3.10 LED DISPLAY AND LCD DISPLAY

INTERFACING LIGHT EMITTING DIODE (LED) WITH 8086

Anode is connected through a resistor to GND & the Cathode isconnected to the Microprocessor pin as shown in Fig.9.1. When the Port Pin is HIGH, the LED is OFF & whenthe Port Pin is LOW the LED is turned ON.

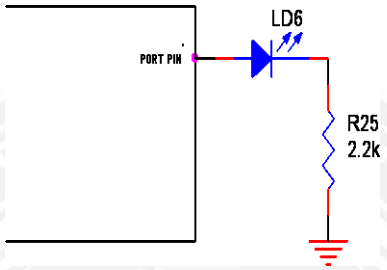

Figure 3.10.1 LED interfacing diagram

We now want to flash a LED. It works by turning ON a LED & then turning it OFF & then looping back to START. A delay is generated between the flashing of LEDs.

	Point	8255 Lines	LED Selection
DIGITAL OUTPUTS	LD1	PA.0	
	LD2	PA.1	
	LD3	PA.2	
	LD4	PA.3	
	LD5	PA.4	
	LD6	PA.5	
	LD7	PA.6	
	LD8	PA.7	

Table 3.10.1 Port Pin Assignment for LEDs

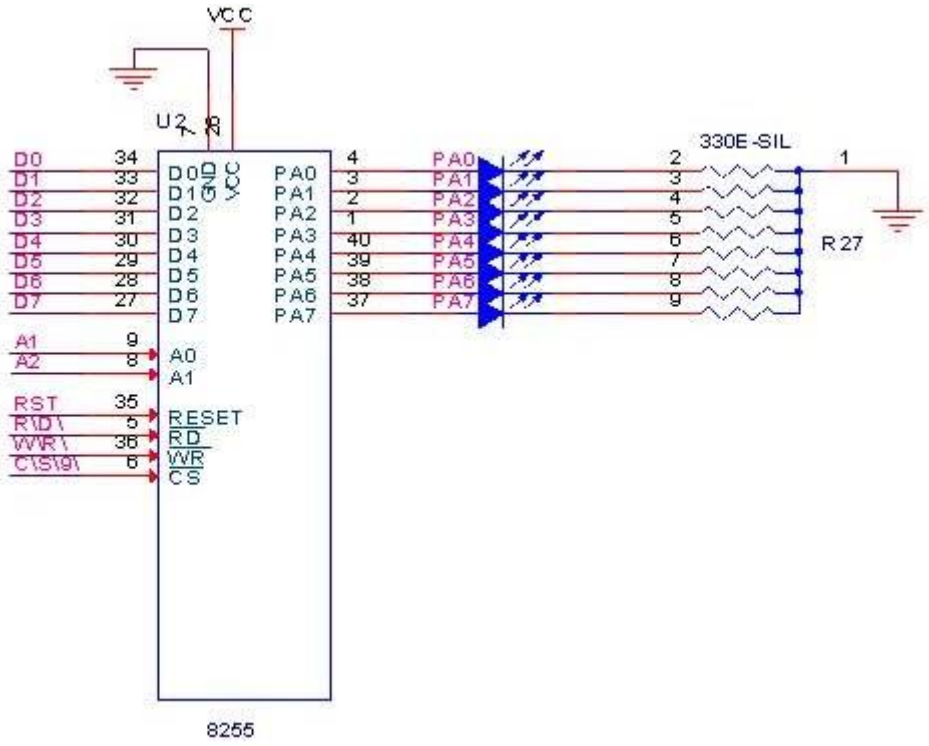

Figure 3.10.2 LEDs connected to port pins of 8255

[Source: www.slideshare.net]

ASSEMBLY PROGRAM TO TURN ON AND OFF LEDS USING 8086

MOV AL, 80

MOV DX, Ctrl Reg

OUT DX, AL

BEGIN: MOV AL, 00

MOV DX, Port addr

OUT DX, AL

CALL DELAY

MOV AL, FF

OUT DX, AL

CALL DELAY

JMP BEGIN

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DELAY: MOV CX, FFFF

P0: DEC CX

JNZ PO

RET
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INTERFACING LIQUID CRYSTAL DISPLAY (LCD) WITH 8086

Liquid Crystal displays (LCD) are created by sandwiching a thin 10-12 µm layer of a liquid-crystal fluid between two glass plates. A transparent, electrically conductive film or backplane is put on the rear glass sheet. Transparent sections of conductive film in the shape of the desired characters are coated on the front glass plate. When a voltage is applied between a segment and the backplane, an electric field is created in the region under the segment. This electric field changes the transmission of light through the region under the segment film.

There are two commonly available types of LCD: dynamic scattering and field-effect. The Dynamic scattering types of LCD: It scrambles the molecules where the field is present. This produces an etched-glass-looking light character on a dark background.Field-effect types use polarization to absorb light where the electric field is present. This produces dark characters on a silver- gray background.

Most LCDs require a voltage of 2 or 3 V between the backplane and a segment to turn on the segment. We cannot just connect the backplane to ground and drive the segment with the outputs of a TTL decoder. The reason for this is a steady dc voltage of more than about 50mV is applied between a segment and the backplane. To prevent a dc buildup on the segments, the segment drive signals for LCD must be square waves with a frequency of 30 to 150 Hz.

Intersil ICM7211M can be connected to drive a 4-digit, nonmultiplexed, 7- segment LCD display through port pins or directly to microcomputer bus. Here, the CS inputs are connected to the Y2 output of the 74LS138 port decoder. The device can be addressed as ports say with a base address of FF10H. 8086 system address lines A2 is connected to the digit-select input (DS2) and system address lines A1 is connected to the DS1 input.

This gives digit 4 a system address of FF10H.Digit 3 will be addressed at FF12H, digit 2 at FF14H and digit 1 at FF16H. The data inputs are connected to the lower four lines of the 8086 system data bus. The oscillator input is left open.

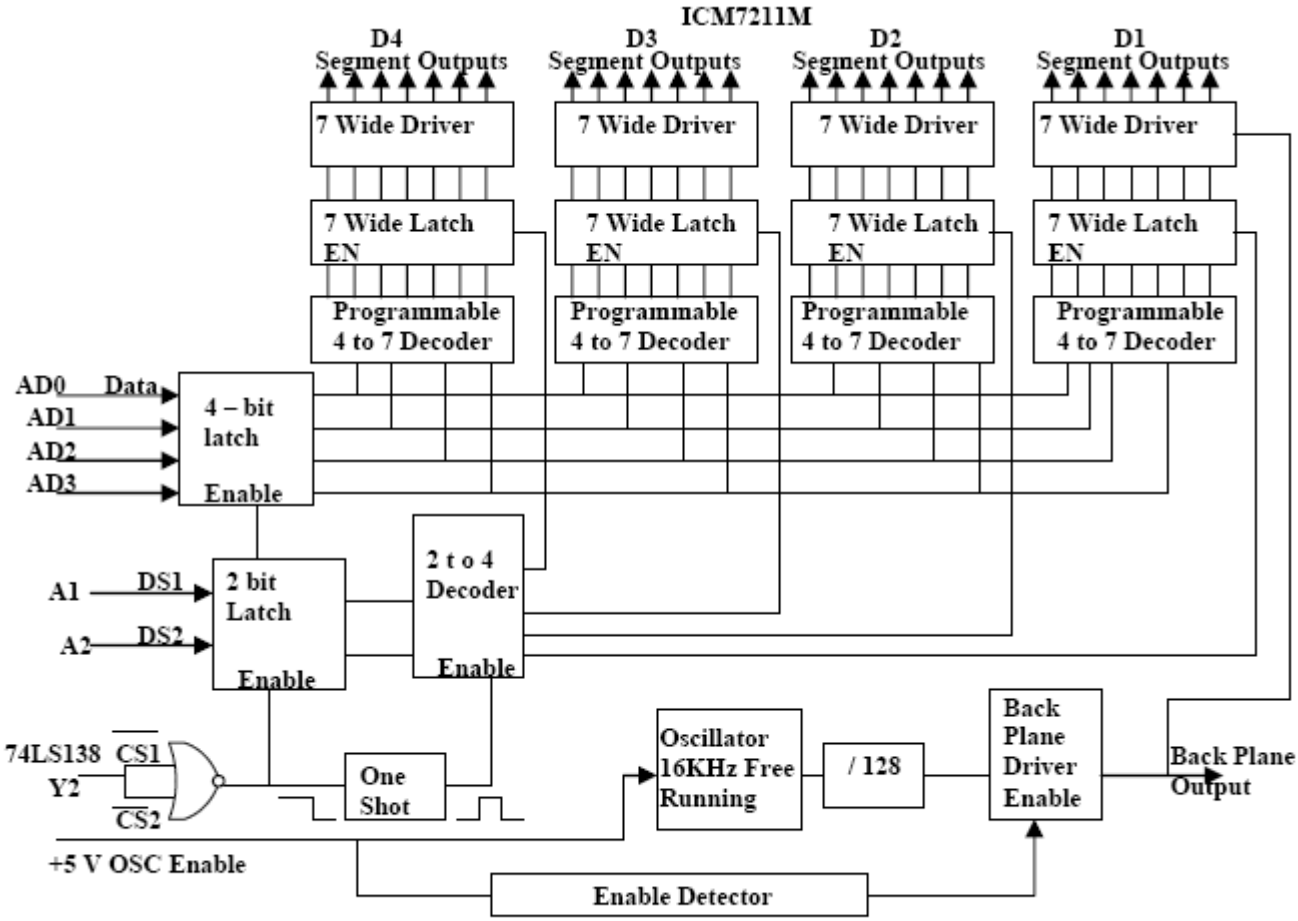

Fig.9.3 Circuit for interfacing four LCD digits to an SDK-86 bus using ICM7211M

[Source Doughlas V.Hall, —Microprocessors and Interfacing, Programming and Hardware:,TMH, 2012]

To display a character on one of the digits, the 4-bit hex code for that digit is in the lower 4 bits of the AL register and output it to the system address for that digit. The ICM7211M converts the 4-bit hex code to the required 7- segment code. The rising edge of the CS input signal causes the 7-segment code to be latched in the output latches for the address digit. An internal oscillator automatically generates the segment and backplane drive waveforms.

3.11 KEYBOARD DISPLAY INTERFACE AND ALARM CONTROLLER

In most keyboards, the key switches are connected in a matrix of Rows and Columns.

Keyboard Interface requires three major tasks for getting a valid data for the key press.

1. Detect a key press

2. Debounce the key press.

3. Encode the key press (produce a standard code for the pressed key).

Logic 0 is read by the microprocessor when the key is pressed.

The rows of the matrix are connected to four output Port lines and columns are connected to four input Port lines as shown in Figure 3.11.1. When no keys are pressed, the column lines are held high by the pull-up resistors connected to +5v and pressing a key connects a row & a column.

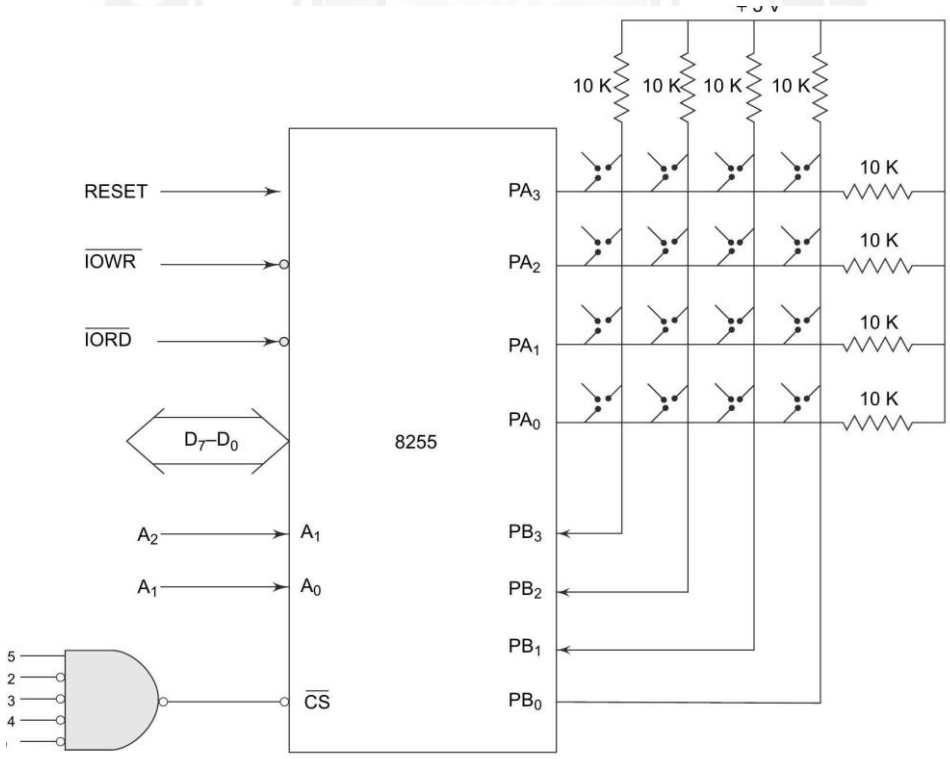

Figure 3.11.1 Port Connections

[Source: Advanced Microprocessors and Microcontrollersby A.K Ray & K.M. Bhurchandi Pg.No.182]

To detect if any key is pressed, the following program sequence is pursued as shown in the Figure 3.11.2 (Flow Chart).

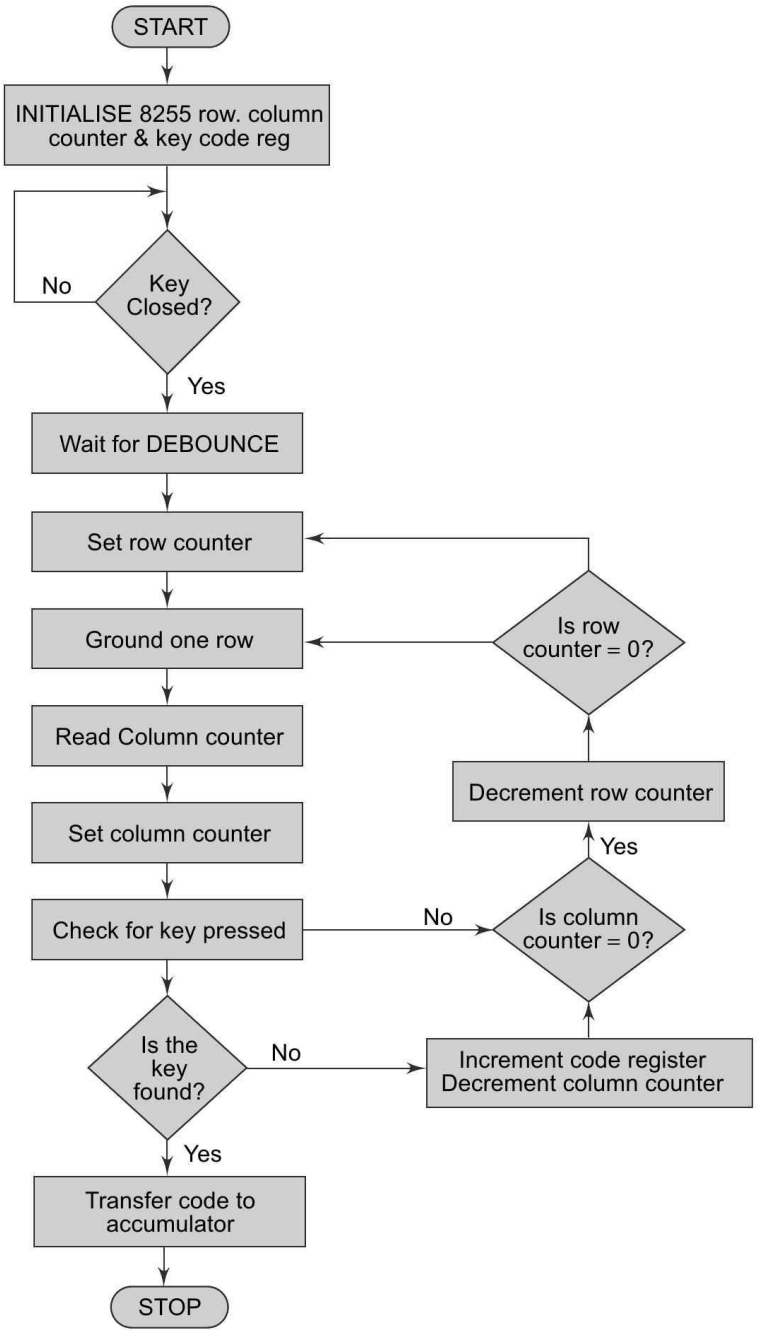

Figure 3.11.2 Flow Chart to detect a valid key press

[Source: Advanced Microprocessors and Microcontrollersby A.K Ray & K.M. Bhurchandi Pg.No.182]

- Output Logic 0 to all rows and then check columns to see if a pressed key has connected a low (zero) to a column.
- Once the columns are found to be all high, the program enters another loop, which waits until a low appears on one of the columns i.e indicating a key press.

- A simple 20/10 m sec delay is executed as debounce time.
- After the debounce time, another check is made to see if the key is still pressed. If the columns are now all high, then no key is pressed & the initial detection was caused by a noise pulse.

To avoid this problem, two schemes are suggested:

1. Use of Bi-stable multivibrator at the output of the key to debounce it.

2. The microprocessor has to wait for the transient period (at least for 10 ms), so that the transient response settles down and reaches a steady state.

- If any of the columns are low now, then the assumption is made that it was a valid key press.
- The final task is to determine the row & column of the pressed key &convert this information to Hex-code for the pressed key.
- The 4-bit code from I/P port & the 4-bit code from O/P port (row &column) are converted to Hex-code.