address of data comm buffer	Load two least significant bytes (refer to table 2.5)
XCR32	00A0	-	-	Check flag (10100101)	Load hexadecimal code A5

Table 2.2
BAUD RATE CONVERSION

Baud Rate	Hex Code for Register XCR01	Hex Code for Register XCR12
75	3F	ØA
110	7C	ØA
150	9F	ØA
200	B7	ØA
300	C7	ØA
600	9F	Ø9
1200	CF	Ø9
1800	DF	Ø9
2400	E7	Ø9
4800	F3	Ø9
9600	A1	Ø8
19.2K	D1	Ø8
38.4K	E9	Ø8

Table 2.2
BAUD RATE CONVERSION (Cont)

To set up a baud rate that is not listed above, perform the following eight steps:

	Example for 1800 baud:
1. Convert baud rate or bps into microseconds as follows: $\frac{1}{\text{BAUD RATE}} \times 10^6 = \text{USEC/BIT}$	$\frac{1}{1800} \times 10^6 = 555.55$ USEC/BIT
2. To compensate for circuit delays, subtract a constant of 2.17 USEC.	555.55 - 2.17 553.38 USEC/BIT
3. To determine the number of count pulses needed, divide the adjusted USEC/BIT rate by the counter clock rate of .5426 USEC.	$\frac{553.38 \text{ USEC/BIT}}{.5426 \text{ USEC}} = 1019.86$ count pulses
4. To determine preset number, divide the count pulses by 2.	$2 \overline{)1019.86} = 509.93$ preset number
5. If baud rate is less than 600 bps, divide preset number by 64. If baud rate is from 600 to 4800 bps, divide preset number by 16. If baud rate is greater than 4800 bps, divide preset number by 1.	$16 \overline{)509.93} = 31.87$ preload
6. Round off preload to nearest whole number and complement the number by subtracting the preload from 255. Then, convert answer to hexadecimal code (refer to chart on figure 1.4).	255 - 32 223 = DF
7. Load the hexadecimal code, for the complement preload, into scratchpad memory register XCR01.	XCR01 = DF

Table 2.2
BAUD RATE CONVERSION (Cont)

8. Load the hexadecimal code for the divisor (used in step 5) into scratchpad memory register XCR12.	XCR12 = Ø9
a. Divide by 1 = Ø8	
b. Divide by 16 = Ø9	
c. Divide by 64 = ØA	

Table 2.3
CLEAR TO SEND DELAY

Type of Communication	Delay in Milliseconds
V23 (4-wire), 1200 or 600 baud	16 or 200
V23 (2-wire), 1200 or 600 baud	200
V21 and Bell 202 series	50
Bell 103 series	265
Burroughs TA 713	16
Burroughs TA 783	16
TDI or BDI	1

Notes:
1. The delays listed above are recommended for the data sets indicated. The delay circuit is enabled by loading a logic 1 into scratchpad memory register XCR08 bit 4.
2. To configure the terminal for any desired clear-to-send delay, convert the delay in milliseconds into the equivalent hexadecimal code and write the hexadecimal code into register XCR02. (Refer to conversion chart on figure 1.4.)

   Example: Burroughs TA 713 Data Set requires 16 millisecond delay. 16 = 1 Ø in hexadecimal code. Write 1 Ø into register XCR02.
3. If no internal clear-to-send delay is needed, load a logic 0 into scratchpad memory register XCR08 bit 4.

Table 2.4
TRANSMIT-TO-RECEIVE AND TRANSMIT CLEAR DELAY

To set up terminal configuration for correct transmit-to-receive delay, convert delay in milliseconds into hexadecimal code and load into register XCR03. If no delay is required, set XCR08, bit 5, to the zero state. Typical delays are indicated below:

Type of Data Comm	Delay in Milliseconds
V23 data set	100
RS232, 4-wire	0
RS232, 2-wire	100

To set up terminal configuration for correct transmit-clear-delay, convert delay in milliseconds into hexadecimal code and load into register XCR13. Convert fractional delays to the next lower millisecond (Example: 3.6 MS = 3.0 MS delay).

Baud Rate	Milliseconds
75	13.3
110	9.1
150	6.6
200	4.9
300	3.3
600	1.6
1200	.8
1800	.5
2400	.4
4800	.2
9600	.1
19.2K	.05
38.4K	.02

For RS232, 2-wire, use a delay that is three times the millisecond baud-clock rate.

For RS23, 4-wire, use a delay that is one time the millisecond baud-clock rate.

For no delay, load a hexadecimal Ø Ø into register XCR13.

Table 2.5
MEMORY ASSIGNMENT AND ADDRESS

Memory Assignment	Hexadecimal Address for 1920 Character Display System		Hexadecimal Address for 3840 or 4000 Character Display System	
	Starting Address	Ending Address	Starting Address	Ending Address
SCRATCHPAD	Ø Ø Ø Ø	Ø Ø F F	Ø Ø Ø Ø	Ø Ø F F
EXTENDED WORKING AREA	Ø 1 Ø Ø	Ø 1 F F	Ø 1 Ø Ø	Ø 1 F F
STATUS LINE	Ø 2 Ø Ø	Ø 2 4 F	Ø 2 Ø Ø	Ø 2 4 F
UNASSIGNED	Ø 2 5 Ø	Ø 2 F F	Ø 2 5 Ø	Ø 2 F F
EDIT TABLE	Ø 3 Ø Ø	Ø 3 7 F	Ø 3 Ø Ø	Ø 3 F F
DATA COMM BUFFER	Ø 3 8 Ø	Ø 8 4 F	Ø 4 Ø Ø	Ø F F F
DISPLAY MEMORY	Ø 8 5 Ø	Ø F F F	4 Ø Ø Ø	4 F F F

STATUS LINE @ 0160

PAGE WORD @ 0106 (HEX)

"******