1.0   SUMMARY.

DISPLAY FORMAT.	80 characters x 40 lines
SCREEN.	14" diagonal, P39 phosphor
VIEWING AREA.	10" x 8"
CHARACTER SET.	96 character ASCII (upper/lower case)
CHARACTER SHAPE.	7x9 dot matrix in 10x13 dot field
CHARACTER SIZE.	.09 x .16 nominal
CURSOR.	Underline

KEYBOARD.
    Upper/lower case TTY with
    separate cursor and numeric
    pads

OPERATING MODES.
    KSR operation
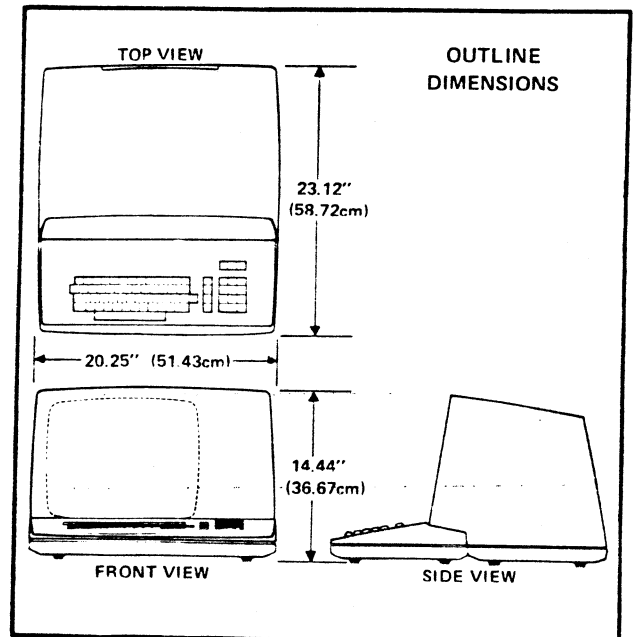
COMMAND FUNCTIONS.
    Erase screen
    Line feed, Carriage return
    Cursor left, right, up, down,
        home, and x-y positioning

SWITCH FUNCTIONS.
    Roll/Page
    Local/Line
    Full/Half Duplex

DATA INTERFACE
    RS232 compatible

TOP VIEW   OUTLINE DIMENSIONS

23.12"
(58.72cm)

20.25" (51.43cm)

14.44"
(36.67cm)

FRONT VIEW   SIDE VIEW

SIZE.	Per outline dimensions
WEIGHT.	49 lbs.
POWER.	105-125 Vac, 60 Hz, 110w
TEMPERATURE.	10° - 40°C (operating)
	-40° - 70°C (storage)
HUMIDITY.	0-95% non-condensing

AVAILABLE OPTIONS.

CR/LF Options:	Auto LF on CR, New Line
Interface:	RS232, 20ma, 60ma, TTL
Baud Rates:	110, 300, 600, 1200, 1800, 2400, 4800, 9600
Dual Baud Rate	
Export Model	

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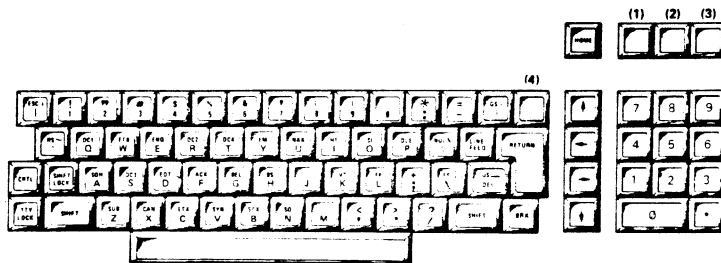| NAME	⟨R⟩	JR	ES	ANN ARBOR TERMINALS /Specification	203162
DATE	3-79	3-74	5-74	K4080D TERMINAL	SHT 1 OF 6
	ENG	MFG	REL		

2.0 DISPLAY. See Summary.

Refresh Memory. The displayed data is refreshed from an internal memory. The data remains stored and displayed until changed by the data source.

Refresh Rate. 30 Hz.

3.0 KEYBOARD.

Keyboard Layout.

Cursor Control. Cursor return, line feed, left, right, up, down, and home functions are provided on individual keys.

Screen Erase. Actuating the Control- and L-keys erases the screen.

Break. Holding down the BRK-key causes the outgoing data line to hold at the spacing level if the terminal is on-line.

Repeat. Holding down any key for greater than 1/2 sec. causes the key code to repeat at approx. 15 char/sec.

TTY Lock. Locks keyboard into Model 33 TTY code set. Push to lock, push to release. Key is lighted when locked.

OUTPUT CODES (TTY LOCK)

KD	3210 / COLUMN	0	1	2	3	4	5	6	7
0000	0	NUL	DLE	SP	0	@	P		
0001	1	SOH	DC1	!	1	A	Q		
0010	2	STX	DC2	"	2	B	R		
0011	3	ETX	DC3	#	3	C	S		
0100	4	EOT	DC4	$	4	D	T		
0101	5	ENQ	NAK		5	E	U		
0110	6	ACK	SYN	&	6	F	V		
0111	7	BEL	ETB	'	7	G	W		
1000	8	BS	CAN	(	8	H	X		
1001	9	HT	EM	)	9	I	Y		
1010	10	LF	SUB	*	:	J	Z		
1011	11	VT	ESC	+	;	K	[		
1100	12	FF	FS	,	<	L	\		
1101	13	CR	GS	-	=	M	]		
1110	14	SO	RS	.	>	N	^		
1111	15	SI	US	/	?	O	—		DEL

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4.0 KSR OPERATION. The terminal operates in the
same manner as a KSR teletype terminal. As
the operator strikes each key, its character
code is sent to the computer as a start/stop
synchronized serial character at the specified
baud rate.

If the terminal is set for full-duplex (S3 ON),
the computer echoes back the character (or an
error message) to the terminal's memory, where-
upon it is displayed on the screen. This is
the usual mode of operation. If the computer
is not programmed for echo-back, the terminal
may be set for half-duplex (S3 OFF), whereupon
the character is fed back into the terminal's
memory as it is transmitted.

In either case, the incoming data are stored
and the cursor positioned under control of the
memory address register. Characters enter at
the cursor position. The cursor automatically
advances after each character entry. Each entry
overwrites the character previously displayed
at that position; no other data on the screen
are affected. Advance of the cursor past the
end of a line automatically advances it to the
beginning of the next line.

4.1 COMMANDS. Eight command characters are provided.
They operate on the memory address register to
effect the specified cursor movement. They do
not affect data displayed on the screen (except
FF). They are not stored in memory.

Erase Screen (FF): Moves the cursor to the first
character position of the top line and clears the
screen.

Carriage Return (CR): Returns the cursor to the
first character position of the line in which it
is located.

Line Feed (LF): Moves the cursor one line below
its present position. If in bottom line, the
cursor moves to same position in the top line
(PAGE operation), or all lines move up one line,
(ROLL operation).

OUTPUT CODES

3210 / DI	0	1	2	3	4	5	6	7
0000 / 0	NUL	DLE	SP	0	@	P	`	p
0001 / 1	SOH	DC1	!	1	A	Q	a	q
0010 / 2	STX	DC2	"	2	B	R	b	r
0011 / 3	ETX	DC3	#	3	C	S	c	s
0100 / 4	EOT	DC4	$	4	D	T	d	t
0101 / 5	ENQ	NAK	%	5	E	U	e	u
0110 / 6	ACK	SYN	&	6	F	V	f	v
0111 / 7	BEL	ETB	'	7	G	W	g	w
1000 / 8	BS	CAN	(	8	H	X	h	x
1001 / 9	HT	EM	)	9	I	Y	i	y
1010 / 10	LF	SUB	*	:	J	Z	j	z
1011 / 11	VT	ESC	+	;	K	[	k	{
1100 / 12	FF	FS	,	<	L	\	l	|
1101 / 13	CR	GS	-	=	M	]	m	}
1110 / 14	SO	RS	.	>	N	^	n	~
1111 / 15	SI	US	/	?	O	_	o	

INPUT CODES

3210 / DI	0	1	2	3	4	5	6	7
0000 / 0			SP	0	@	P	`	
0001 / 1			!	1	A	Q	a	
0010 / 2			"	2	B	R	b	
0011 / 3			#	3	C	S	c	
0100 / 4			$	4	D	T	d	
0101 / 5			%	5	E	U	e	u
0110 / 6			&	6	F	V	f	v
0111 / 7			'	7	G	W	g	w
1000 / 8		BS	(	8	H	X	h	
1001 / 9		HT	)	9	I	Y	i	
1010 / 10		LF	*	:	J	Z	j	
1011 / 11		VT	+	;	K	[	k	
1100 / 12		FF	,	<	L	\	l	
1101 / 13		CR	-	=	M	]	m	
1110 / 14		SO	.	>	N	^	n	
1111 / 15		SI	/	?	O	_	o	

Back Space (BS): Moves the cursor one character position to the left. If in the first character position of the line, the cursor moves to the last character position of the line above.

Cursor Home (VT): Moves the cursor to the first character position of the first line. The displayed data are unchanged.

Cursor Right (HT): Moves the cursor one character position to the right. If the last character position of the line, the cursor moves to the first character position of the next line.

Cursor Up (SO): Moves the cursor one line above its present position. If in the top line, the cursor moves to the same position in the bottom line.

Cursor Address (SI): The cursor may be moved to an absolute x-y position on the screen by entering the three-character string: SI-CPC-CPL. The CPC-code moves the cursor horizontally to the specified character position within the line. The CPL-code moves the cursor vertically to the specified line. The permitted values of CPC and CPL are shown in the code tables.

CPC CODES	CHAR POS 0 / CHAR POS 79	FIRST CHAR POS TO LEFT / LAST CHAR POS TO RIGHT						
DI / 3210	0	1	2	3	4	5	6	7
0000 0	0	10	20	30	40	50	60	70
0001 1	1	11	21	31	41	51	61	71
0010 2	2	12	22	32	42	52	62	72
0011 3	3	13	23	33	43	53	63	73
0100 4	4	14	24	34	44	54	64	74
0101 5	5	15	25	35	45	55	65	75
0110 6	6	16	26	36	46	56	66	76
0111 7	7	17	27	37	47	57	67	77
1000 8	8	18	28	38	48	58	68	78
1001 9	9	19	29	39	49	59	69	79
1010 10								
1011 11								
1100 12								
1101 13								
1110 14								
1111 15								

CPL CODES	LINE 0 = TOP LINE / LINE 39 = BOTTOM LINE							
b / 3210	0	1	2	3	4	5	6	7
0000 0					0	16	20	36
0001 1					1	17	21	37
0010 2					2	18	22	38
0011 3					3	19	23	39
0100 4					4	24		
0101 5					5	25		
0110 6					6	26		
0111 7					7	27		
1000 8					8	28		
1001 9					9	29		
1010 10					10	30		
1011 11					11	31		
1100 12					12	32		
1101 13					13	33		
1110 14					14	34		
1111 15					15	35		

4.2   SWITCHES.

S1 Switch: This switch selects either PAGE or ROLL operation for the display.

> OFF (Page operation): Advance of the cursor past the end of the bottom line advances the cursor to the beginning of the top line. Used for display/update of tabular data.

> ON (Roll operation): Advance of the cursor past the end of the bottom line moves all lines up one line. The bottom line clears and the cursor remains in the bottom line. The top line is lost. Used for display of textual data, listings, and other continuous printout.

S2 Switch: This switch selects either LOCAL or ON-LINE operation for the terminal.

> OFF (Local operation): Data line disconnected. Keyboard output to display only. Used for test.

> ON (On-line operation): Data line connected. Normal operation.

<u>S3 Switch</u>: This switch selects either HALF- or FULL-duplex operation for the terminal.

> <u>OFF (Half-duplex operation)</u>: Keyboard output to display and data line. Display input from keyboard and data line.

> <u>ON (Full-duplex operation)</u>: Keyboard output to outgoing data line. Display input from incoming data line.

5.0 INTERFACE.

5.1 DATA CONNECTOR. Provides RS232-compatible interface. Interfaces with couplers, data sets, and computer teletype channels that are strapped or strappable for RS232.

<u>Data Input (SDI)</u>: ASCII-coded serial data, 10- or 11-unit code, start/stop synchronized. (See sample waveform drawn below for letter "U" with even parity.) The terminal responds to the ASCII subset shown in the INPUT CODE table; it ignores all others.
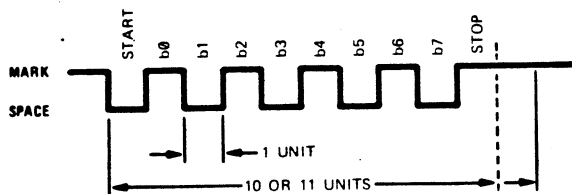
<u>Data Output (SDO)</u>: ASCII-coded serial data, 11-unit code, start/stop synchronized. The data output line is normally at MARK. The terminal transmits an 11-unit burst, as above, following each key entry.

<u>Parity</u>: The parity bit, b7, is ignored on input. It is transmitted at MARK.

<u>Data Rate</u>: Factory preset to one of the following rates: 110, 300, 600, 1200, 1800, 2400, 4800 or 9600 baud. Specify on order.

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Specifications subject to change without notice.

Caution: For operation above 2400 baud, the following pad characters are required on input:
    4800 baud:
    One (1) NUL-code after issuing FF-command.
    9600 baud:
    Two (2) NUL-codes after issuring FF-command.
    One (1) NUL-code after causing screen to roll, in ROLL mode.

Request-to-Send Output (RTS):
    Tied to SPACE level

Data-Terminal-Ready Output (DTR):
    Tied to SPACE level

Input Signal Levels:
    RS232 compatible
    Mark (1): -3V to -25V
    Space (0): +3V to +25V

Output Signal Levels:
    RS232 compatible
    Mark (1): $-6.0V \pm 10\%$ into 3K ohm load
    Space (0): $+3.5V \pm 10\%$ into 3K ohm load

Connector:
    Cinch DB-25S, or equivalent

Pin Assignments:

Pin	Signal	Circuit	Description
1	GND	AA	Protective Ground
2	SDO	BA	Transmitted Data
3	SDI	BB	Received Data
4	RTS	CA	Request to Send
7	COMM	AB	Signal Ground
20	DTR	CD	Data Terminal Ready

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.NN SERIAL INTERFACE OPTIONS. Ann Arbor serial-data terminals are factory
     configured with an RS232-compatible interface for use with data sets, couplers,
     and computer TTY channels that are strapped, or strappable, for RS232.
     Alternatively, they can be configured for current-loop operation, either 20ma
     or 60ma, for applications requiring direct TTY replacement and/or high noise
     immunity.

.01 RS232 INTERFACE. This is Ann Arbor's standard KSR interface. For details
     see 203NNN Terminal specification.

.02 20ma INTERFACE. This option replaces the RS232 Interface with a 20ma current-
     loop interface for direct teletype replacement. With this interface, the MARK
     and SPACE levels are represented by current rather than voltage. Current nor-
     mally flows in the loop (MARK). Codes are transmitted by interrupting the
     current flow (SPACE). The DATA CONNECTOR Specification is changed as follows:

          Data Input Loop (SDI+/SDI-): Current changes are sensed by the diode
          portion of an input opto-isolator.

          Data Output Loop (SDO+/SDO-): Resistance changes are generated by the
          transistor portion of an output opto-isolator.

          Loop Power: The loops must be powered, i.e., normal MARK current caused
          to flow, externally. The Ann Arbor terminal does not provide means for
          powering the loops.

          Input Signal Levels:
               Mark (1): 20ma ± 4ma
               Space(0):   0ma + 1ma, – 0ma
               Input Impedance: 50 ohms nominal; 75 ohms max.

          Output Signal Levels:
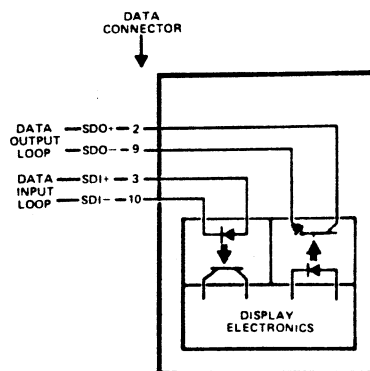   Mark (1): 50 ohms nominal; 75 ohms max.
               Space(0): 60K ohms nominal
               Applied Voltage: 35 volts max.

          Pin Assignments:

     Note: For half-duplex operation, jumper pin 3 to pin 9 on mating connector.

     Because of installation complexities, use of this interface is recommended only
     if an RS232 interface is unavailable. All couplers and data sets provide an
     RS232 interface; most computer teletype channels can be strapped for RS232.
     If it is necessary to use this interface, we recommend it be installed only
     by qualified engineering personnel.

NAME	J. R	D.S.	JR	ANN ARBOR TERMINALS/Specification	200295.NN
DATE	9-10-76	9-14-76	9-14-76	SERIAL INTERFACE OPTIONS	
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.03 **60ma INTERFACE.** Same as 20ma Interface, except:

<u>Input Impedance</u>: 17 ohms nominal; 25 ohms max.

<u>Output Impedance (MARK)</u>: 17 ohms nominal; 25 ohms max.

<u>Output Impedance (SPACE)</u>: 20K ohms nominal.

<u>Signal Levels</u>: MARK (1): 60ma nominal ± 12ma
SPACE(0): 0ma nominal + 1ma, − 0ma

.14 **PARITY OPTION.** Ann Arbor serial-data-terminals are factory preset to transmit parity at Mark, and to ignore parity on incoming data. This option permits specification, on order, of Even or Odd parity on outgoing data. It does not provide parity (or framing error) detection on incoming data with errors.

.98 **BAUD ___.** Ann Arbor serial-data terminals are factory-preset to one of the following baud rates: 110, 300, 600, 1200, 1800, 2400, 4800, 9600 baud. Specify on order. Note: The baud rate is preset by jumpers on the terminal's Serial Board. It can be changed in the field by a qualified technician.

.97 **DUAL BAUD __/__.** This option provides external-switch-selection between two specified baud rates. The rates are factory preset (by Serial Board jumpers) to any two of the available rates. Specify on order. The S4 switch selects between the two rates: OFF selects the lower rate, ON selects the higher rate.

.96 **SWITCHED BAUD.** This option provides internal-switch-selection of all available baud rates, by means of a DIP-switch on the terminal's Serial Board. Switch positions 2-4-6-8 select the data I/O baud rate. Switch positions 1-3-5-7 select the OFF-position baud rate (if DUAL BAUD option is ordered). The switch is factory set to 4800 baud.
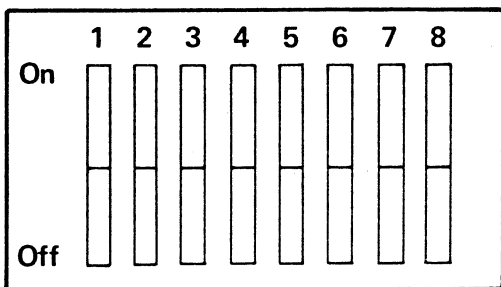
Switch Positions				Baud Rate
1	3	5	7	
2	4	6	8	
0	0	0	1	110
0	1	0	0	300
1	1	0	0	600
0	0	1	0	1200
1	0	1	1	1800
1	0	1	0	2400
0	1	1	0	4800
1	1	1	0	9600

1 = on   0 = off