OBJECTIVE SPECIFICATION

2609-F,I,N

DESCRIPTION

The 2609 is a mask-programmable 8192-bit row select character generator. It contains 128 characters in a 7X9 matrix, and has the capability of shifting certain characters that normally extend below the baseline, such as j, y, g, p and q. Circuitry is supplied internally to effectively lower the whole matrix for this type of character, a feature previously requiring external circuitry.
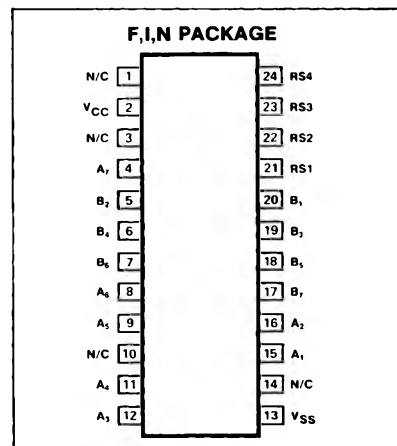
A 7-bit address code is used to select 1 of the 128 available characters. Each character is defined as a specific combination of logic "1"s and "0"s stored in a 7X9 matrix. When a specific 4-bit binary row select code is applied, a word of 7 parallel bits appears at the output. The rows can be sequentially selected, providing a 9-word sequence of 7 parallel bits per word for each character selected by the address inputs. As the row select inputs are sequentially addressed, the devices will automatically place the 7X9 character in 1 of 2 pre-programmed positions on the 16-row matrix, with the positions defined by the 4 row select inputs.

Complete TTL compatibility is provided, as well as direct interfacing with other NMOS devices, and with CMOS when using a +5V power supply. Maximum access time is 500ns; however, if a device is programmed without shifted characters, the access time is reduced.
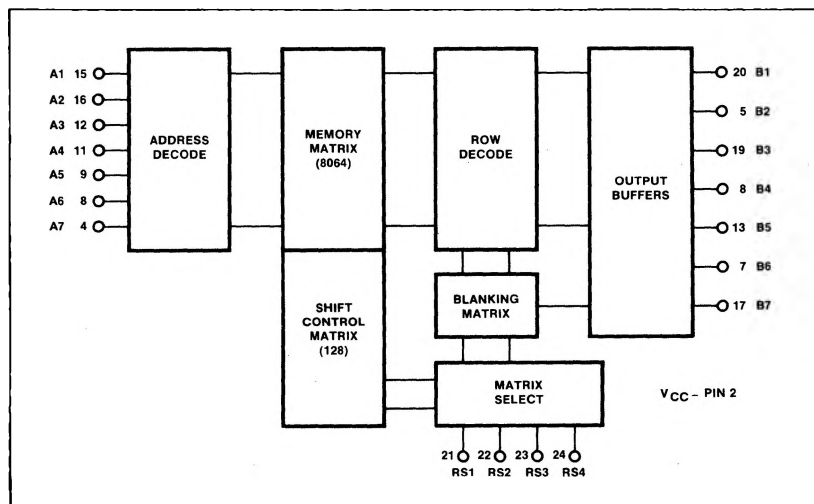
FEATURES

- **Static operation—no clocks**
- **Access time: 500ns max**
- **Single 5V power supply**
- **TTL compatible inputs and outputs**
- **Power dissipation: 525mW**
- **N-channel silicon gate technology**
- **Standard 24-pin package**
- **All inputs are capacitive and do not sink or source current**

PIN CONFIGURATION

F,I,N PACKAGE

Pin		Pin	
N/C	1	24	RS4
V_{CC}	2	23	RS3
N/C	3	22	RS2
A_7	4	21	RS1
B_2	5	20	B_1
B_4	6	19	B_3
B_6	7	18	B_5
A_6	8	17	B_7
A_5	9	16	A_2
N/C	10	15	A_1
A_4	11	14	N/C
A_3	12	13	V_{SS}

BLOCK DIAGRAM

ABSOLUTE MAXIMUM RATINGS[1]

	PARAMETER	RATING	UNIT
	Temperature range		°C
T_A	Operating	0 to 70	
T_{STG}	Storage	−65 to +150	
	All input, output and supply voltages with respect to ground pin	−0.5 to +7	V

OBJECTIVE SPECIFICATION

DC ELECTRICAL CHARACTERISTICS $T_A = 0°C$ to $70°C$, $V_{CC} = 5.0V \pm 5\%$ unless otherwise specified.

PARAMETER		TEST CONDITIONS	LIMITS			UNIT
			Min	Typ	Max	
V_{IL}	Input voltage Low		0		0.65	V
V_{IH}	High[1]	Driven by TTL	2.2		V_{CC}	
V_{OB}	Output voltage Low (Blank)	$I_{OL} = 1.6mA$	0	0.4		V
V_{OD}	High (Dot)	$I_{OH} = -40\mu A$	2.4			
I_{IH}	Leakage current	$V_{IH} = 5.25V$, $V_{CC} = 4.75V$			10	μA
I_{CC}	Supply current			80	100	mA
C_{IN}	Capacitance[2] Input	$f = 1.0MHz$, $T_A = 25°C$			7.5	pF
C_{OUT}	Output			4.0	15	

AC ELECTRICAL CHARACTERISTICS $T_A = 0°C$ to $70°C$, $V_{CC} = 5V \pm 5\%$ unless otherwise specified,
V_{IN} levels = 0.65V and 2.2V or driven by TTL, Input t_r and $t_f < 20ns$,
Measurement reference level = 1.5V, Output loading = 1 TTL gate +130pF

PARAMETER		TO	FROM	LIMITS			UNIT
				Min	Typ	Max	
$t_{ACC(A)}$	Access time	Output	Address		350	500	ns
$t_{ACC(RS)}$		Output	Row select		300	500	
P_D	Power dissipation				400	525	mW

NOTES

1. No pullup resistors are required.
2. Capacitances are periodically sampled rather than 100% tested.
3. This is advance information and specifications are subject to change without notice.

TIMING DIAGRAMS

ADDRESS ACCESS

Address inputs are set in a dc state

ROW SELECT ACCESS

Row select inputs are set in a dc state
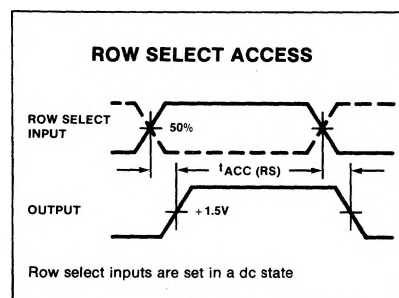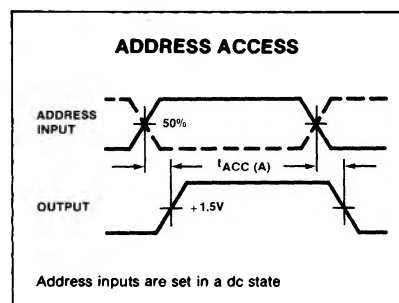
MEMORY OPERATION USING POSITIVE LOGIC   (Most positive level = 1, most negative level = 0)

Address
To select 1 of the 128 characters, apply the appropriate binary code to the address inputs (A1-A7).

Row Select
To select 1 of the rows of the addressed character to appear at the 7 output lines, apply the appropriate binary code to the row select inputs (RS1-RS4).

Shifted Characters
These devices have the capability of displaying characters that descend below the bottom line (such as lower case letters j, y, g, p and q). Internal circuitry effectively drops the whole matrix for this type of character. Any character can be programmed to occupy either of the 2 positions in a 7X16 matrix.

Output
For these devices, an output dot is defined as a logic "1" level, and an output blank is defined as a logic "0" level.

MEMORY TIMING DEFINITIONS

$t_{ACC(A)}$ Address Access Time:
The time delay between a change in the address inputs and a corresponding change at the output lines with all other inputs held stable, and with the recommended load.

$t_{ACC(RS)}$ Row Select Access Time:
The time delay between a change in the row select inputs and the appearance of valid information at the output lines, with all other inputs held stable.

DISPLAY FORMAT
Figure 1 shows the relationship between the logic levels at the row select inputs and the character row at the outputs. The 2609 allows the user to locate the basic 7X9 font anywhere in 7X16 array. In addition, a shift-

ed font can be placed anywhere in the same 7X16 array. For example, the basic CN6571 font is established in rows R14-R6. All other rows are automatically blanked. The shifted font is established in rows R11-R3. Thus, while any one character is contained in a 7X9 array, the CN6571 requires a 7X12 array on the CRT screen to contain both normal and descending characters. Other uses of the shift option may require as much as the full 7X16 array, or as little as the basic 7X9 array.

The 2609 can be programmed to be scanned either from bottom to top or from top to bottom. This is achieved through the option of assigning row numbers in ascending or descending count, as long as both the basic font and the shifted font are the same. For example, an up counter will scan the CN6571 from bottom to top.

CUSTOM PROGRAMMING FOR 2609

By programming of a single photomask, the customer may specify the content of this memory. Encoding of the photomask is done with the aid of a computer. Use of the computer provides a quick and efficient way to implement a custom bit pattern, while reducing the cost of implementation.

Information on the general options of the 2609 should be submitted on an Organizational Data Form.

Programming of the memory content should be transmitted to Signetics as completed data encoding sheets. The Data Encoding Sheet Format illustration details the requirements for proper completion of the data encoding sheets.

Three examples are shown to indicate proper character encoding. The following rules apply:

1. Enter the character number in the space provided above each dot matrix. Address 0000000 is used for character number 1, with other character numbers following in the normal binary progression.
2. Indicate the rows to be used in the space provided to the left of each dot matrix. Note that characters may be positioned in either of two 7X9 locations on a 7X16 matrix; however, only 2 positions are allowed per mask option. The character for a given address may occupy only 1 of these positions
3. Column zero is added to the dot matrix on the format sheet for use in indicating shifted characters. If a character is to be shifted, a dot should be entered into the first row of the first (zero) column (see the third example, j).
4. The desired character should be entered in the matrix, using only columns B1-B7.

FORMAT FOR PROGRAMMING GENERAL OPTIONS

**ORGANIZATIONAL DATA
SIGNETICS 2609 MOS ROM**

Customer _____

Customer part no. _____ Rev. _____

Row number for top row of non-shifted characters _____

Row number for top row of shifted characters _____

Count down   Count up
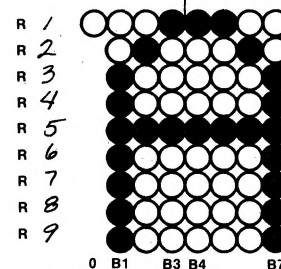
ROW SELECT INPUT CODE AND SAMPLE CHARACTERS FOR CN6571

TRUTH TABLE

RS4	RS3	RS2	RS1	OUTPUT
0	0	0	0	R0
0	0	0	1	R1
0	0	1	0	R2
0	0	1	1	R3
0	1	0	0	R4
0	1	0	1	R5
0	1	1	0	R6
0	1	1	1	R7
1	0	0	0	R8
1	0	0	1	R9
1	0	1	0	R10
1	0	1	1	R11
1	1	0	0	R12
1	1	0	1	R13
1	1	1	0	R14
1	1	1	1	R15
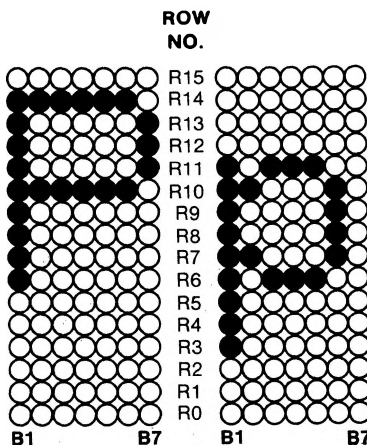
DATA ENCODING SHEET FORMAT

Character Number ___66___

Non-Shifted Character

Character Number ___98___
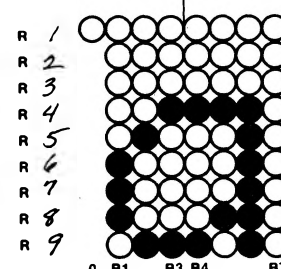
Non-Shifted Character

Character Number ___107___

Shifted Character

OBJECTIVE SPECIFICATION   2609-F,I,N
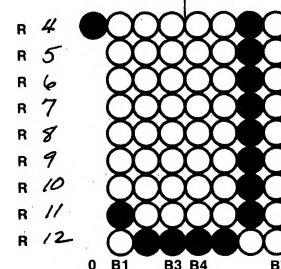
DATA ENCODING SHEET FOR 2609

Customer _____ Customer Part No. _____ Rev. _____ Page _____ of _____ Pages

Character Number _____

Character Number _____

Character Number _____

Character Number _____

Character Number _____

Character Number _____

Character Number _____

Character Number _____

Character Number _____

Character Number _____

Character Number _____

Character Number _____

Signetics
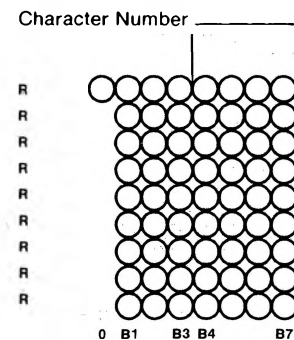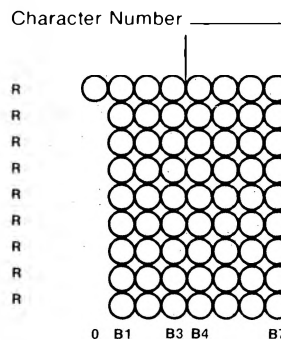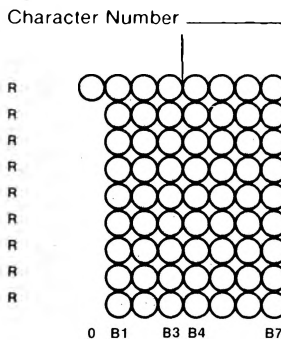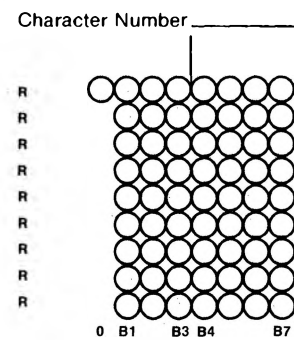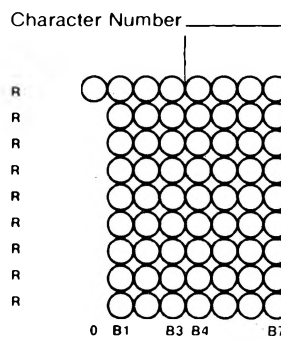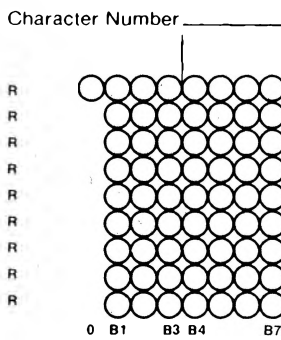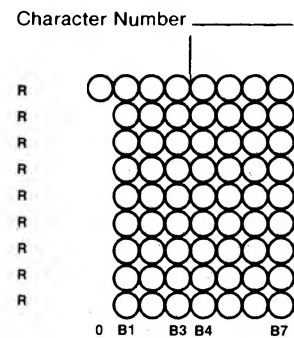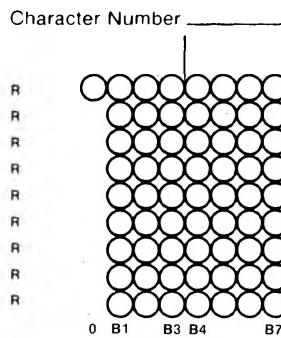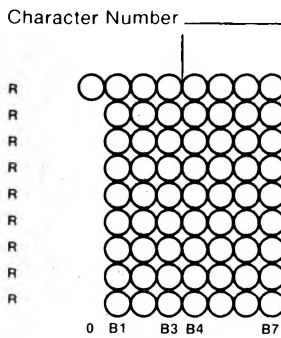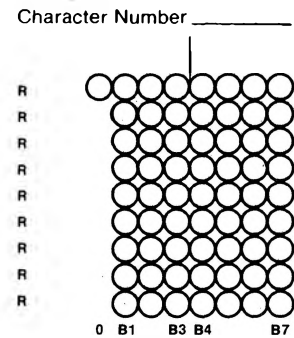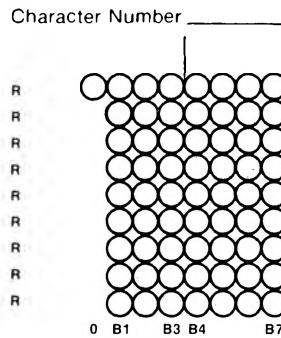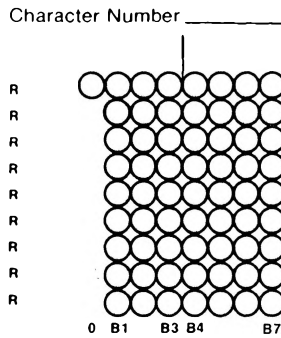
OBJECTIVE SPECIFICATION   2609-F,I,N

USASCII CHARACTER GENERATOR CODE

The CN6571 has been programmed with the characters shown. No attempt has been made on this figure to indicate columns and rows actually used on the display for each character.

7	6	5	4	3	2	1	DISPLAYED CHARACTER	SHIFTED
0	0	0	0	0	0	0	α	
0	0	0	0	0	0	1	β	yes
0	0	0	0	0	1	0	γ	yes
0	0	0	0	0	1	1	δ	
0	0	0	0	1	0	0	ε	
0	0	0	0	1	0	1	ζ	
0	0	0	0	1	1	0	η	yes
0	0	0	0	1	1	1	θ	
0	0	0	1	0	0	0	ι	
0	0	0	1	0	0	1	κ	
0	0	0	1	0	1	0	λ	
0	0	0	1	0	1	1	μ	yes
0	0	0	1	1	0	0	ν	
0	0	0	1	1	0	1	ξ	
0	0	0	1	1	1	0	ο	
0	0	0	1	1	1	1	π	
0	0	1	0	0	0	0	ρ	yes
0	0	1	0	0	0	1	σ	
0	0	1	0	0	1	0	τ	
0	0	1	0	0	1	1	υ	
0	0	1	0	1	0	0	φ	
0	0	1	0	1	0	1	χ	
0	0	1	0	1	1	0	ψ	yes
0	0	1	0	1	1	1	ω	
0	0	1	1	0	0	0	Ω	
0	0	1	1	0	0	1	√	
0	0	1	1	0	1	0	→	
0	0	1	1	0	1	1	←	
0	0	1	1	1	0	0	↑	
0	0	1	1	1	0	1	÷	
0	0	1	1	1	1	0	Σ	
0	0	1	1	1	1	1	≈	
0	1	0	0	0	0	0	Blank	
0	1	0	0	0	0	1	!	
0	1	0	0	0	1	0	"	
0	1	0	0	0	1	1	#	
0	1	0	0	1	0	0	$	
0	1	0	0	1	0	1	%	
0	1	0	0	1	1	0	&	
0	1	0	0	1	1	1	'	
0	1	0	1	0	0	0	(	
0	1	0	1	0	0	1	)	
0	1	0	1	0	1	0	*	
0	1	0	1	0	1	1	+	
0	1	0	1	1	0	0	,	yes
0	1	0	1	1	0	1	—	
0	1	0	1	1	1	0	.	
0	1	0	1	1	1	1	/	
0	1	1	0	0	0	0	0	
0	1	1	0	0	0	1	1	
0	1	1	0	0	1	0	2	
0	1	1	0	0	1	1	3	
0	1	1	0	1	0	0	4	
0	1	1	0	1	0	1	5	
0	1	1	0	1	1	0	6	
0	1	1	0	1	1	1	7	
0	1	1	1	0	0	0	8	
0	1	1	1	0	0	1	9	
0	1	1	1	0	1	0	:	
0	1	1	1	0	1	1	;	
0	1	1	1	1	0	0	<	
0	1	1	1	1	0	1	=	
0	1	1	1	1	1	0	>	
0	1	1	1	1	1	1	?	

7	6	5	4	3	2	1	DISPLAYED CHARACTER	SHIFTED
1	0	0	0	0	0	0	@	
1	0	0	0	0	0	1	A	
1	0	0	0	0	1	0	B	
1	0	0	0	0	1	1	C	
1	0	0	0	1	0	0	D	
1	0	0	0	1	0	1	E	
1	0	0	0	1	1	0	F	
1	0	0	0	1	1	1	G	
1	0	0	1	0	0	0	H	
1	0	0	1	0	0	1	I	
1	0	0	1	0	1	0	J	
1	0	0	1	0	1	1	K	
1	0	0	1	1	0	0	L	
1	0	0	1	1	0	1	M	
1	0	0	1	1	1	0	N	
1	0	0	1	1	1	1	O	
1	0	1	0	0	0	0	P	
1	0	1	0	0	0	1	Q	
1	0	1	0	0	1	0	R	
1	0	1	0	0	1	1	S	
1	0	1	0	1	0	0	T	
1	0	1	0	1	0	1	U	
1	0	1	0	1	1	0	V	
1	0	1	0	1	1	1	W	
1	0	1	1	0	0	0	X	
1	0	1	1	0	0	1	Y	
1	0	1	1	0	1	0	Z	
1	0	1	1	0	1	1		
1	0	1	1	1	0	0	—	
1	0	1	1	1	0	1	}	
1	0	1	1	1	1	0	—	
1	0	1	1	1	1	1	—	
1	1	0	0	0	0	0	'	
1	1	0	0	0	0	1	a	
1	1	0	0	0	1	0	b	
1	1	0	0	0	1	1	c	
1	1	0	0	1	0	0	d	
1	1	0	0	1	0	1	e	
1	1	0	0	1	1	0	f	
1	1	0	0	1	1	1	g	yes
1	1	0	1	0	0	0	h	
1	1	0	1	0	0	1	i	
1	1	0	1	0	1	0	j	yes
1	1	0	1	0	1	1	k	
1	1	0	1	1	0	0	l	
1	1	0	1	1	0	1	m	
1	1	0	1	1	1	0	n	
1	1	0	1	1	1	1	o	
1	1	1	0	0	0	0	p	yes
1	1	1	0	0	0	1	q	yes
1	1	1	0	0	1	0	r	
1	1	1	0	0	1	1	s	
1	1	1	0	1	0	0	t	
1	1	1	0	1	0	1	u	
1	1	1	0	1	1	0	v	
1	1	1	0	1	1	1	w	
1	1	1	1	0	0	0	x	
1	1	1	1	0	0	1	y	yes
1	1	1	1	0	1	0	z	
1	1	1	1	0	1	1	{	
1	1	1	1	1	0	0			
1	1	1	1	1	0	1	}	
1	1	1	1	1	1	0		
1	1	1	1	1	1	1	Solid	

CARD FORMAT HEADER CARDS

IDENTIFICATION CARDS

Column 8, 9
Custom designation "CN"

Column 10, 11, 12, 13,
Custom number (assigned
by Signetics)

Column 2-6
Basic part type

Column 26-80
Customer identification

Person responsible for reviewing Signetics
computer generated truth table

Street address

City   State   Zip

Company name

CHARACTER SET UP CARD

CHARACTER SET UP CARD

Card #6

Columns	
1	Type in —, NONSHIFT =
10 & 11	Enter decimal number that corresponds to TOP row of the nonshifted characters
13-18	Type in —, SHIFT =
19 & 20	Enter decimal number that corresponds to TOP row of shifted characters
22-27	Type in —, COUNT =
28 & 29	These columns are used to identify the direction of the numerical count for the subsequent row numbers.
	When "DN" is punched this adds –1 to the number of top row of character to get the second row; third row is –2; etc.
30-78	Leave blank
79 & 80	Enter truth table number

CHARACTER CARDS

This format identifies characters by numerical sequence beginning with 001 (the first character of the set) and ending with 128 (the last character of the set). Address 0000000 is used for character #1, with other characters following in normal binary progression with A_1 the LSB and A_7 the MSB.

Columns	
1-3	Enter decimal character number
4	Leave blank
5	Enter character position: S for shifted, N for nonshifted
6	Leave blank
7-13	Enter contents of the top row of character beginning with the least significant bit (B_1) and ending with the most significant bit (B_7)[A,B]
14	Leave blank
15-21	Enter contents of second row of character (LSB to MSB)
22	Leave blank
23-29	Enter third row
30	Leave blank
31-77	Continue until contents of all 9 rows have been entered
78	Leave blank
79 & 80	Enter truth table number
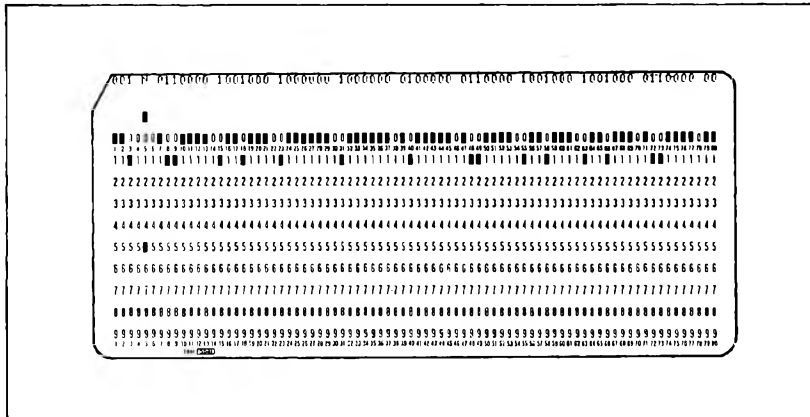
CHARACTER CARD

NOTES

A. An entered dot corresponds to a high voltage output

B. A complete card deck consists of 5 header cards, 1 set up card and 128 character cards