

User's Manual

FOR

ET - GLCD
GRAPHICAL LCD MODULE

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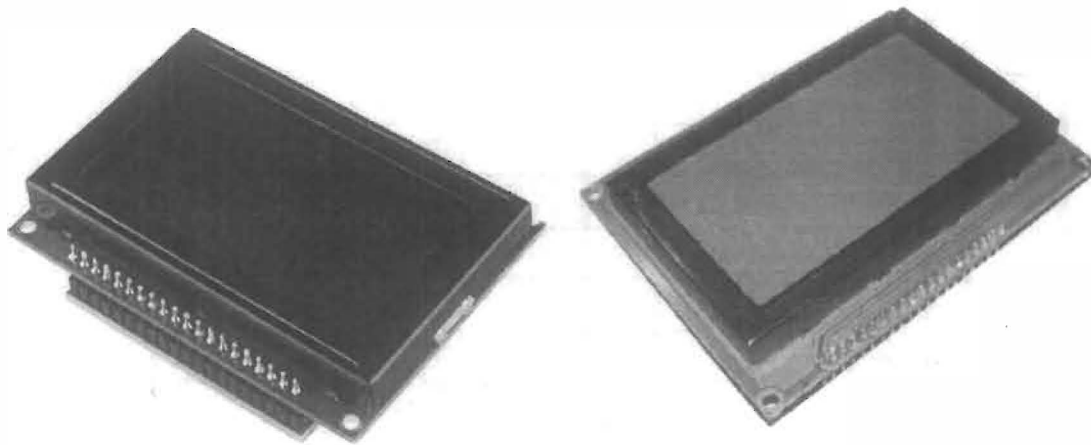
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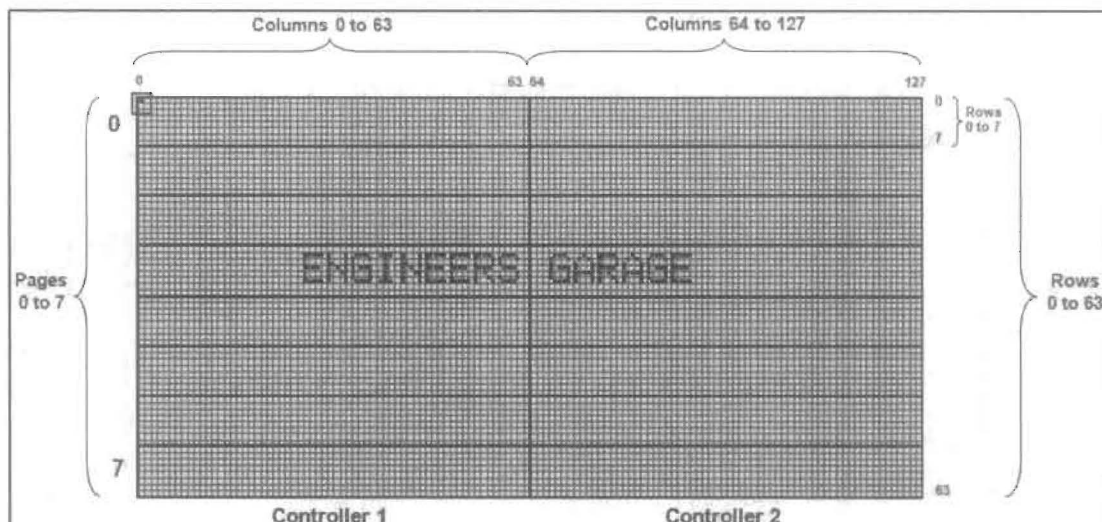
GRAPHICAL LCD 128x64 pixel

MODEL JHD12864E



BASIC ABOUT GRAPHICAL LCD

- It use 2 KS0108 Controller to executes its internal operation
- 128x64 graphical lcd is divided into two equal halves with each half being controlled by a separate KS0108 controller.
- This division is called paging scheme and is explain as follow:

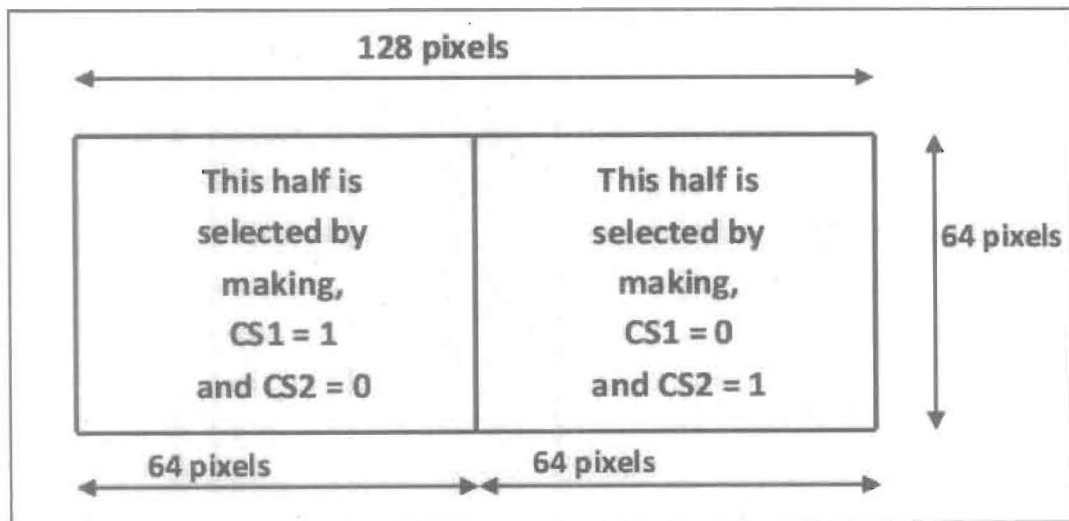


- Each half is consist of 8 pages and each page consist of 8 row and 64 columns.

Row 0	Row 0	} Each row is 8 pixel thick
Row 1	Row 1	
Row 2	Row 2	
Row 3	Row 3	
Row 4	Row 4	
Row 5	Row 5	
Row 6	Row 6	
Row 7	Row 7	

- So two horizontal pages make 128 (64x2) columns and 8 vertical pages to makes 64 rows (8x8) and hense $128 \times 64 = 8192$ pixels.

- To select each half separately we have to use as following values of CS1 and CS2:

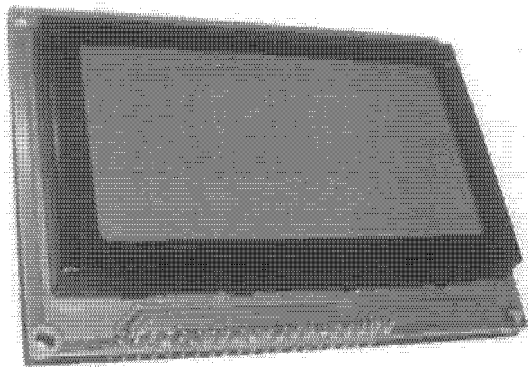


PIN FUNCTION OF GLCD:

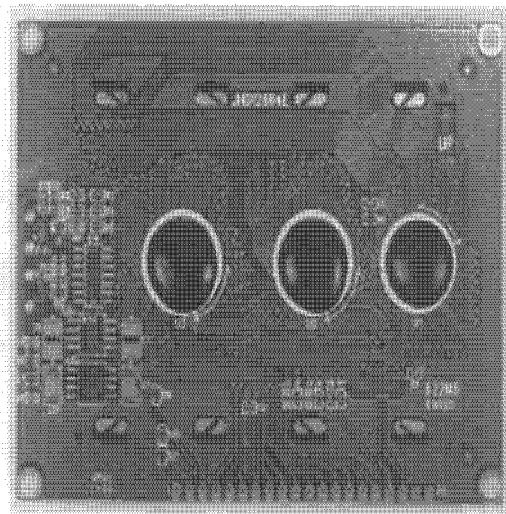
❖ Graphical Lcd has Following Pins and their Functions are:

PIN NO.	SYMBOL	DESCRIPTION	FUNCTION
1	VSS	GROUND	0V (GND)
2	VDD	POWER SUPPLY FOR LOGIC CIRCUIT	+5V
3	V0	LCD CONTRAST ADJUSTMENT	
4	RS	INSTRUCTION/DATA REGISTER SELECTION	RS = 0 : INSTRUCTION REGISTER RS = 1 : DATA REGISTER
5	R/W	READ/WRITE SELECTION	R/W = 0 : REGISTER WRITE R/W = 1 : REGISTER READ
6	E	ENABLE SIGNAL	
7	DB0	DATA INPUT/OUTPUT LINES	8 BIT: DB0-DB7
8	DB1		
9	DB2		
10	DB3		
11	DB4		
12	DB5		
13	DB6		
14	DB7		
15	CS1	CHIP SELECTION	CS1=1,CHIP SELECT SIGNAL FOR IC1
16	CS2	CHIP SELECTION	CS2=1,CHIP SELECT SIGNAL FOR IC2
17	RST	RESET SIGNAL	RSTB=0,DISPLAY OFF,DISPLAY FROM LINE 0.
18	Vout	Connected to Port	
19	LED+	SUPPLY VOLTAGE FOR LED+	+5V
20	LED-	SUPPLY VOLTAGE FOR LED-	0V

GRAPHICAL LCD PICTURES:

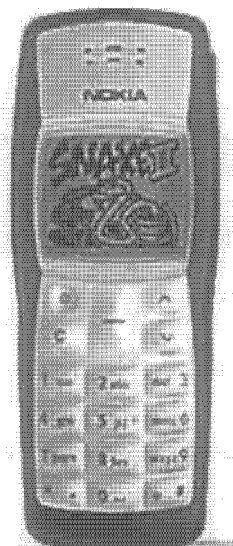


FRONT SIDE

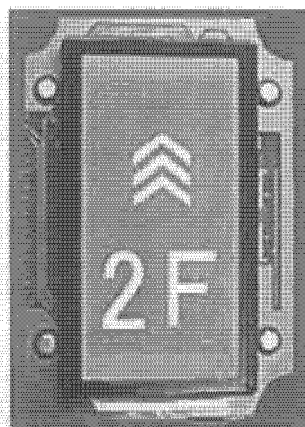


BACK SIDE

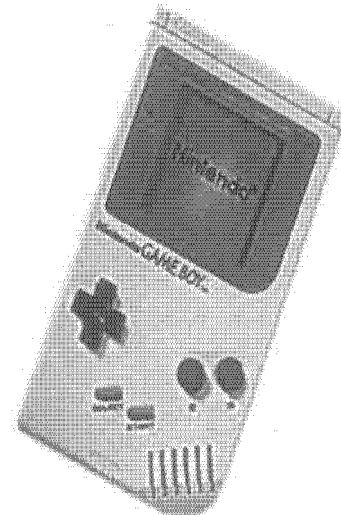
GRAPHICAL LCD APPLICATION:



in cell phones



in lift (showing 2nd floor)



in video games

FUNCTION OF R/W AND RS:

R/W	RS	FUNCTION
0	0	SEND INSTRUCTION TO DDRAM
0	1	DATA WRITE FROM INPUT REGISTER TO DDRAM (ON LCD)
1	0	STATUS CHECK (BUSY READ)
1	1	DATA READ FROM DDRAM TO OUTPUT REGISTER

DDRAM: DATA DISPLAY RAM

BASIC PROCEDURE TO WORK ON GLCD:

1. LCD initialization
2. Page selection
3. Column selection
4. Data Display

1. LCD INTIALIZATION

- a. Put these value in data resister

DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	1	1	1	1	1	D

D = 1, LCD ON

D = 0, LCD OFF (DISSAPPEARS DATA)

- b. CS1 = 1, CS2 = 1 (Both halves Selected)
c. RS = 0, R/W = 0 (To select Instruction mode)
d. EN = 1 (ENABLE = 1)
e. DELAY
f. EN = 0 (To latch data into the input register)

2. PAGE SELECTION

- a. Put these value in data resister

DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
1	0	1	1	1	X3	X2	X1

X3	X2	X1	PAGE NUMBER
0	0	0	PAGE 0

0	0	1	PAGE 1
0	1	0	PAGE 2
0	1	1	PAGE 3
1	0	0	PAGE 4
1	0	1	PAGE 5
1	1	0	PAGE 6
1	1	1	PAGE 7

- b. CS1 = 1, CS2 = 1 (Both halves Selected)
- c. RS = 0, R/W = 0 (To select Instruction mode)
- d. EN = 1 (ENABLE = 1)
- e. DELAY
- f. EN = 0 (To latch data into the input register)

3. COLUMN SELECTION

- a. Put these value in data resister

DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	1	Y5	Y4	Y3	Y2	Y1	Y0

Range of Column Selection is Column 0 to Column 63 for each halves.

CS1	CS2	FUNCTION
0	0	Neither Half Selected
0	1	Second Half Selected
1	0	First Half Selected
1	1	Both Half Selected

Y5	Y4	Y3	Y2	Y1	Y0	COLUMN NUMBER
0	0	0	0	0	0	COLUMN 0
0	0	0	0	0	1	COLUMN 1
0	0	0	0	1	0	COLUMN 2

: : : : :

: : : : :

1	1	1	1	0	1	COLUMN 61
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1	1	1	1	1	0	COLUMN 62
1	1	1	1	1	1	COLUMN 63

- b. RS = 0, R/W = 0 (To select Instruction mode)
- c. EN = 1 (ENABLE = 1)
- d. DELAY
- e. EN = 0 (To latch data into the input register)

4. DISPLAY DATA

- ❖ After Page and Column are Selected Data can be written to that particular location of GLCD. For example if you want to display all 8 pixel of that particular column you can give data as "FF" So all 8 pixel will be darken.
- ❖ Data must be written by first selecting column address and then data can be given to it.

a. Put the any desire value in data resister

DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
X	X	X	X	X	X	X	X

- b. Select CS1, CS2 based on requirement.
- c. RS = 1, R/W = 0 (To select Data write mode)
- d. EN = 1 (ENABLE = 1)
- e. DELAY
- f. EN = 0 (To latch data into the input register)

CONTROL WORD GENERATION

1.FOR LCD INITIALIZATION

DATA WORD

PA7	PA6	PA5	PA4	PA3	PA2	PA1	PA0	PORT A
DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	HEX DW
0	0	1	1	1	1	1	D	
0	0	1	1	1	1	1	1	3F

COMMAND WORD

PC7	PC6	PC5	PC4	PC3	PC2	PC1	PC0	PORT C
NC	NC	NC	CS2	CS1	EN	R/W	RS	FUNCTION
DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	HEX CW
0	0	0	1	1	1	0	0	1C

PC7	PC6	PC5	PC4	PC3	PC2	PC1	PC0	PORT C
NC	NC	NC	CS2	CS1	EN	R/W	RS	FUNCTION
DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	HEX CW
0	0	0	1	1	0	0	0	18

2.FOR PAGE 0 SELECTION

DATA WORD

PA7	PA6	PA5	PA4	PA3	PA2	PA1	PA0	PORT A
DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	HEX DW
1	0	1	1	1	X3	X2	X1	
1	0	1	1	1	0	0	0	B8

COMMAND WORD

NOTE: Command Word Remain Same For Lcd Initialization, Page Selection and Column Selection. It changes only for data display.

3.FOR COLUMN 0 SELECTION

DATA WORD

PA7	PA6	PA5	PA4	PA3	PA2	PA1	PA0	PORT A
DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	HEX DW
0	1	Y5	Y4	Y3	Y2	Y1	Y0	
0	1	0	0	0	0	0	0	40

4.FOR DATA DISPLAY “|”

i.e Straight line of 8 pixel on FIRST halves

DATA WORD

PA7	PA6	PA5	PA4	PA3	PA2	PA1	PA0	PORT A
DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	HEX DW
X	X	X	X	X	X	X	X	
1	1	1	1	1	1	1	1	FF

DATAWR1 WORD/CONTROL WORD

PC7	PC6	PC5	PC4	PC3	PC2	PC1	PC0	PORT C
NC	NC	NC	CS2	CS1	EN	R/W	RS	FUNCTION
DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	HEX CW
0	0	0	0	1	1	0	1	0D

PC7	PC6	PC5	PC4	PC3	PC2	PC1	PC0	PORT C
NC	NC	NC	CS2	CS1	EN	R/W	RS	FUNCTION
DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	HEX CW
0	0	0	0	1	0	0	1	09

8255 PIN CONFIGURATION

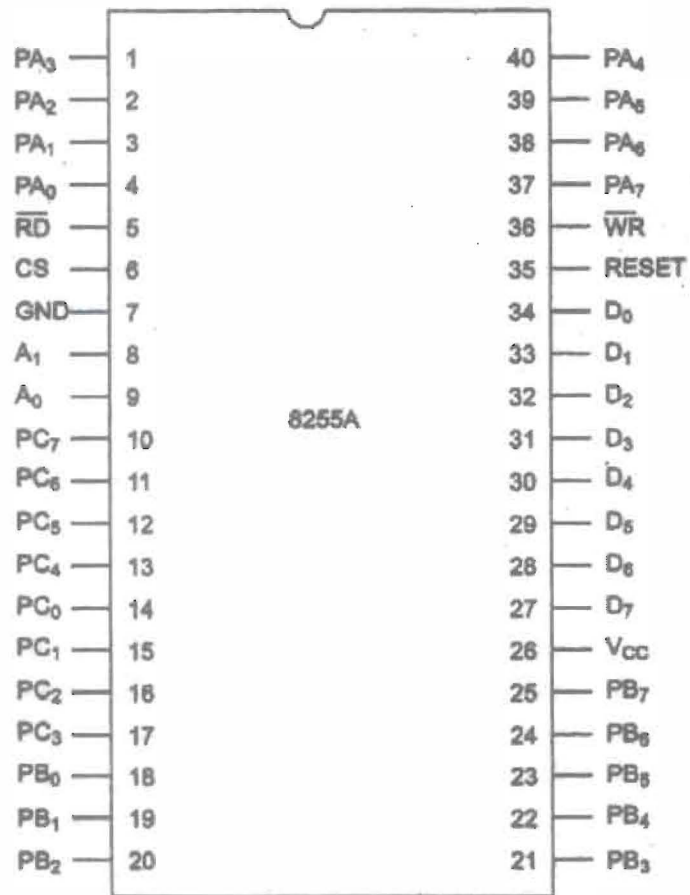


Fig. 5.17(b) 8255A Pin Configuration

DATAWRITE CONTROL WORD

HEX CODE	FUNCTION
0D,09	SELECT FIRST HALF OF LCD
1D,19	BOTH HALF SELECTED
15,11	SECOND HALF SELECT

HARDWARE CONNECTION

LCD PIN FUNCTION	LCD PIN NO.	8255 26 PIN CONNECTOR/PIN NO.	8255 PIN FUNCTION	8255 IC PIN NO.
DB0	7	21	PORT A PA0	4
DB1	8	22	PA1	3
DB2	9	19	PA2	2
DB3	10	20	PA3	1
DB4	11	17	PA4	40
DB5	12	18	PA5	39
DB6	13	15	PA6	38
DB7	14	16	PA7	37
LEDK	20	GND		
GND	1	GND		
VCC	2	+5V		
V(contrast adust)	3	+5V (Variable through POT)		
LEDA	19	+5V(through Resister)		
RS	4	5	PORT C PC0	14
R/W	5	6	PC1	15
EN	6	3	PC2	16
CS1	15	4	PC3	17
CS2	16	1	PC4	13
RESET(active low)	17	ON SWITCH		
VOUT	18	ON PORT		

PROGRAM 1

PROGRAM TO DISPLAY “EXCEL TECHNOLOGIES”at center with square border on top and bottom of the GRAPHICAL LCD USING 8085 KIT THROUGH 8255.

ADDRESS	OP-CODE	LABEL	MNEMONICS	COMMENTS
2000	3E80		MVI A,80	LOAD A WITH CW
2002	D303		OUT 03	OUT CW ON CWR OF 8255
2004	3E3F		MVI A,3F	CW FOR GLCD INITIALIZATION
2006	D300		OUT 00	OUT CW ON PORT A
2008	CD5020		CALL 2050	CALL COMMAND
200B	CDF020		CALL 20F0	CALL CLEAR LCD
200E	3EB8		MVI A,B8	PAGE 0 ADDRESS
2010	D300		OUT 00	OUT ADDRESS
2012	CD5020		CALL 2050	CALL COMMAND
2015	0640		MVI B,40	LOAD ADDRESS OF COLUMN 0
2017	0E08		MVI C,08	COUNT OF CALL SQUARE
2019	CD5021	LP1:	CALL 2150	CALL SQUARE SUBROUTINE
201C	04		INR B	INCREMENT ADDRESS OF COLUMN
201D	0D		DCR C	DECREMENT COUNTER
201E	C21920		JNZ 2019	JNZ LP1
2021	3EBF		MVI A,BF	PAGE 7 SELECT
2023	D300		OUT 00	OUT DATA
2025	CD5020		CALL 2050	CALL COMMAND
2028	0640		MVI B,40	COLUMN ADDRESS
202A	0E08		MVI C,08	COUNTER
202C	CD5021	LP2:	CALL 2150	CALL SQUARE SUBROUTINE
202F	04		INR B	INCREMENT ADDRESS
2030	0D		DCR C	DECREMENT COUNTER
2031	C22C20		JNZ 202C	JNZ LP2
2034	CDF021		CALL 21F0	CALL EXCEL SUBROUTINE
2037	76		HLT	STOP PROGRAM

SUBROUTINE 1. TO PRINT SQUARE []

ADDRESS	OP-CODE	LABEL	MNEMONICS	COMMENTS
2150	1604	SQUARE:	MVI D,04	LOAD COUNT
2152	78	AG1:	MOV A,B	LOAD ADDRESS
2153	D300		OUT 00	OUT ADDRESS
2155	CD5020		CALL 2050	CALL COMMAND
2158	3E00		MVI A,00	LOAD DATA
215A	D300		OUT 00	OUT DATA
215C	CD5F20		CALL 205F	CALL DATAWR
215F	04		INR B	INCREMENT B
2160	15		DCR D	DECREMENT D
2161	C25221		JNZ 2152	JNZ AG1
2164	78		MOV A,B	COPY ADDRESS
2165	D300		OUT 00	OUT ADDRESS
2167	CD5020		CALL 2050	CALL COMMAND
216A	3EFF		MVI A,FF	COPY DATA
216C	D300		OUT 00	OUT DATA
216E	CD5F20		CALL 205F	CALL DATA
2171	04		INR B	INCREMENT B
2172	1602		MVI D,02	LOAD COUNT
2174	78	AG2:	MOV A,B	LOAD ADDRESS
2175	D300		OUT 00	OUT ADDRESS
2177	CD5020		CALL 2050	CALL COMMAND
217A	3E81		MVI A,81	LOAD DATA
217C	D300		OUT 00	OUT DATA
217E	CD5F20		CALL 205F	CALL DATAWR
2181	04		INR B	INCREMENT B
2182	15		DCR D	DECREMENT D
2183	C27421		JNZ 2174	JNZ AG2
2186	78		MOV A,B	COPY ADDRESS
2187	D300		OUT 00	OUT ADDRESS
2189	CD5020		CALL 2050	CALL COMMAND
218C	3EFF		MVI A,FF	COPY DATA
218E	D300		OUT 00	OUT DATA
2190	CD5F20		CALL 205F	CALL DATA
2193	C9		RET	RETURN TO MAIN

SUBROUTINE 2 FOR CLEAR LCD

ADDRESS	OPCODE	LABEL	MNEMONICS	COMMENTS
20F0	16BF	CLEAR:	MVI D,BF	PAGE 7 SELECT
20F2	0E08		MVI C,08	PAGE COUNT
20F4	7A	LP2:	MOV A,D	LOAD PAGE ADDRESS
20F5	D300		OUT 00	OUT ADDRESS
20F7	CD5020		CALL 2050	CALL COMMAND
20FA	067F		MVI B,7F	COLUMN 63 ADDRESS
20FC	1E40		MVI E,40	COLUMN COUNT
20FE	78	LP1:	MOV A,B	LOAD COLUMN ADDRESS
20FF	D300		OUT 00	OUT ADDRESS
2101	CD5020		CALL 2050	CALL COMMAND
2104	3E00		MVI A,00	CLEAR LCD
2106	D300		OUT 00	OUT DATA
2108	CD5F20		CALL 205F	CALL DATAWR
210B	05		DCR B	DECREMENT COLUMNS ADDRESS
210C	1D		DCR E	DECREMENT COUNTER
210D	C2FE20		JNZ 20FE	JNZ LP1
2110	15		DCR D	DECREMENT PAGE
2111	0D		DCR C	DECREMENT COUNTER
2112	C2F420		JNZ 20F4	JNZ LP2
2115	C9		RET	RETURN TO MAIN

SUBROUTINE 3 FOR COMMAND

ADDRESS	OP CODE	LABEL	MNEMONICS	COMMENTS
2050	3E1C	COMMAND:	MVI A,1C	CW FOR LCD
2052	D302		OUT 02	OUT CW ON PORT C
2054	CD7020		CALL 2070	CALL DELAY
2057	3E18		MVI A,18	CW FOR LCD
2059	D302		OUT 02	OUT CW
205B	CD7020		CALL 2070	CALL DELAY
205E	C9		RET	RETURN TO MAIN

SUBROUTINE 4 FOR DATAWRITE

ADDRESS	OP CODE	LABEL	MNEMONICS	COMMENTS
205F	3E1D	DATAWRITE:	MVI A,1D	DW FOR LCD
2061	D302		OUT 02	OUT DW ON PORT C
2063	CD7020		CALL 2070	CALL DELAY
2066	3E19		MVI A,19	DW FOR LCD
2068	D302		OUT 02	OUT DW
206A	CD7020		CALL 2070	CALL DELAY
206D	C9		RET	RETURN TO MAIN

SUBROUTINE 5 TO GIVE SOME TIME DELAY

ADDRESS	OP CODE	LABEL	MNEMONICS	COMMENTS
2070	00	DELAY:	NOP	NO OPERATION
2071	00		NOP	USED FOR TIME DELAY
2072	C9		RET	RETURN

SUBROUTINE 6 FOR DATAWRITE1

ADDRESS	OP CODE	LABEL	MNEMONICS	COMMENTS
2073	3E0D	DATAWRITE1:	MVI A,0D	DW FOR LCD
2075	D302		OUT 02	OUT DW ON PORT C
2077	CD7020		CALL 2070	CALL DELAY
207A	3E09		MVI A,09	DW FOR LCD
207C	D302		OUT 02	OUT DW
207E	CD7020		CALL 2070	CALL DELAY
2081	C9		RET	RETURN TO MAIN

SUBROUTINE 7 FOR DATAWRITE2

ADDRESS	OP CODE	LABEL	MNEMONICS	COMMENTS
2082	3E15	DATAWRITE2:	MVI A,15	DW FOR LCD
2084	D302		OUT 02	OUT DW ON PORT C
2086	CD7020		CALL 2070	CALL DELAY
2089	3E11		MVI A,11	DW FOR LCD
208B	D302		OUT 02	OUT DW
208D	CD7020		CALL 2070	CALL DELAY
2090	C9		RET	RETURN TO MAIN

SUBROUTINE 8 TO PRINT "EXCEL TECHNOLOGIES"

ADDRESS	OPCODE	LABEL	MNEMONICS	COMMENTS
21F0	210030	EXCEL:	LXI H,3000	LOAD MEMORY POINTER
21F3	3EBB		MVI A,BB	PAGE 3 ADDRESS
21F5	D300		OUT 00	OUT DATA
21F7	CD5020		CALL 2050	CALL COMMAND
21FA	1640		MVI D,40	COLUMN ADDRESS
21FC	1E40		MVI E,40	COLUMN COUNT
21FE	7B	LOP1:	MOV A,E	COLUMN SELECT
21FF	D300		OUT 00	OUT DATA
2201	CD5020		CALL 2050	CALL COMMAND
2204	7E		MOV A,M	TAKE DATA FROM MEMORY
2205	D300		OUT 00	OUT DATA
2207	CD7320		CALL 2073	CALL DATAWRITE1
220A	23		INX H	INCREMENT MEMORY POINTER
220B	1C		INR E	INCREMENT COLUMN ADDRESS
220C	15		DCR D	DECREMENT COUNTER
220D	C2FE21		JNZ 21FE	JNZ LOP1
2210	1640		MVI D,40	COLUMN ADDRESS
2212	1E40		MVI E,40	COLUMN COUNT
2214	7B	LOP2:	MOV A,E	COLUMN SELECT
2215	D300		OUT 00	OUT DATA
2217	CD5020		CALL 2050	CALL COMMAND
221A	7E		MOV A,M	TAKE DATA FROM MEMORY
221B	D300		OUT 00	OUT DATA
221D	CD8220		CALL 2082	CALL DATAWRITE1
2220	23		INX H	INCREMENT MEMORY POINTER
2221	1C		INR E	INCREMENT COLUMN ADDRESS
2222	15		DCR D	DECREMENT COUNTER
2223	C21422		JNZ 2214	JNZ LOP2
2226	C9		RET	RETURN SUBROUTINE

DATA ON MEMORY LOCATION 3000 TO 3080

CHARECTER	ADDRESS						
SPACE/BLANK	3000	00	00	00	00	00	00
SPACE/BLANK	3006	00	00	00	00	00	
E	300B	FE	92	92	92	82	00
X	3011	C6	28	10	28	C6	00
C	3017	7C	82	82	82	44	00
E	301D	FE	92	92	92	82	00
L	3023	FE	80	80	80	80	00
SPACE/BLANK	3029	00	00	00	00	00	
T	302E	02	02	FE	02	02	00
E	3034	FE	92	92	92	82	00
C	303A	7C	82	82	82	44	00
H	3040	FE	10	10	10	FE	00
N	3046	FE	08	10	20	FE	00
O	304C	7C	82	82	82	7C	00
L	3052	FE	80	80	80	80	00
O	3058	7C	82	82	82	7C	00
G	305E	7C	82	92	92	F4	00
I	3064	00	82	FE	82	00	00
E	306A	FE	92	92	92	82	00
S	3070	8C	92	92	92	62	00
SPACE/BLANK	3076	00	00	00	00	00	00
SPACE/BLANK	307C	00	00	00	00	00	00

NOTE: We have used 7 row and 5 columns to create a character.

