Real Time System

Third Level

Programmable Interval Timer
PIT 8253 and 8254

Dr. Hussein AbdulAlmeer Alkhamees

Hussein.Alkhamees@uomus.edu.iq

I/O (Input/output) Mode:

Mode 0: Simple Input or Output

In this mode, ports A and B are used as two simple 8 bit ports and port C as two 4 bit ports.

Any port can be used as an input or output port (each port can be programmed to function as simply an input port or an output port).

The input/output features in Mode 0 are:-

- Output ports are latched.
- Input ports are buffered.
- 16 different Input/output configurations are possible.

Mode 1: Input or Output with handshake

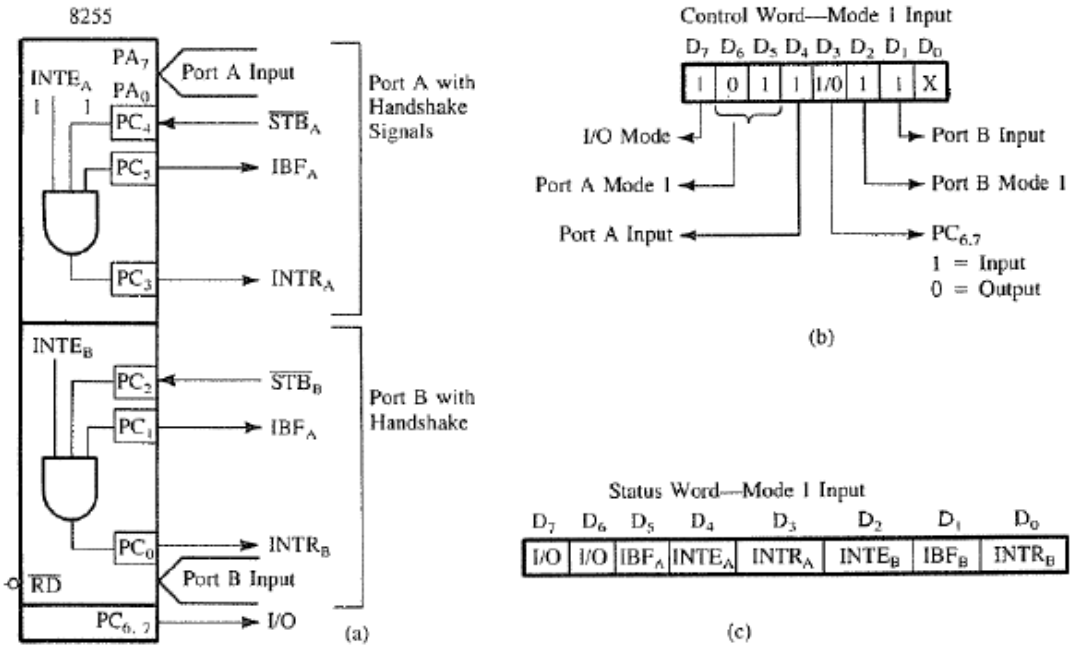
The features of this mode are

- Two ports (A and B) function as 8 bit I/O ports. They can be configured either as input or output ports.
- Each port uses three lines from port C as handshake signals. The remaining two lines of port C can be used for simple I/O functions.
- Input and output data are latched.
- Interrupt logic is supported.

Mode 1: Input Control Signals:

Port A used 3 upper lines PC3, 4, 5, while Port B used PC0, 1, 2. The functions of these signals are as follows:

- Strobe STB.
- Input Buffer Full IBF.
- Interrupt Request INTR.
- Interrupt Enable INTE.



Mode 1: Output Control Signals:

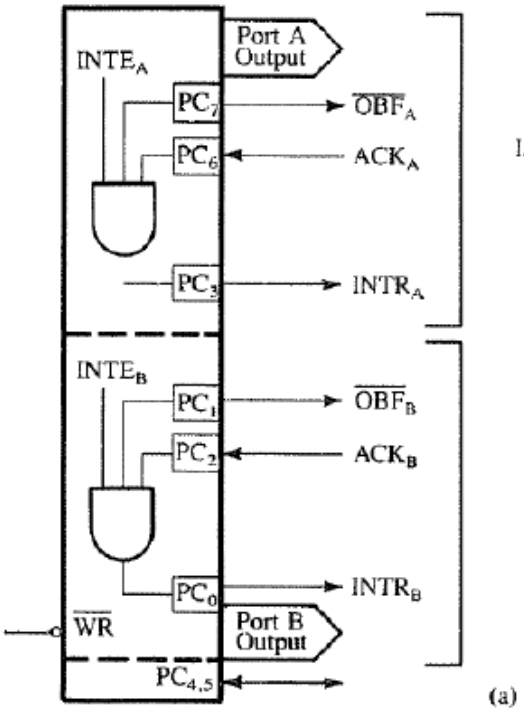
Port A used 3 upper lines PC3, 6, 7, while Port B used PC0, 1, 2. The functions of these signals are as follows:

- Strobe STB.
- Input Buffer Full IBF.
- Interrupt Request INTR.
- Interrupt Enable INTE.

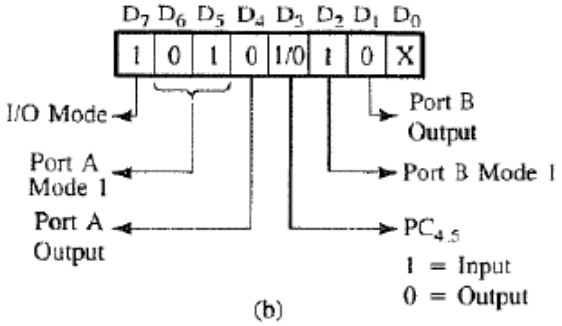
Mode 1: Output Control Signals:

Port A used 3 upper lines PC3, 6, 7, while Port B used PC0, 1, 2. The functions of these signals are as follows:

- Strobe STB.
- Input Buffer Full IBF.
- Interrupt Request INTR.
- Interrupt Enable INTE.

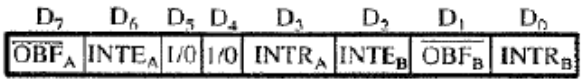


(a)



(b)

Status Word



(c)

Mode 2: Bidirectional Data Transfer

This mode is used primarily in applications such as data transfer between two microcomputers or floppy disk controller interface. In this mode, port A can be configured as the bidirectional port and port B in either Mode 0 or Mode 1. Port A uses five signals from port C as controls signals for data transfer. The remaining three signals from port C can be used either as simple I/O or as handshake signals for port B.

- The bidirectional communication between two microcomputer can be accomplished using the 8255A PPI in Mode 2.

Control word Mode 2:

D7	D6	D5	D4	D3	D2	D1	D0
1	1	X	X	X	I/O	I/O	I/O
I/O mode	mode 2		Don't care	Don't care	Port B Mode 1 Mode 0	Port B I/O	$PC_{2,1,0}$ I = in O = out

Status word Mode 2:

D7	D6	D5	D4	D3	D2	D1	D0
OBF_A	$INTE_1$	IBF_A	$INTE_2$	$INTE_A$	X	X	X

- PC2-0 are used as handshake signals by Port B when configured in Mode 1. This is immaterial whether Port B is configured as I/P or O/P port.
- PC5-3 are used as handshake signals by Port A when configured as I/P port in Mode 1.
- PC7,6,3 are used as handshake signals by Port A when configured as O/P port in Mode 1.
- PC7-3 are used as handshake signals by Port A when configured in Mode 2.

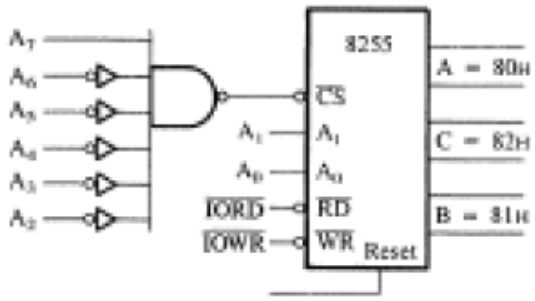
Ex. 1: Configure Port A as i/p in Mode 0, Port B as o/p in mode 0, Port C (Lower) as o/p and Port C (Upper) as i/p ports.

Ex. 2: Configure Port A as i/p in Mode 1, Port B as o/p in mode 1, Port C7-8 as i/p ports. (PC5-0 are handshake lines, some i/p lines and others o/p. So they are shown as X)

Ex. 3: Configure Port A in Mode 2, Port B as o/p in mode 1. (PC5-0 are handshake lines for Port A and PC2-0 are handshake signals for port B)

Ex. 4: what is the control word for the following:

- Port A: simple input, Port B: simple output, Port CL: output, Port CU: input
- Port A: output with handshake, Port B: input with handshake, Port CL: output, Port CU: input
- Port A: Output, Port B: Output, Port CU: Output, Port CL: Output all mode 0.
- Port A: Input, Port B: Input, Port CU: Input, Port CL: Input all mode 0.



(a)

$\overline{CS}$		Hex Address	Port
A_7 A_6 A_5 A_4 A_3 A_2	A_1 A_0		
1 0 0 0 0 0	0 0	= 80H	A
	0 1	= 81H	B
	1 0	= 82H	C
	1 1	= 83H	Control Register

(b)

Example 4-6

(a) Find the port address for Figure 4-7.
(b) Find the control word if PA =out, PB=in, PC0 - PC3 =in, and PC4 - PC7=out.

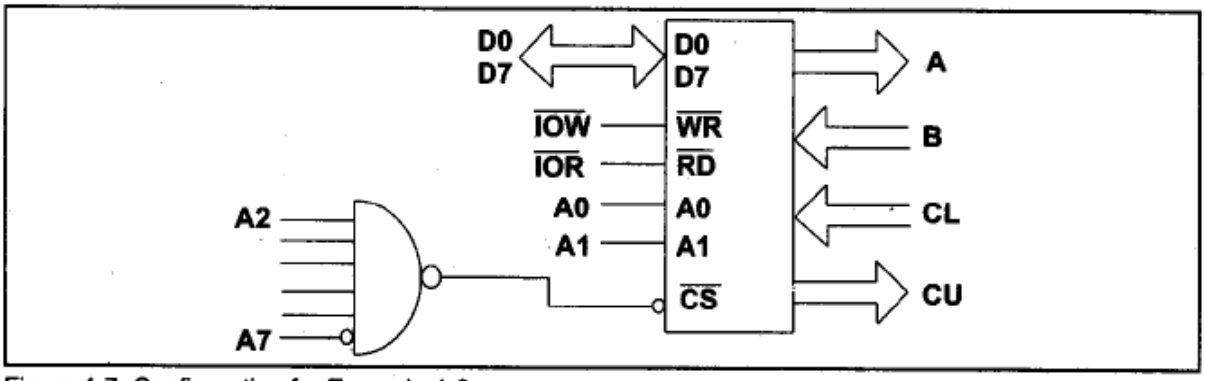
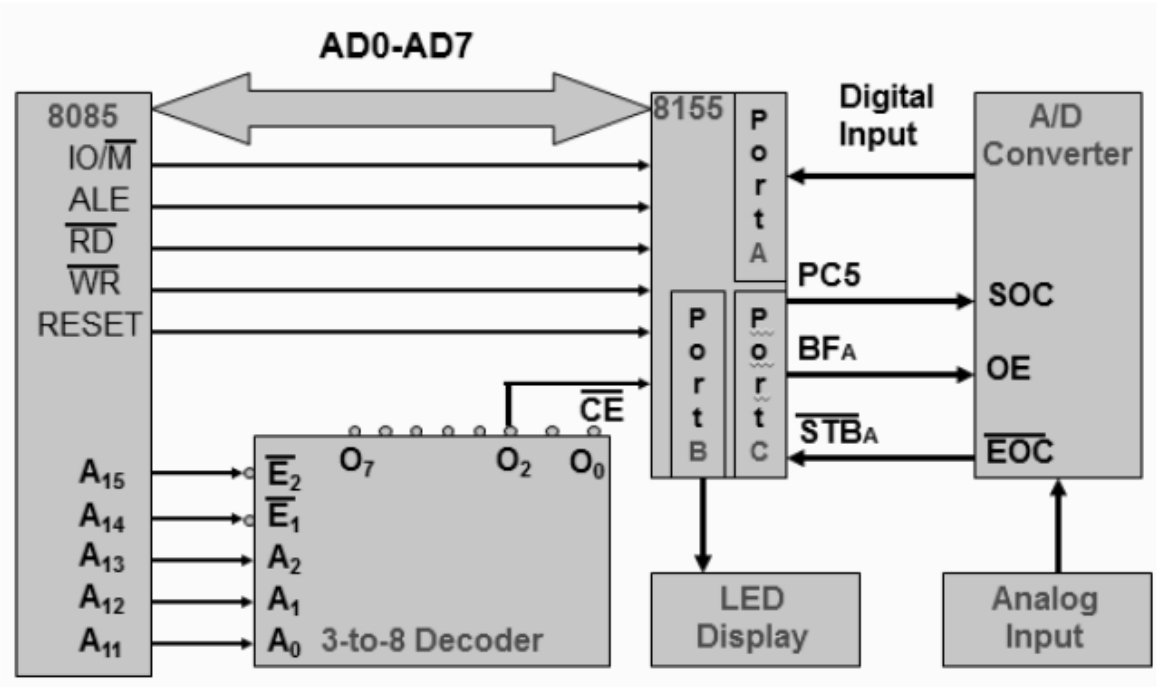


Figure 4-7. Configuration for Example 4-6

Ex. 5:- Design (draw and explain) an interfacing circuit using the 8255 to read data from an A/D converter and then display the data to meet the following requirement:-

- Setup port A to read data.
- Setup PC0 to start of conversion and PC7 to read the ready status of the converter.
- Display current data on 7 segment connected to port B
- Write the CW and BSR for port C.

Ex: Design an interfacing circuit to read data from an A/D converter using the 8155A in the peripheral mapped I/O.

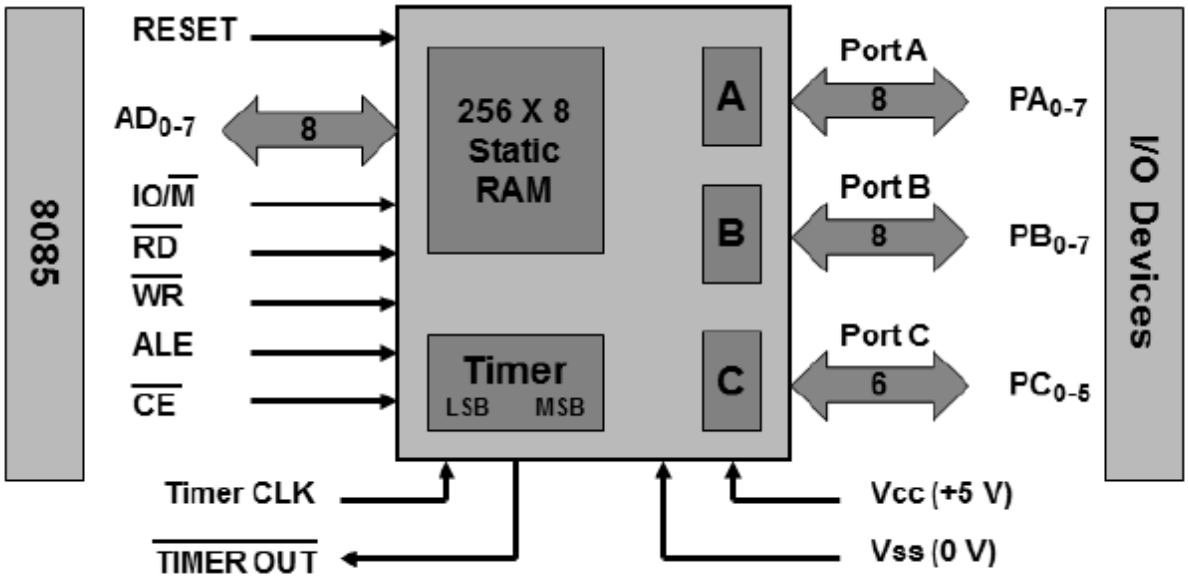


Chip Selection

A7 A6 A5 A4 A3

0 0 0 1 0

A2	A1	A0	Port	
0	0	0	Control/Status Register	= 10H
0	0	1	Port A	= 11H
0	1	0	Port B	= 12H
0	1	1	Port C	= 13H
1	0	0	LSB Timer	= 14H
1	0	1	MSB Timer	= 15H


8085
RESET
AD0-7
8
IO/M
RD
WR
ALE
CE
256 X 8
Static
RAM
Timer
LSB MSB
A
B
C
Port A
8
PA0-7
Port B
8
PB0-7
Port C
6
PC0-5
I/O Devices
Timer CLK
TIMER OUT
Vcc (+5 V)
Vss (0 V)