MOTOROLA

MCM66700 MCM66710 MCM66714 MCM66720 MCM66730 MCM66734 MCM66740 MCM66750 MCM66751 MCM66760 MCM66770 MCM66780 MCM66790

2

MOS

(N-CHANNEL, SILICON-GATE)

8K READ ONLY MEMORIES

HORIZONTAL-SCAN CHARACTER GENERATORS WITH SHIFTED CHARACTERS

8192-BIT READ ONLY MEMORIES

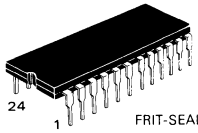
ROW SELECT CHARACTER GENERATORS

The MCM66700 is a mask-programmable 8192-bit horizontal-scan (row select) character generator. It contains 128 characters in a 7 X 9 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.

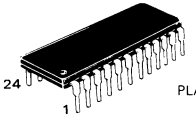
A seven-bit address code is used to select one of the 128 available characters. Each character is defined as a specific combination of logic 1s and 0s stored in a 7 X 9 matrix. When a specific four-bit binary row select code is applied, a word of seven parallel bits appears at the output. The rows can be sequentially selected, providing a nine-word sequence of seven 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 7 X 9 character in one of two preprogrammed positions on the 16-row matrix, with the positions defined by the four row select inputs. Rows that are not part of the character are automatically blanked.

The devices listed are preprogrammed versions of the MCM66700. They contain various sets of characters to meet the requirements of diverse applications. The complete patterns of these devices are contained in this data sheet.

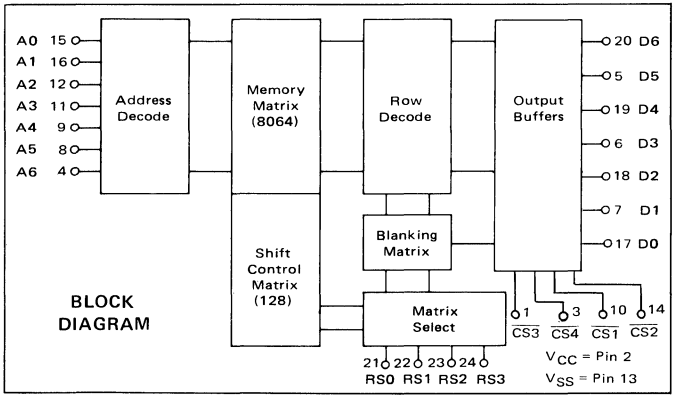
- Fully Static Operation
- Fully TTL Compatible with Three-State Outputs
- CMOS and MPU Compatible, Single ±10% 5 Volt Supply
- Shifted Character Capability
  (Except MCM66720, MCM66730, and MCM66734)
- Maximum Access Time = 350 ns
- 4 Programmable Chip Selects (0, 1, or X)
- Pin-for-Pin Replacement for the MCM6570, Including All Standard Patterns



C SUFFIX
FRIT-SEAL CERAMIC PACKAGE
CASE 623-04



P SUFFIX
PLASTIC PACKAGE
CASE 709-02



BLOCK DIAGRAM

PIN ASSIGNMENT

CS3	1	24	RS3
V_{CC}	2	23	RS2
CS4	3	22	RS1
A6	4	21	RS0
D5	5	20	D6
D3	6	19	D4
D1	7	18	D2
A5	8	17	D0
A4	9	16	A1
CS1	10	15	A0
A3	11	14	CS2
A2	12	13	V_{SS}

DS9516/8-78

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ABSOLUTE MAXIMUM RATINGS (See Note 1, Voltages Referenced to V_{SS})

Rating	Symbol	Value	Unit
Supply Voltages	V_{CC}	−0.3 to 7.0	Vdc
Input Voltage	V_{in}	−0.3 to 7.0	Vdc
Operating Temperature Range	T_A	0 to +70	°C
Storage Temperature Range	T_{stg}	−55 to +125	°C

NOTE 1: Permanent device damage may occur if ABSOLUTE MAXIMUM RATINGS are exceeded. Functional operation should be restricted to RECOMMENDED OPERATING CONDITIONS. Exposure to higher-than-recommended voltages for extended periods of time could affect device reliability.

DC OPERATING CONDITIONS AND CHARACTERISTICS

(Full operating voltage and temperature range unless otherwise noted)

RECOMMENDED DC OPERATING CONDITIONS (Referenced to V_{SS})

Parameter	Symbol	Min	Nom	Max	Unit
Supply Voltage	V_{CC}	4.5	5.0	5.5	Vdc
Input Logic "1" Voltage	V_{IH}	2.0	–	V_{CC}	Vdc
Input Logic "0" Voltage	V_{IL}	−0.3	–	0.8	Vdc

DC CHARACTERISTICS

Characteristic	Symbol	Min	Typ	Max	Unit
Input Leakage Current (V_{IH} = 5.5 Vdc, V_{CC} = 4.5 Vdc)	I_{IH}	–	–	2.5	μAdc
Output Low Voltage (Blank) (I_{OL} = 1.6 mAdc)	V_{OL}	0	–	0.4	Vdc
Output High Voltage (Dot) (I_{OH} = −205 μAdc)	V_{OH}	2.4	–	–	Vdc
Power Supply Current	I_{CC}	–	–	80	mAdc
Power Dissipation	P_D	–	200	440	mW

CAPACITANCE (Periodically sampled rather than 100% tested)

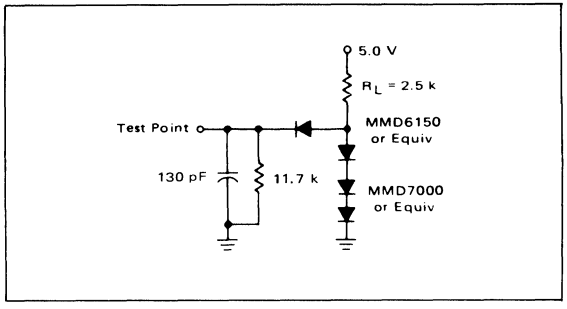
Input Capacitance (f = 1.0 MHz)	C_{in}	–	4.0	7.0	pF
Output Capacitance (f = 1.0 MHz)	C_{out}	–	4.0	7.0	pF

This device contains circuitry to protect the inputs against damage due to high static voltages or electric fields; however, it is advised that normal precautions be taken to avoid application of any voltage higher than maximum rated voltages to this high-impedance circuit.

AC OPERATING CONDITIONS AND CHARACTERISTICS

(Full operating voltage and temperature range unless otherwise noted)

AC TEST LOAD



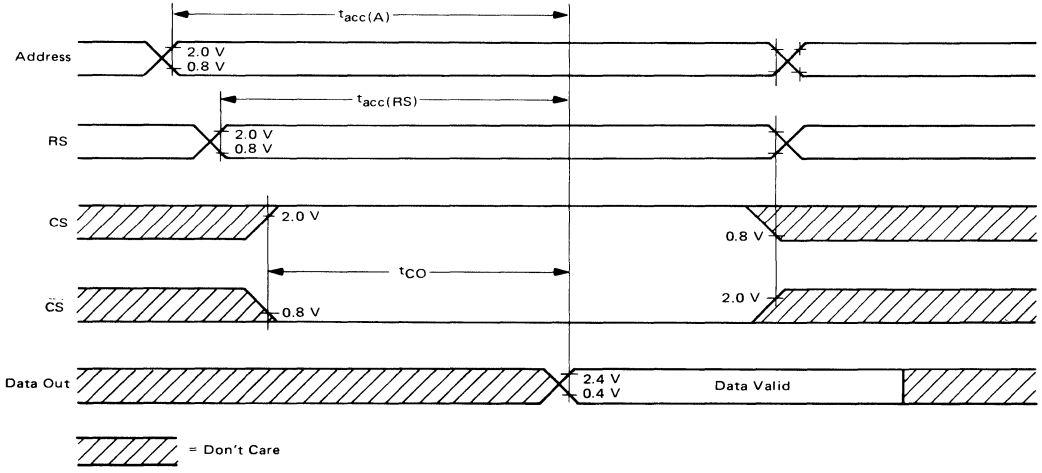
AC TEST CONDITIONS

Condition	Value
Input Pulse Levels	0.8 V to 2.0 V
Input Rise and Fall Times	20 ns
Output Load	1 TTL Gate and C_L = 130 pF

AC CHARACTERISTICS

Characteristic	Symbol	Typ	Max	Unit
Address Access Time	$t_{acc(A)}$	250	350	ns
Row Select Access Time	$t_{acc(RS)}$	250	350	ns
Chip Select to Output Delay	t_{CO}	100	150	ns

TIMING DIAGRAM



MEMORY OPERATION (Using Positive Logic)

Most positive level = 1, most negative level = 0.

Address

To select one of the 128 characters, apply the appropriate binary code to the Address inputs (A0 through A6).

Row Select

To select one of the rows of the addressed character to appear at the seven output lines, apply the appropriate binary code to the Row Select inputs (RS0 through RS3).

Shifted Characters

These devices have the capability of displaying characters that descend below the bottom line (such as lowercase 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 two positions in a 7 X 16 matrix. (Shifted characters are not available on MCM66720, MCM66730, or MCM66734.)

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.

Programmable Chip Select

The MCM66700 has four Chip Select inputs that can be programmed with a 1, 0, or don't care (not connected). A don't care must always be the highest chip select pin or pins. All standard patterns have Don't Care Chip Select—except MCM66751.

DISPLAY FORMAT

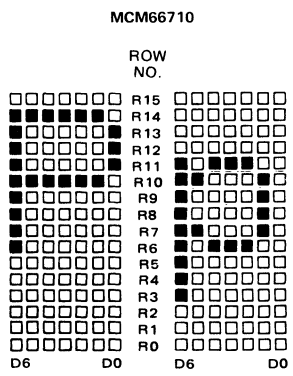
Figure 1 shows the relationship between the logic levels at the row select inputs and the character row at the outputs. The MCM66700 allows the user to locate the basic 7 X 9 font anywhere in the 7 X 16 array. In addition, a shifted font can be placed anywhere in the same 7 X 16 array. For example, the basic MCM66710 font is established in rows R14 through R6. All other rows are automatically blanked. The shifted font is established in rows R11 through R3, with all other rows blanked. Thus, while any one character is contained in a 7 X 9 array, the MCM66710 requires a 7 X 12 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 7 X 16 array, or as little as the basic 7 X 9 array (when no shifting occurs, as in the MCM66720).

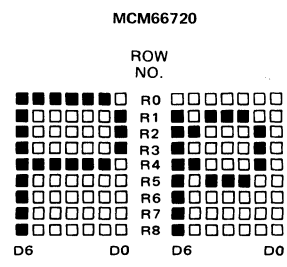
The MCM66700 can be programmed to be scanned either from bottom to top or from top to bottom. This is achieved through the option of assigning row numbers in ascending or descending count, as long as both the basic font and the shifted font are the same. For example, an up counter will scan the MCM66710 from bottom to top, whereas an up counter will scan the MCM66714 from top to bottom (see Figures 7 and 8 for row designation).

FIGURE 1 – ROW SELECT INPUT CODE AND SAMPLE CHARACTERS FOR MCM66710 AND MCM66720

ROW SELECT TRUTH TABLE

RS3	RS2	RS1	RS0	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





CUSTOM PROGRAMMING FOR MCM66700

By the programming of a single photomask, the customer may specify the content of the MCM66700. Encoding of the photomask is done with the aid of a computer to provide quick, efficient implementation of the custom bit pattern while reducing the cost of implementation.

Information for the custom memory content may be sent to Motorola in the following forms, in order of preference:*

1. Hexadecimal coding using IBM Punch Cards (Figures 3 and 4)
2. Hexadecimal coding using ASCII Paper Tape Punch (Figure 5)

Programming of the MCM66700 can be achieved by using the follow sequence:

1. Create the 128 characters in a 7 X 9 font using the format shown in Figure 2. Note that information at output D6 appears in column one, D5 in column two, through D0 information in column seven. The dots filled in and programmed as a logic 1 will appear at the outputs as V_{OH}; the dots left blank will be at V_{OL}. (Blank formats appear at the end of this data sheet for your convenience; they are not to be submitted to Motorola, however.)

2. Indicate which characters are shifted by filling in the extra square (dot) in the top row, at the left (column S).

3. Convert the characters to hexadecimal coding treating dots as 1s and blanks as 0s, and enter this information in the blocks to the right of the character font format. High order bits are at the left, in columns S and D3. For the bottom eight rows, the bit in Column S must be 0, so these locations have been omitted. For the top row, the bit in Column S will be 0 for an unshifted character, and 1 for a shifted character.

4. Transfer the hexadecimal figures either to punched cards (Figure 3) or to paper tape (Figure 5).

5. Assign row numbers to the unshifted font. These must be nine sequential numbers (values 0 through 15) assigned consecutively to the rows. The shifted font is similarly placed in any position in the 16 rows.

6. Provide, in writing, the information indicated in Figure 6 (a copy of Figure 10 may be used for this purpose). Submit this information to Motorola together with the punched cards or paper tape.

FIGURE 2 – CHARACTER FORMAT

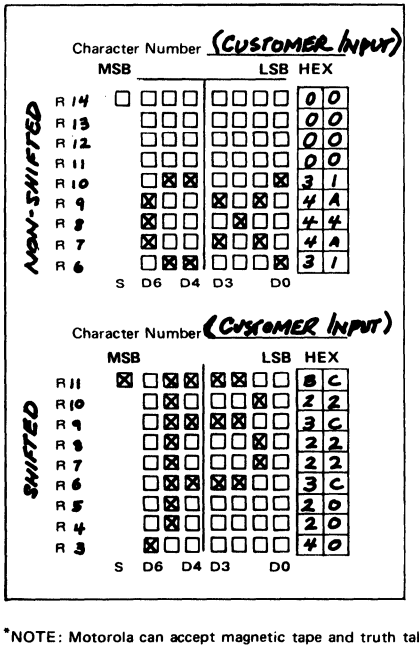


FIGURE 3 – CARD PUNCH FORMAT

Columns	
1 – 10	Blank
11	Asterisk (*)
12 – 29	Hex coding for first character
30	Slash (/)
31 – 48	Hex coding for second character
49	Slash (/)
50 – 67	Hex coding for third character
68	Slash (/)
69 – 76	Blank
77 – 78	Card number (starting 01; through 43)
79 – 80	Blank

Column 12 on the first card contains the hexadecimal equivalent of column S and D6 through D4 for the top row of the first character. Column 13 contains D3 through D0. Columns 14 and 15 contain the information for the next row. The entire first character is coded in columns 12 through 29. Each card contains the coding for three characters. 43 cards are required to program the entire 128 characters, the last card containing only two characters. The characters must be programmed in sequence from the first character to the last in order to establish proper addressing for the part. As an example, the first nine characters of the MCM66710 are correctly coded and punched in Figure 4.

*NOTE: Motorola can accept magnetic tape and truth table formats. For further information contact your local Motorola sales representative.

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FIGURE 4 – EXAMPLE OF CARD PUNCH FORMAT
(First 9 Characters of MCM66710)

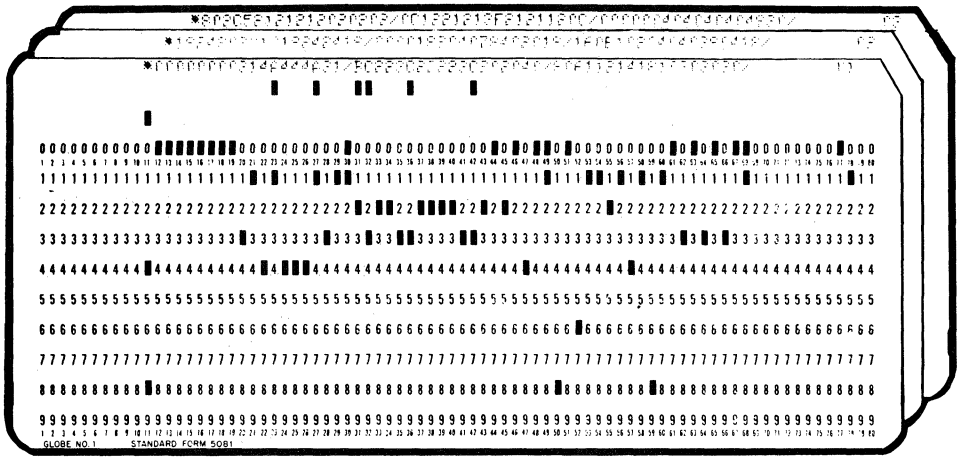


FIGURE 5 – PAPER TAPE FORMAT

Frames	
Leader	Blank Tape
1 to M	Allowed for customer use (M ⩽ 64)
M + 1, M + 2	CR; LF (Carriage Return; Line Feed)
M + 3 to M + 66	First line of pattern information (64 hex figures per line)
M + 67, M + 68	CR; LF
M + 69 to M + 2378	Remaining 35 lines of hex figures, each line followed by a Carriage Return and Line Feed

Blank Tape

Frames 1 to M are left to the customer for internal identification, where M ⩽ 64. Any combination of alphanumerics may be used. This information is terminated with a Carriage Return and Line Feed, delineating the start of data entry. (Note that the tape cannot begin with a CR and/or LF, or the customer identification will be assumed to be programming data.)

Frame M + 3 contains the hexadecimal equivalent of column S and D6 thru D4 for the top row of the first character. Frame M + 4 contains D3 thru D0. Frames M + 5 and M + 6 program the second row of the first character. Frames M + 3 to M + 66 comprise the first line of the printout. The line is terminated with a CR and LF.

The remaining 35 lines of data are punched in sequence using the same format, each line terminated with a CR and LF. The total 36 lines of data contain 36 x 64 or 2304 hex figures. Since 18 hex figures are required to program each 7 x 9 character, the full 128 (2304 ÷ 18) characters are programmed.

FIGURE 6 – FORMAT FOR ORGANIZATIONAL DATA

ORGANIZATIONAL DATA
MCM66700 MOS READ ONLY MEMORY

Customer _____

Customer Part No. _____ Rev. _____

Row Number for top row of non-shifted font _____

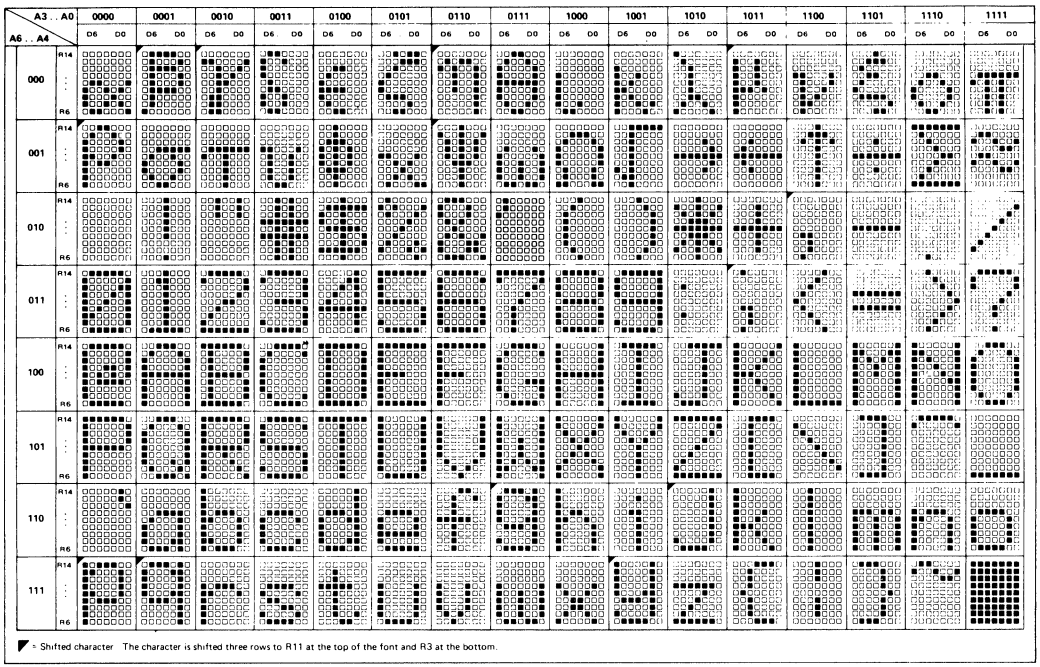
Row Number for bottom row of non-shifted font _____

Row Number for top row of shifted font _____

Programmable Chip Select information: 1 = Active High 0 = Active Low X = Don't Care (Not Connected)

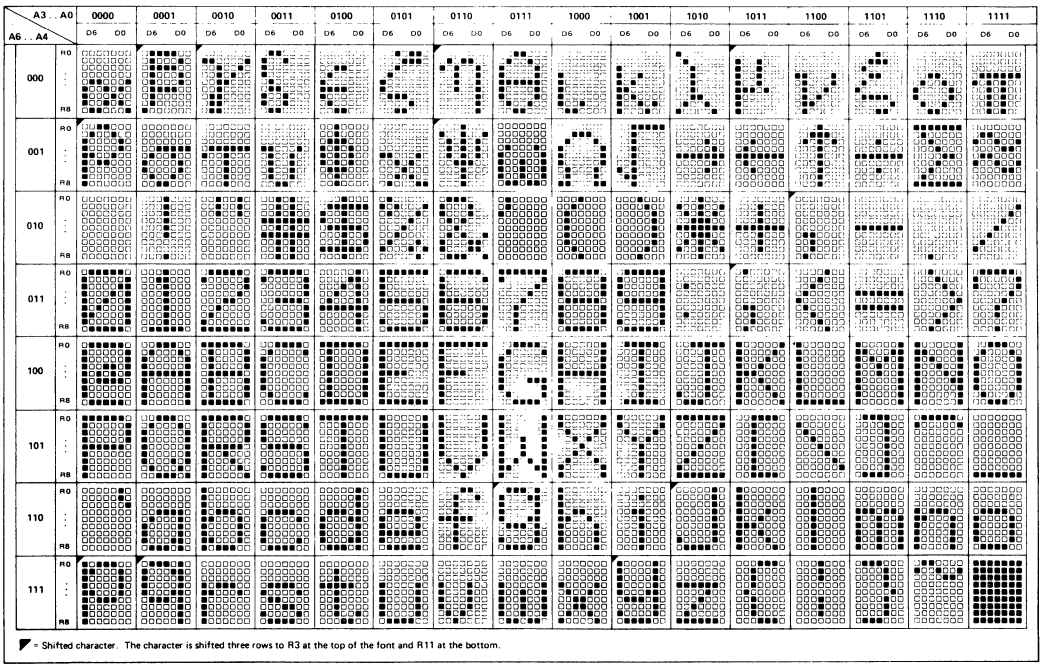
CS1___ CS2___ CS3___ CS4___

FIGURE 7 – MCM66710 PATTERN



◤ = Shifted character The character is shifted three rows to R11 at the top of the font and R3 at the bottom.

FIGURE 8 – MCM66714 PATTERN



◤ = Shifted character. The character is shifted three rows to R3 at the top of the font and R11 at the bottom.

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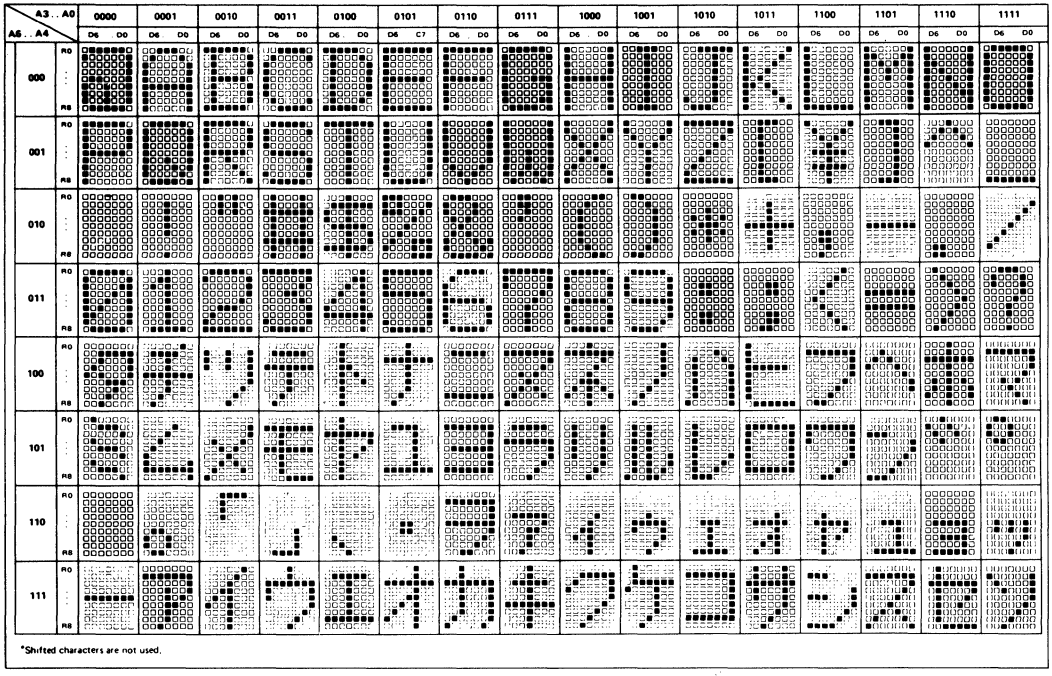
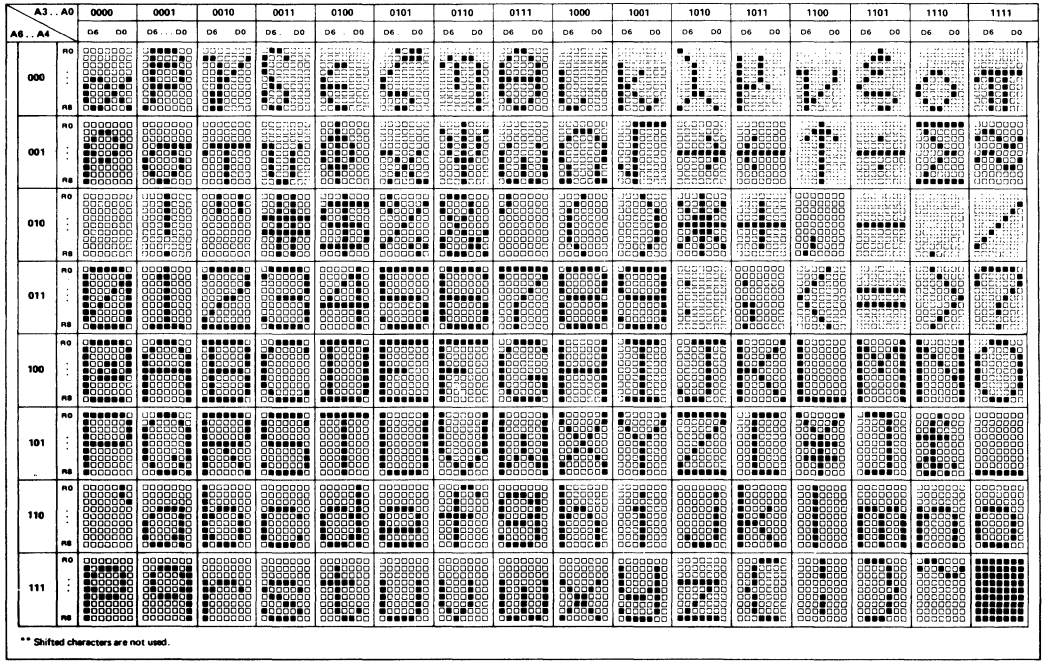
FIGURE 9 – MCM66734 PATTERN*



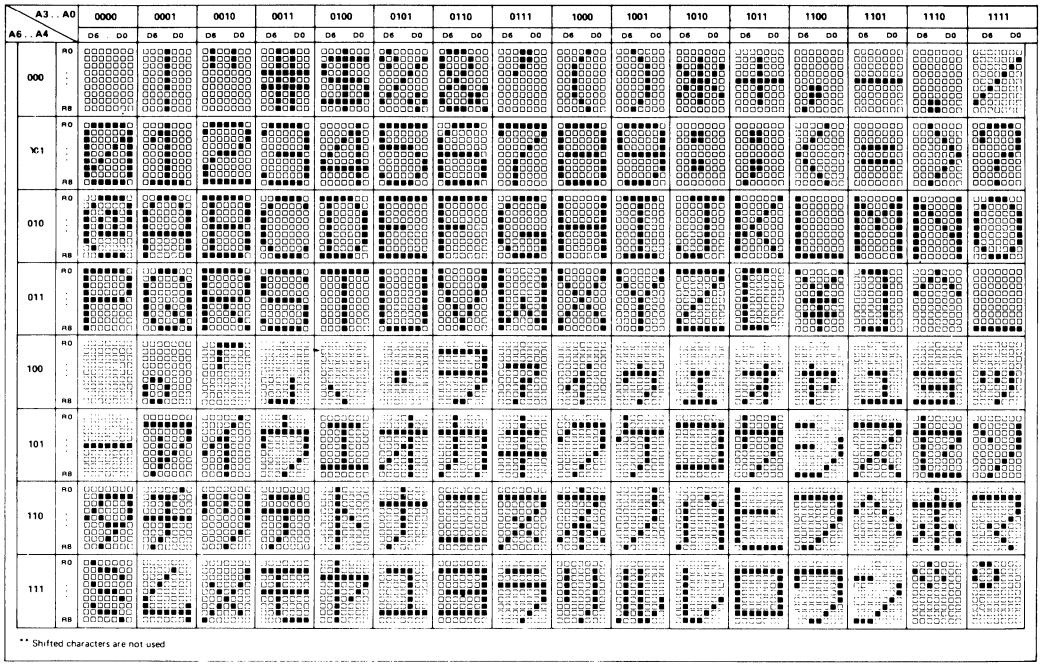
*Shifted characters are not used.

FIGURE 10 – MCM66720 PATTERN**



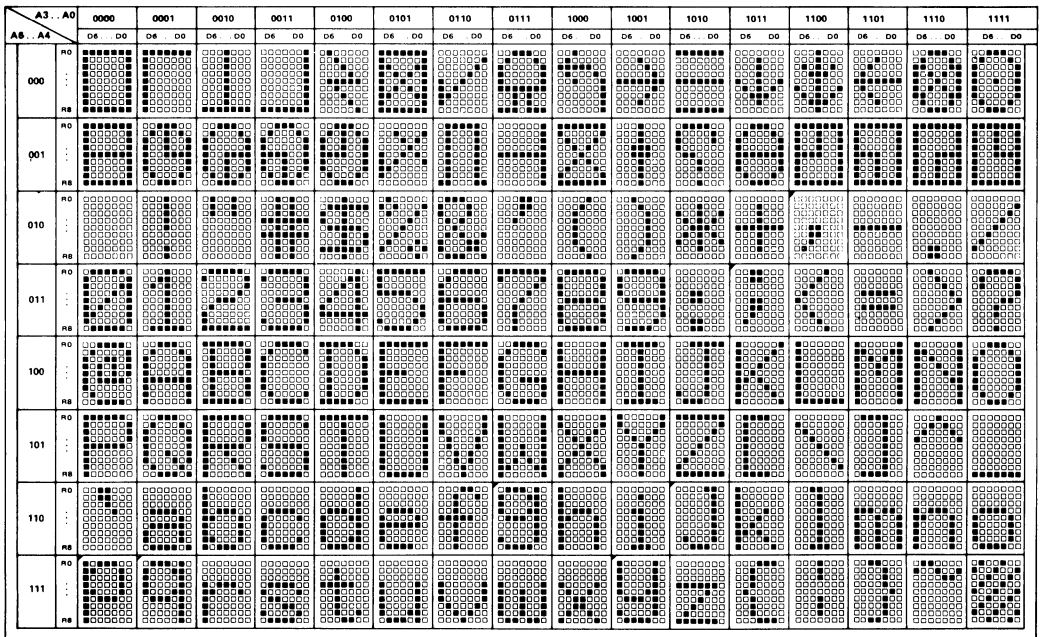
** Shifted characters are not used.

FIGURE 11 – MCM66730 PATTERN**



** Shifted characters are not used

FIGURE 12 – MCM66740 PATTERN



◤ = Shifted character. The character is shifted three rows to R3 at the top of the font and R11 at the bottom.

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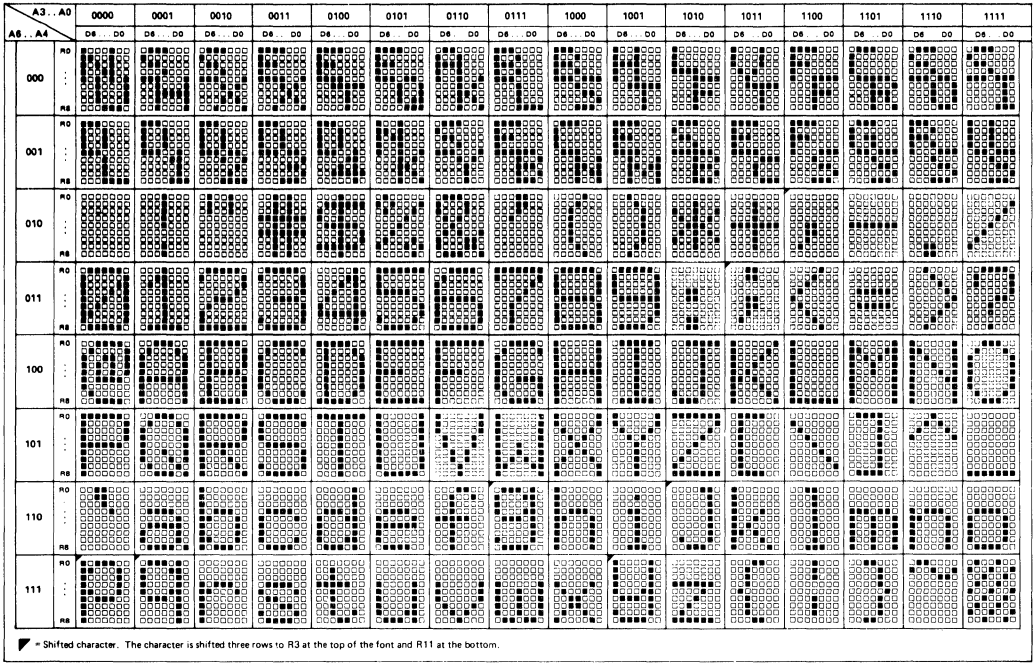
FIGURE 13 – MCM66750 PATTERN



MCM66751 – Same as MCM66750 except CS1 = 0, CS2 = 0, CS3 = X, and CS4 = X.

FIGURE 14 – MCM66760 PATTERN

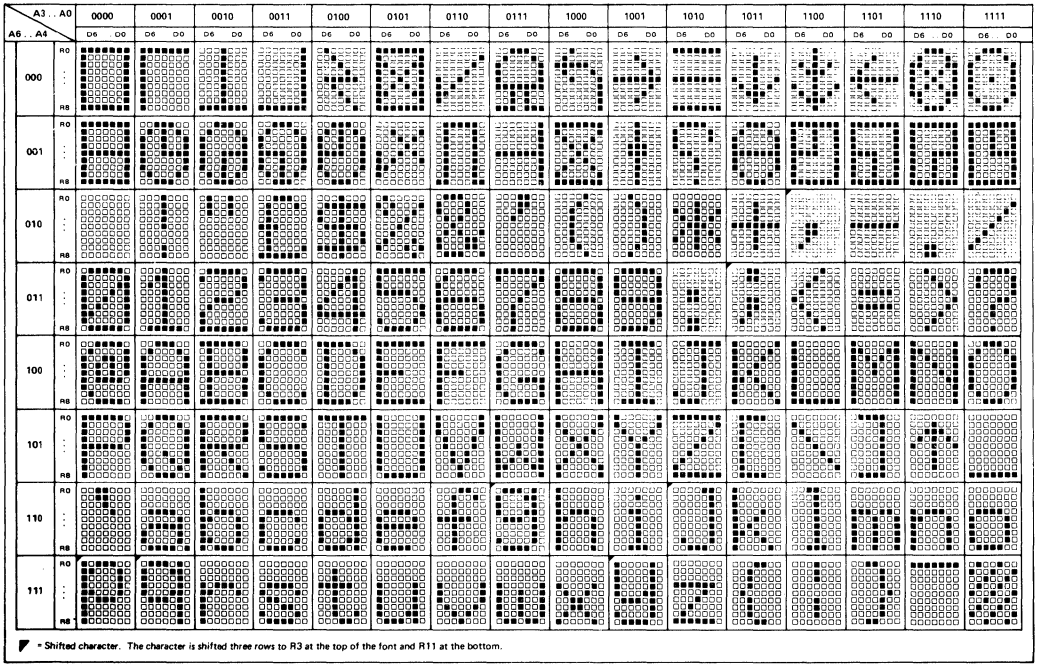
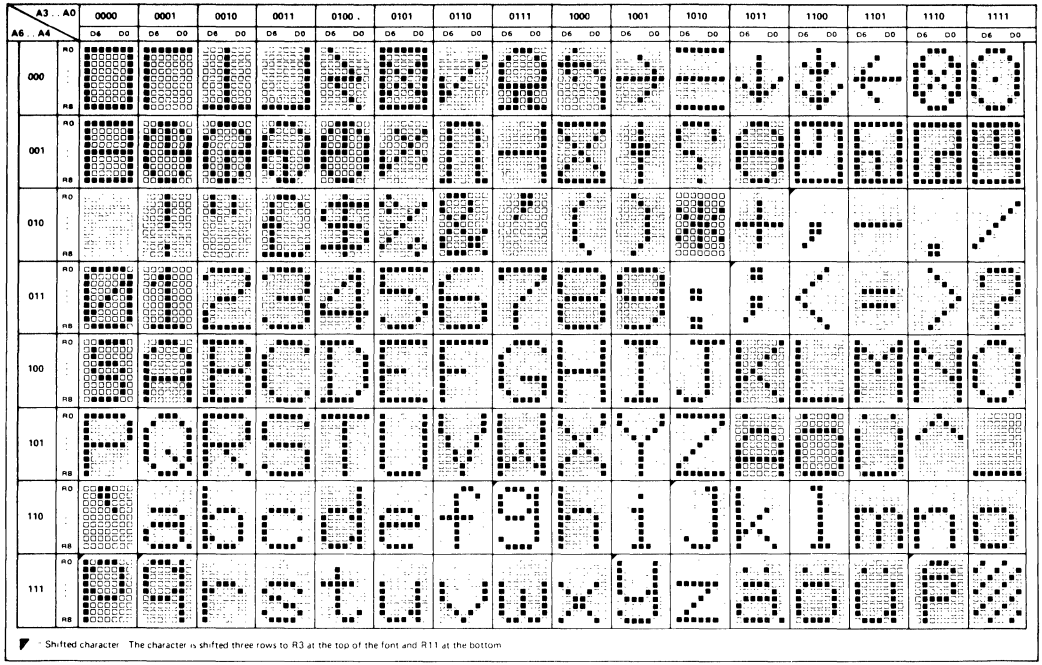
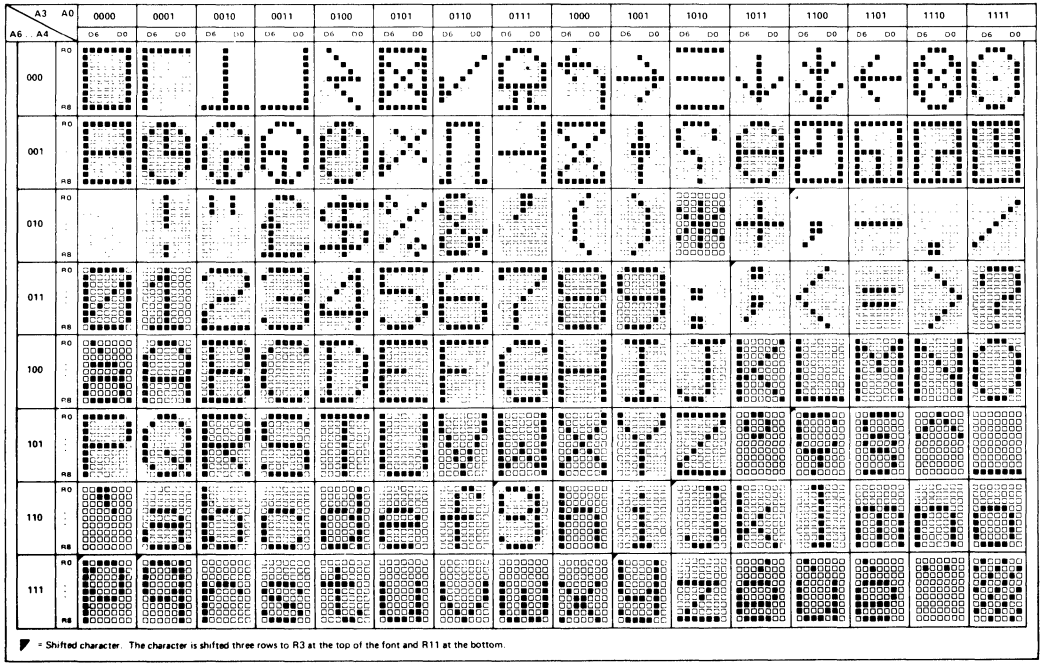


FIGURE 15 – MCM66770 PATTERN



▛ = Shifted character. The character is shifted three rows to R3 at the top of the font and R11 at the bottom.

FIGURE 16 – MCM66780 PATTERN



▛ = Shifted character. The character is shifted three rows to R3 at the top of the font and R11 at the bottom.

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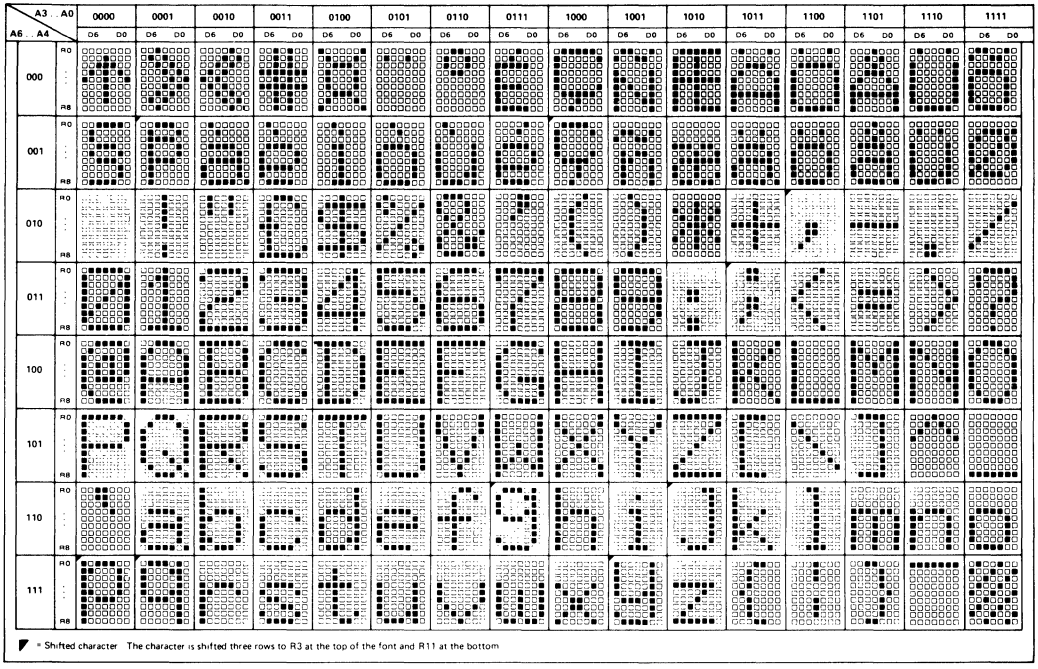
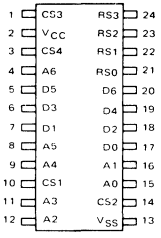
FIGURE 17 – MCM66790 PATTERN

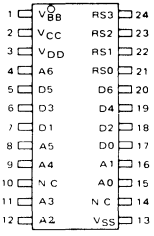


MCM6570 Series	MCM66700 Equivalent	Description
MCM6571	MCM66710	ASCII, shifted
MCM6571A	MCM66714	ASCII, shifted
MCM6572	MCM66720	ASCII
MCM6573	MCM66730	Japanese
MCM6573A	MCM66734	Japanese
MCM6574	MCM66740	Math Symbols
MCM6575	MCM66750	Alphanumeric Control
MCM6576	MCM66760	British, shifted
MCM6577	MCM66770	German, shifted
MCM6578	MCM66780	French, shifted
MCM6579	MCM66790	European, shifted

MCM66700 Series Pin Assignment



MCM6570 Series Pin Assignment



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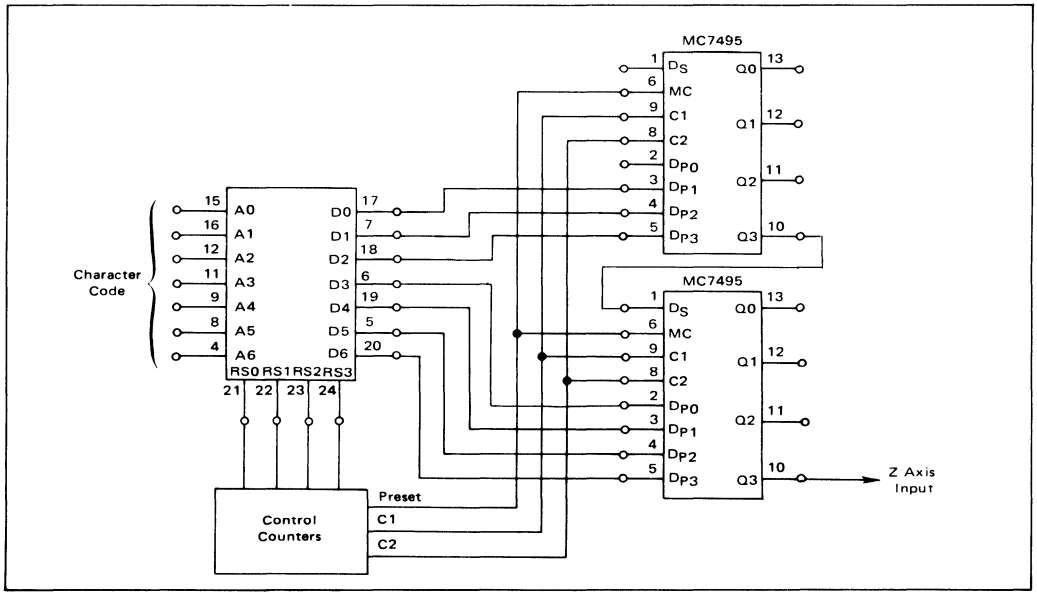
APPLICATIONS INFORMATION

One important application for the MCM66700 series is in CRT display systems (Figure 18). A set of buffer shift registers or random access memories applies a 7-bit character code to the input of the character generator, which then supplies one row of the character according to the count at the four row select inputs. As each row is available, it is put into the TTL MC7495 shift registers. The parallel information in these shift registers is clocked serially out to the Z-axis where it modulates the raster to form the character.

The MCM66700 series require one power supply of +5.0 volts. When powering this device from laboratory or system power supplies, it is important that the Absolute Maximum Ratings not be exceeded or device failure can result. Some power supplies exhibit spikes or glitches on their outputs when the ac power is switched on and off.

FIGURE 18 – CRT DISPLAY APPLICATION USING MCM66710



The formats below are given for your convenience in preparing character information for MCM66700 programming. **THESE FORMATS ARE NOT TO BE USED TO TRANSMIT THE INFORMATION TO MOTOROLA.** Refer to the Custom Programming instructions for detailed procedures.

2

Character Number ______________

	MSB							LSB	HEX	
R										
R										
R										
R										
R										
R										
R										
R										
R										
	S	D6		D4	D3			D0		

Character Number ______________

	MSB							LSB	HEX	
R										
R										
R										
R										
R										
R										
R										
R										
R										
	S	D6		D4	D3			D0		

Character Number ______________

	MSB							LSB	HEX	
R										
R										
R										
R										
R										
R										
R										
R										
R										
	S	D6		D4	D3			D0		

Character Number ______________

	MSB							LSB	HEX	
R										
R										
R										
R										
R										
R										
R										
R										
R										
	S	D6		D4	D3			D0		

Character Number ______________

	MSB							LSB	HEX	
R										
R										
R										
R										
R										
R										
R										
R										
R										
	S	D6		D4	D3			D0		

Character Number ______________

	MSB							LSB	HEX	
R										
R										
R										
R										
R										
R										
R										
R										
R										
	S	D6		D4	D3			D0		

Character Number ______________

	MSB							LSB	HEX	
R										
R										
R										
R										
R										
R										
R										
R										
R										
	S	D6		D4	D3			D0		

Character Number ______________

	MSB							LSB	HEX	
R										
R										
R										
R										
R										
R										
R										
R										
R										
	S	D6		D4	D3			D0		

Character Number ______________

	MSB							LSB	HEX	
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