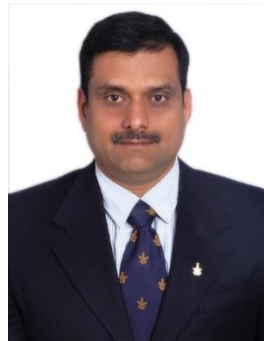




MPI Tutorial-12

8086 IO Interface

By Dr. Sanjay Vidhyadharan



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Problem-1

What is the range of address space for I/O in an 8086 based system?

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Problem-1

What is the range of address space for I/O in an 8086 based system?

Address can range from 0000H to FFFFH in an 8086 based system i.e. 64K.

It means 64K for input ports and 64K for output ports.

Using IN / OUT

Direct **256 : Ports**

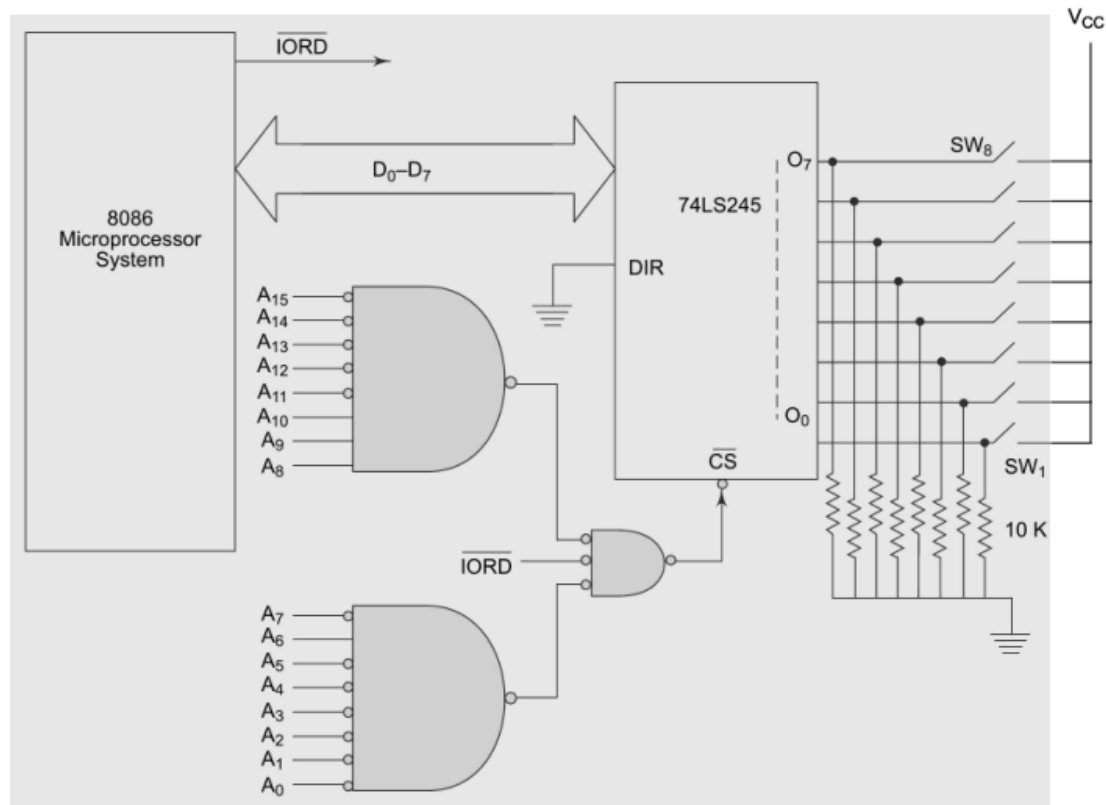
```
IN AL, 19H ; IN AX, 20H ;  
OUT 19H, AL ; OUT 20H, AX
```

Indirect **64K Ports**

```
IN AL, DX ; IN AX, DX ;  
OUT DX, AL ; OUT DX, AX
```

Problem-1

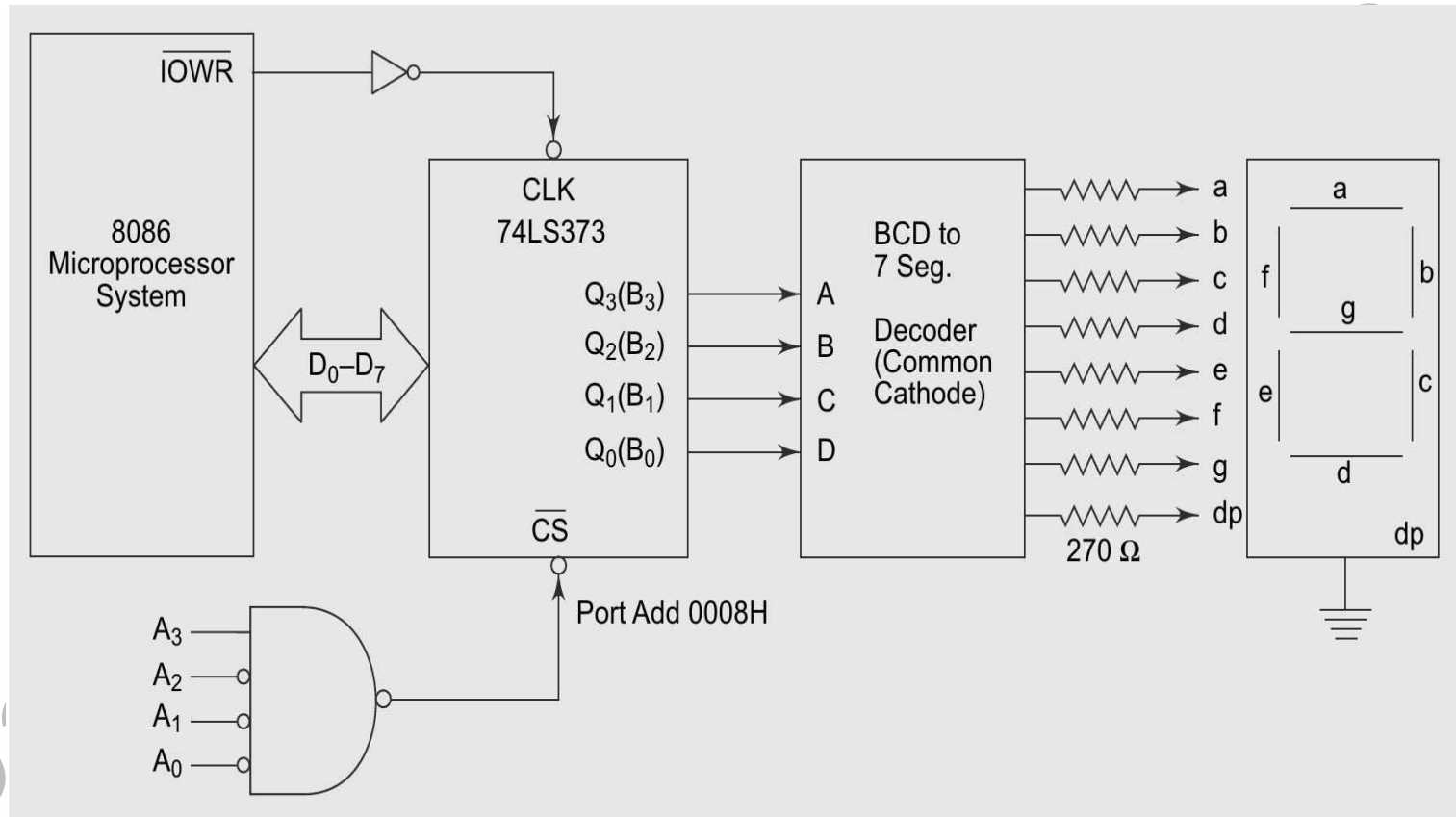
Simple Input Port



8/27/2021 **74245 : Trans-receive Tristate Buffer**

Problem-1

Simple Output Port



Problem-1

Simple Input & Output Ports

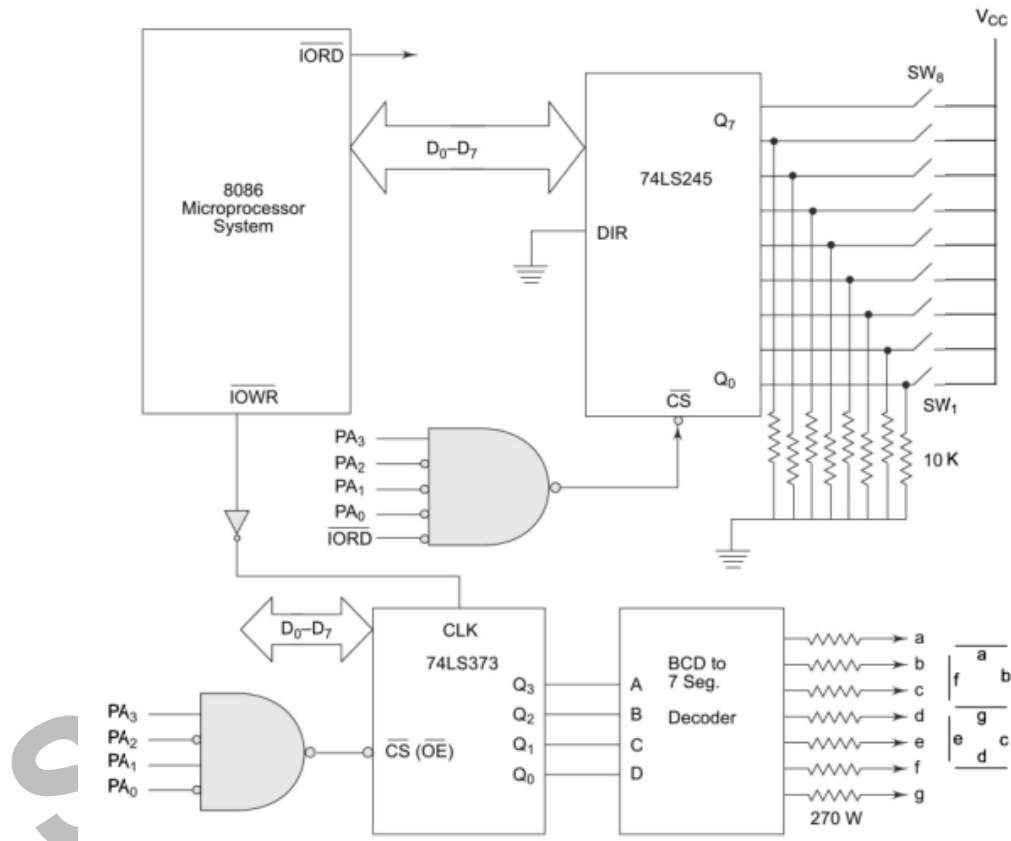


Fig. 5.13 Interfacing Switches and Displays for Problem 5.7

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64K I/P & 64K O/P

Problem-2

Give one example each of (a) direct I/O (b) variable I/O instruction..

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Problem-2

Give one example each of (a) direct I/O (b) variable I/O instruction..

(a) An example of direct I/O instruction is as follows:

```
IN AL, 0F2 H
```

On execution, the contents of the byte wide I/O port at address location F2 H will be put into AL register.

(b) An example of this type is:

```
MOV DX, 0C00F H
```

```
IN AL, DX
```

On execution, at first DX register is loaded with the input port having address C00F H. The second instruction ensures that the port content is moved over to AL register.

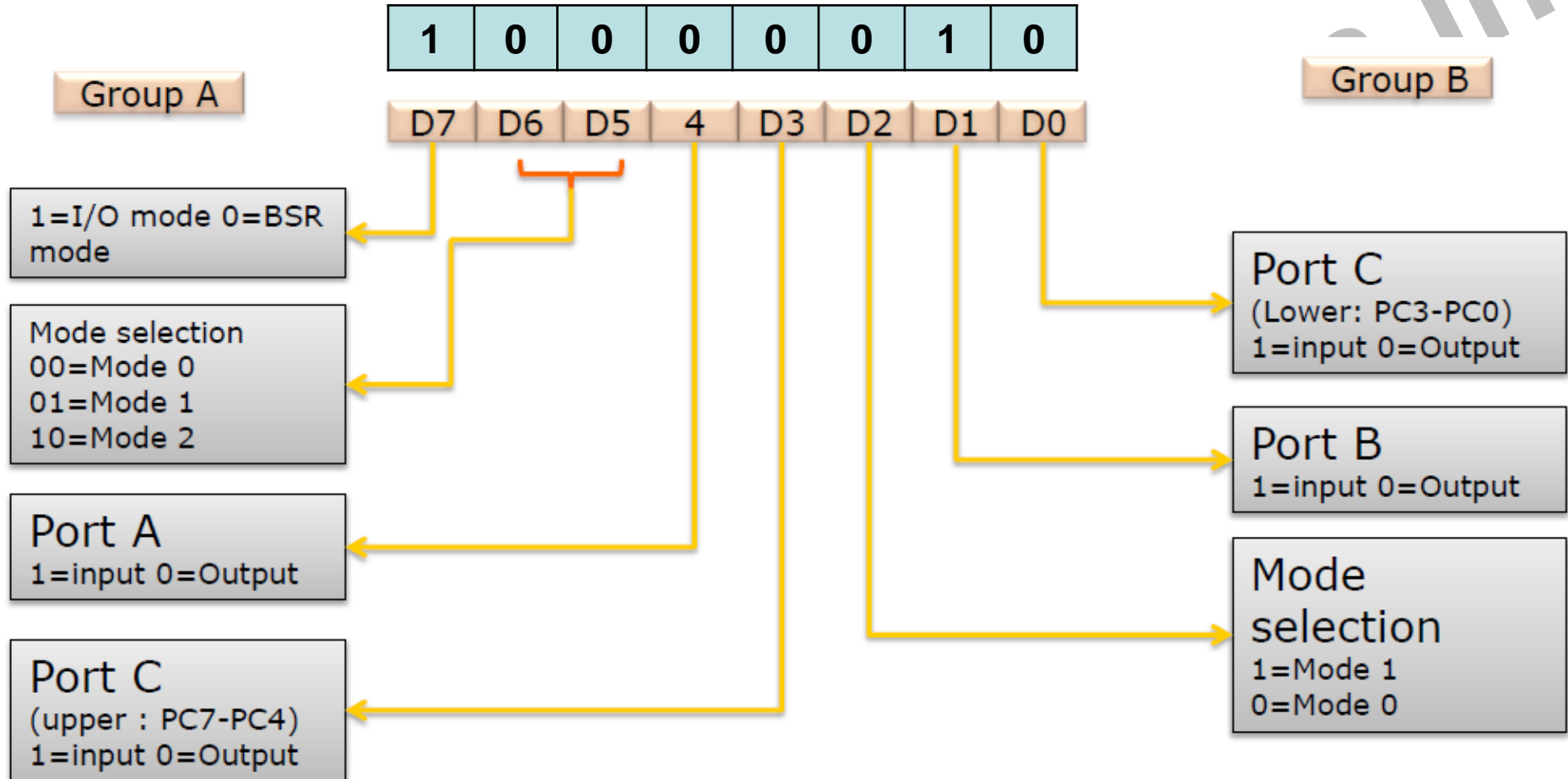
Problem-3

Interface an 8255 with 8086 to work as an I/O port. Initialize port A as output port, port B as input port and port C as output port. Port A address should be 0740H. Write a program to sense switch positions SW_0 - SW_7 connected at port B. The sensed pattern is to be displayed on port A, to which 8 LEDs are connected, while the port C lower displays number of on switches out of the total eight switches.

Problem-3

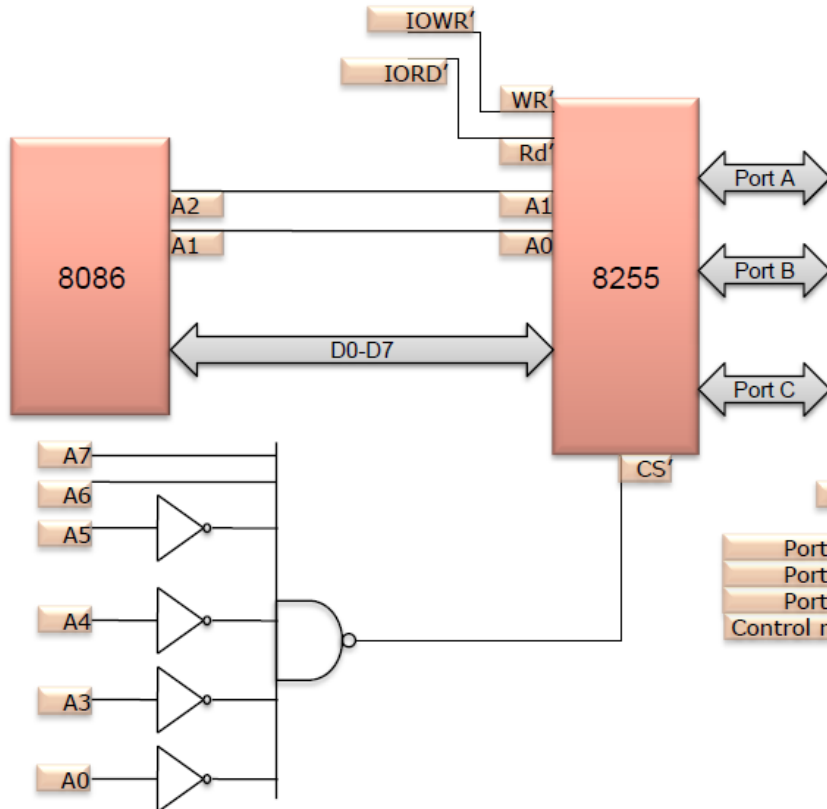
Control word Format

Control word = 82 H



Problem-3

Interfacing with 8086



Port addresses

Port A	C0
Port B	C2
Port C	C4
Control register	C6

CS'	A ₁	A ₀	Selected
0	0	0	Port A
0	0	1	Port B
0	1	0	Port C
0	1	1	Control Register
1	X	X	8255 Not Selected

Problem-3

8086 $A_2 A_1$ pin connected to A_1 and A_0 pin of 8255

As per the question Port A address should be 0740H

Thus

Port A Address = 0000 0111 0100 0 **0 0** 0 = 0740H

Port B Address = 0000 0111 0100 0 **0 1** 0 = 0742H

Port C Address = 0000 0111 0100 0 **1 0** 0 = 0744H

CWR (control word reg) Address = 0000 0111 0100 0 **1 1** 0 = 0746H

Problem-3

The ALP for the program is

```
MOV DX, 0746H
MOV AL, 82H
OUT DX, AL
SUB DX, 04H
IN AL, DX
SUB DX, 02H
OUT DX, AL
MOV BL, 00H
MOV CL, 08H
YY: ROL AL
JNC XX
INC BL
XX: DEC CL
JNZ YY
MOV AL, BL
ADD DX, 04H
OUT DX, AL
HLT
```

Problem-4

Write a program for getting a delay of 100 msec.

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Problem-4

Write a program for getting a delay of 100 msecs.

```
MOV CX,N           4
HERE ADD AX,0      5
LOOP HERE          17/5
```

12 MHz

Total cycles of delay = $4 + 5N + (17 \times (N - 1)) + 5 = 4 + 22N - 12 = 22N - 8$

Total delay time = 100msecs = $(22N - 8) \times 0.083\text{usecs}$

For 100msecs delay time, the value of

$$\begin{aligned} N &= ((100\text{msecs}/.083\text{usecs}) + 8)/22 \\ &= 54765 \\ &= \text{D5ED H} \end{aligned}$$

Problem-5

Write a program to generate a square wave at the LSB of the data bus of an output port with address F767H.

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Problem-5

Write a program to generate a square wave at the LSB of the data bus of an output port with address F767H.

```
MOV DX,F767H
AGAIN: MOV AL,0FFH
OUT DX,AL
CALL DELAY_1MS
MOV AL,00
OUT DX,AL
CALL DELAY_1MS
JMP AGAIN
```

Assume procedure DELAY_1MS having 1msecs delay

```
DELAY_1MS PROC NEAR
MOV CX,N
HERE: NOP
LOOP HERE
```

```
8/27/2021 DELAY_1MS ENDP
```

Problem-6

In a pressure monitoring environment, 10 pressure sensors have been connected. The pressure from these sensors has to be read at intervals of 5 msecs. Write a program to read the sensor values from input ports having address 0FF0H to 0FF9H

Problem-6

- MOV DX,OFF0H
- MOV CX,0AH
- ENTR:
- IN AL,DX
- MOV TEMP[SI],AL //TEMP is memory to store the pressure data
- INC SI
- INC DX
- CALL DELAY_FUNC
- LOOP ENTR
- .EXIT
- DELAY_FUNC PROC NEAR
- MOV CX,0BC2H //4
- HERE: NOP //3 //approx 5 ms.
- LOOP HERE //17/5
- RET
- DELAY_FUNC ENDP
- END

Thank You