Dedicated Peripheral Interface Device (Introduction to 8255)

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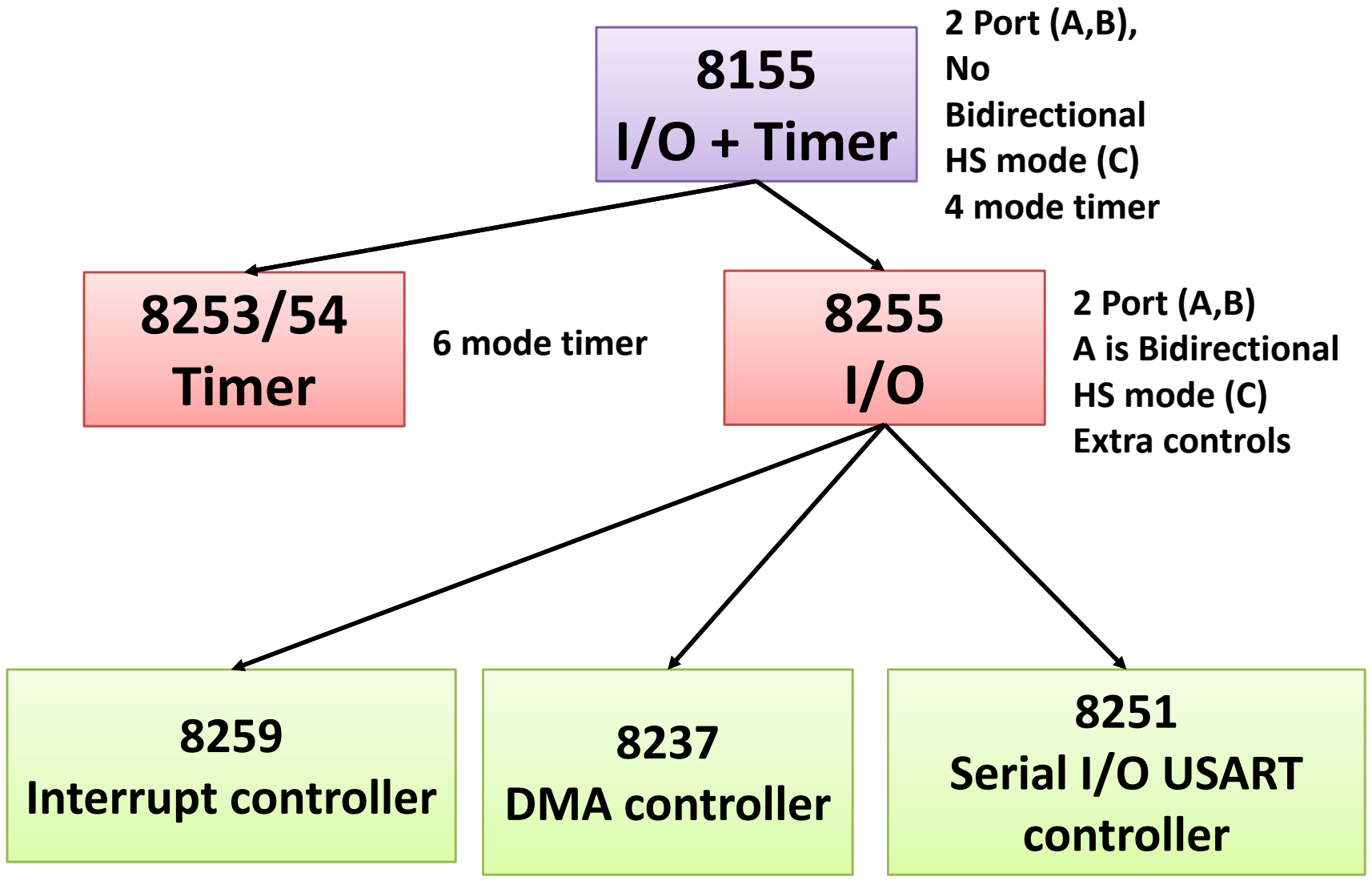
Hierarchy of I/O Control Devices

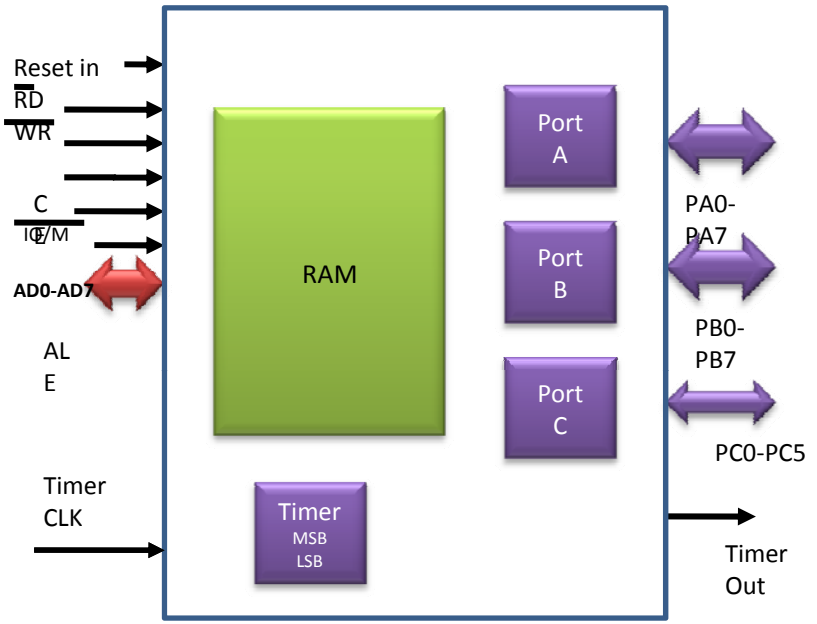


Outline

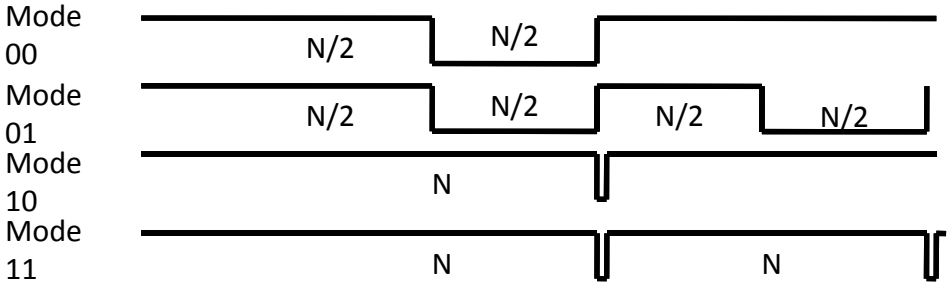
- 8155 I/O Interface & Timer
  - Dedicated I/O interface (8255)
  - Dedicated Timer (8254/8253)
- 8255 Ports and mode of operations
- Interfacing A/D Converter using Handshake mode using 8255

8155 Features

- IO Capability:
  - 2kbits static RAM 256x8
  - 2 programmable 8 bit I/O ports
  - 1 programmable 6 bit I/O port
- Timer Capability:
  - 1 programmable 14 bit binary counter/timer
  - 4 Modes



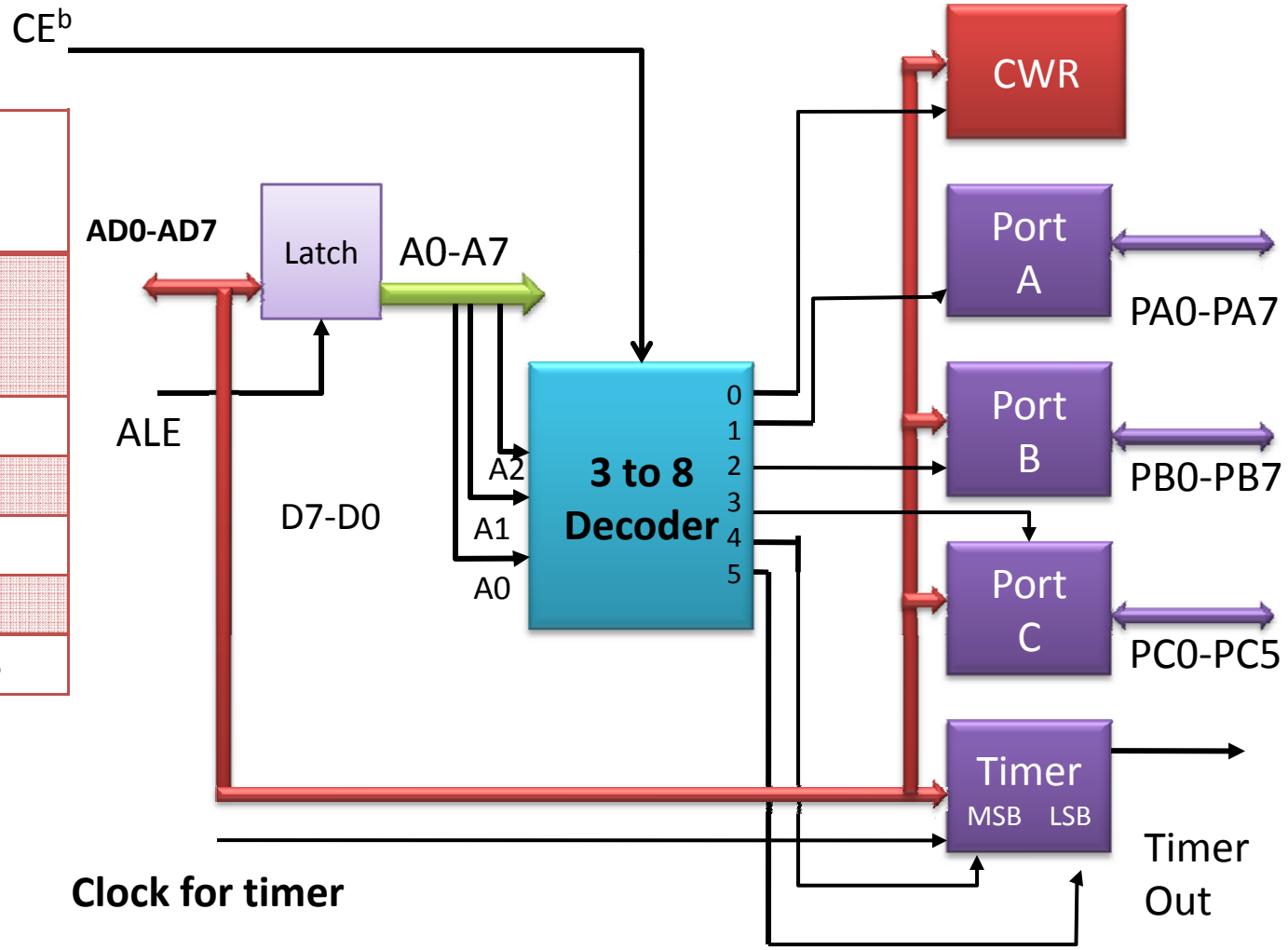
D7	D6	D5	D4	D3	D2	D1	D0
Timer Command		IEB	IEA	PC		PB	PA



ALT	D3	D2	PC5	PC4	PC3	PC2	PC1	PC0
1	0	0	IN	IN	IN	IN	IN	IN
2	0	1	OUT	OUT	OUT	OUT	OUT	OUT
3	1	0	OUT	OUT	OUT	STB_A	BF_A	$INTR_A$
4	1	1	STB_B	BF_B	$INTR_B$	STB_A	BF_A	$INTR_A$

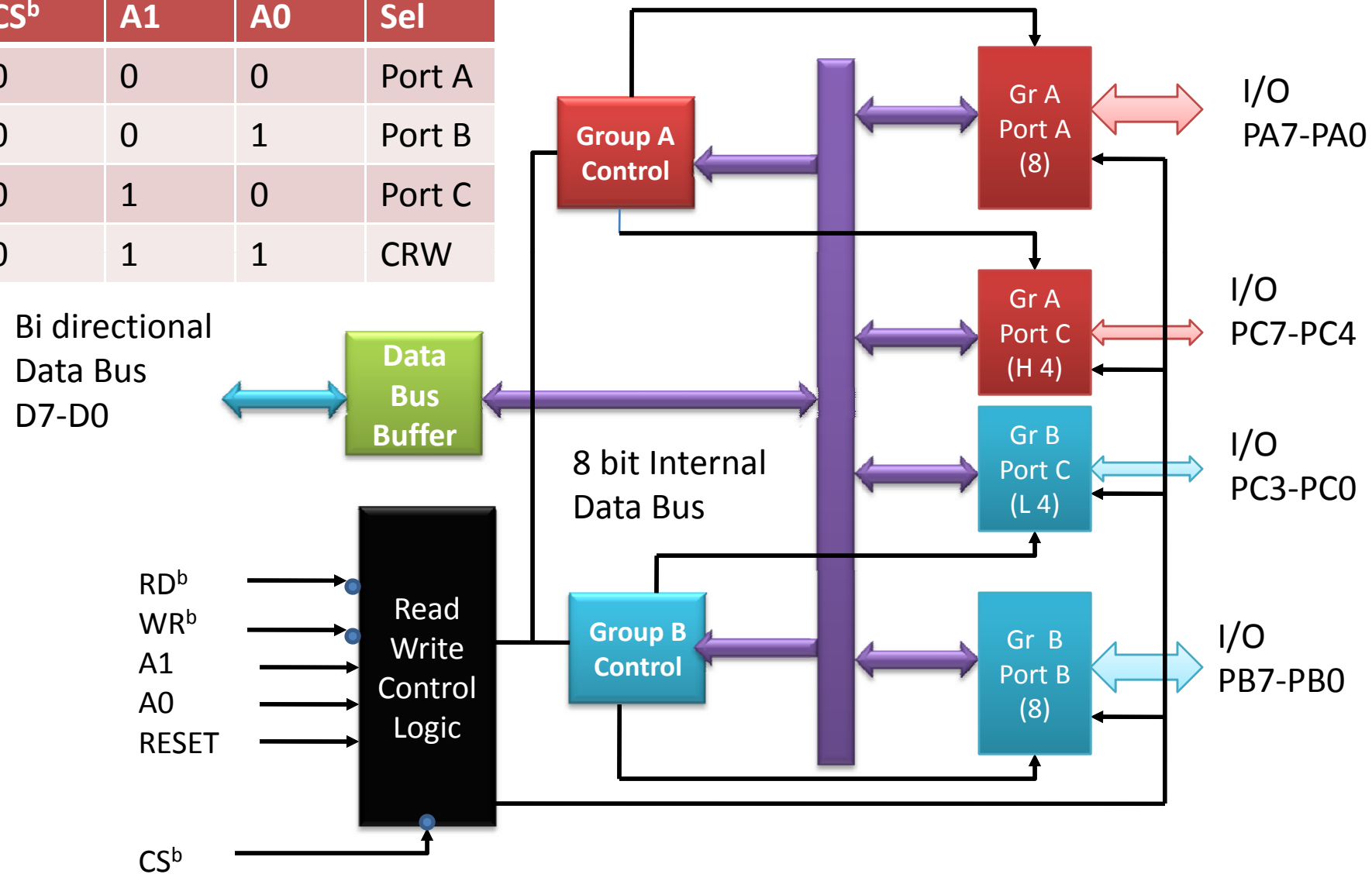
Expanded Block Diagram

A2	A1	A0	Port (ALE high, AD0=A0)
0	0	0	Command /Status Register
0	0	1	PA
0	1	0	PB
0	1	1	PC
1	0	0	Timer LSB
1	0	1	Timer MSB

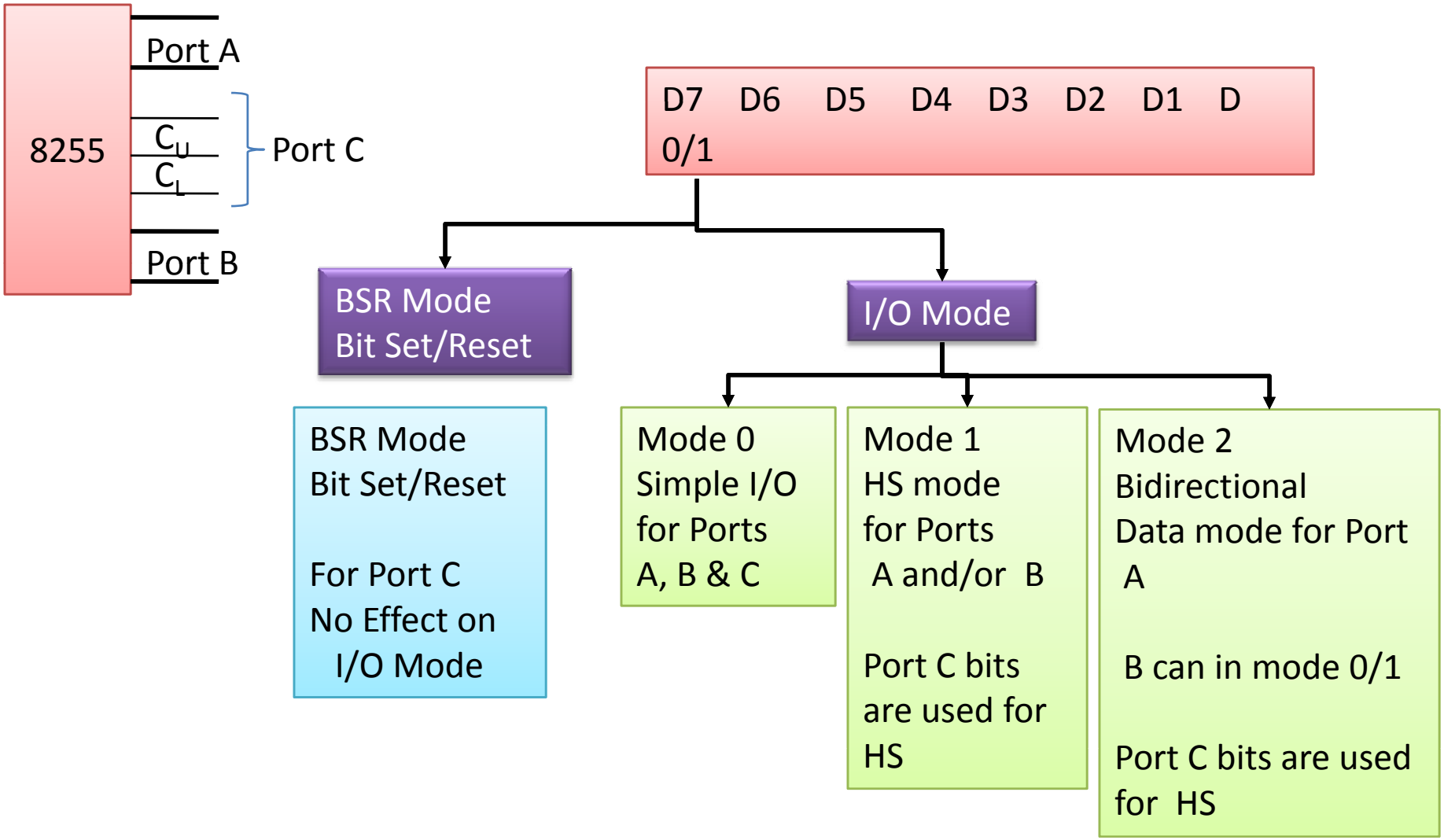


Block Diagram of 8255

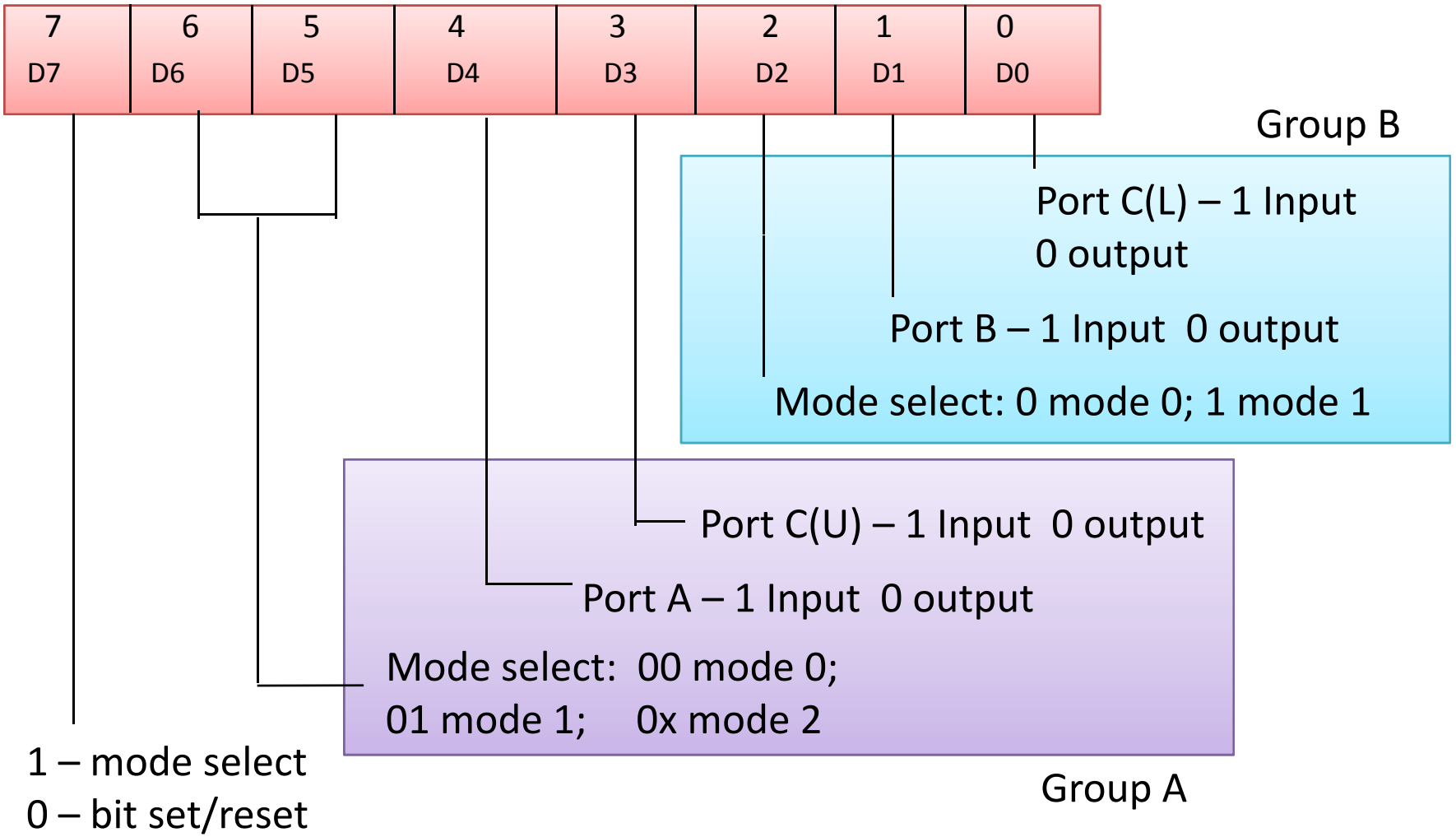
CS^b	A1	A0	Sel
0	0	0	Port A
0	0	1	Port B
0	1	0	Port C
0	1	1	CRW



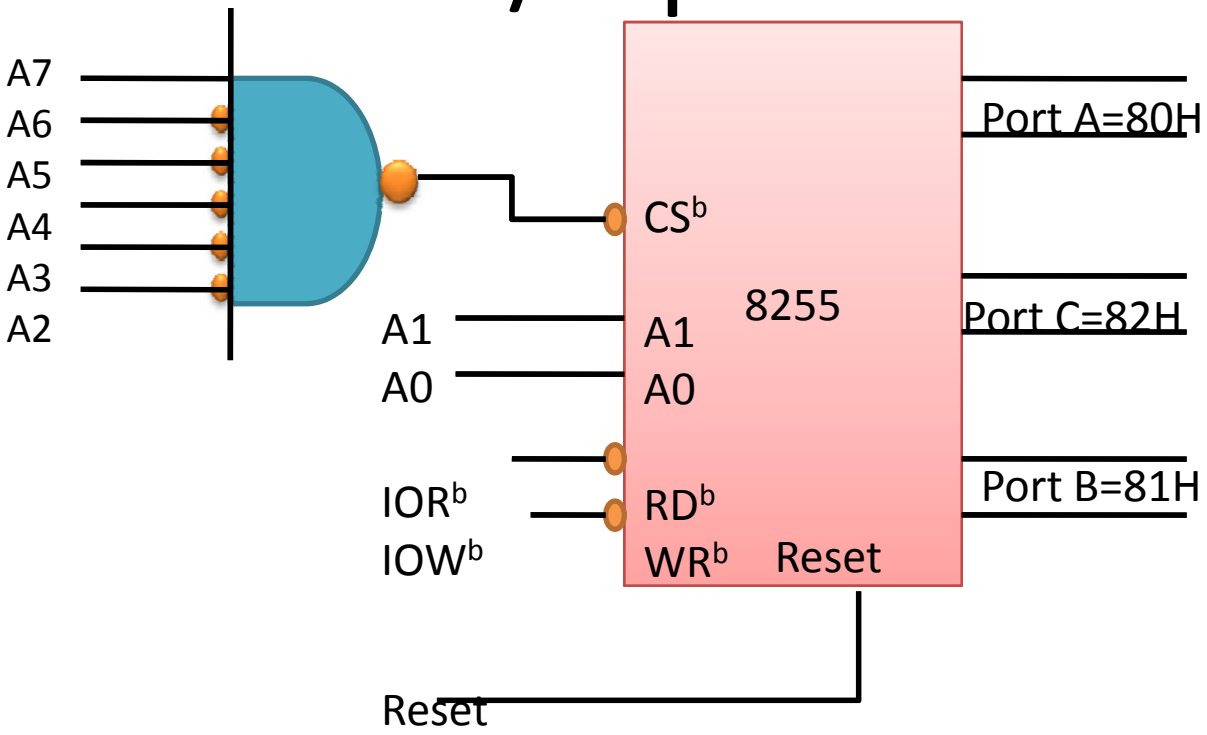
Ports & Modes in 8255



Ports & Modes in 8255 : Control register



I/O port Addressing



CS^b	**A1 A0**	**HEX Address**	**Port**
A7 A6 A5 A4 A3 A2 1 0 0 0 0 0	A1 A0 0 0	= 80H	A
	0 1	=81H	B
	1 0	=82H	C
	1 1	=83H	Control Register

BSR (Bit Set or Reset Mode)

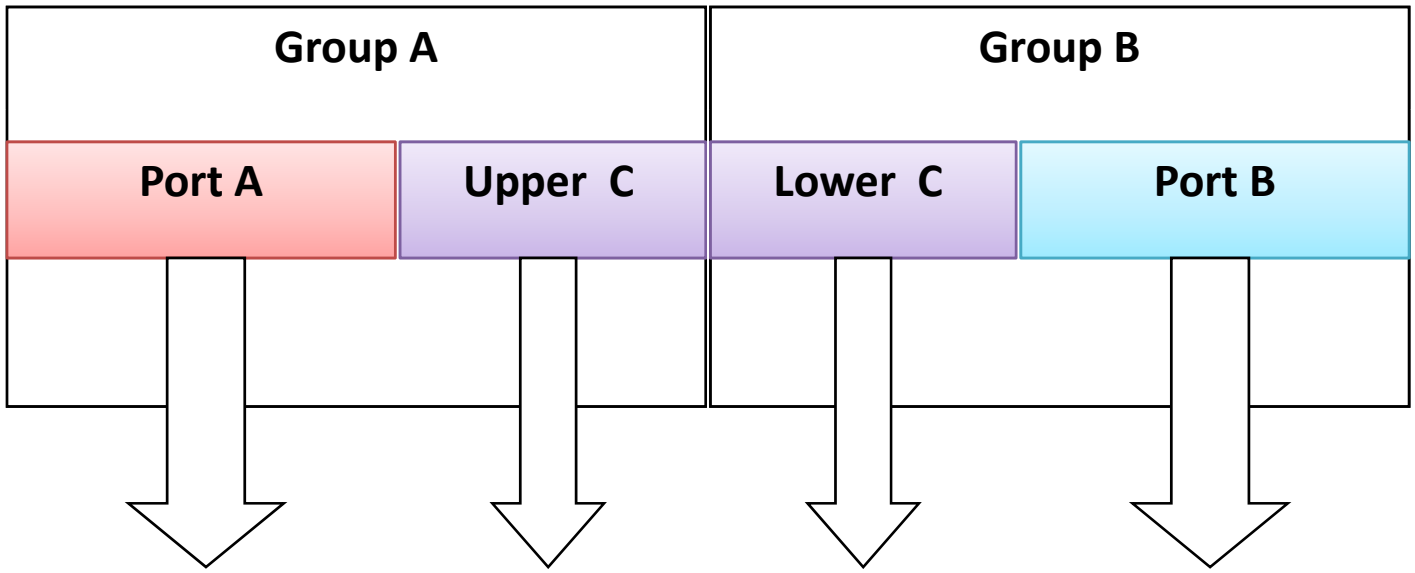
- Set/Reset bit of Port C
- Heavily used for HS and Interrupt mode
- BSR Control word

D7	D6	D5	D4	D3	D2	D1	D0
0 BSR Mode	Not used, So (000)			Bit Select			S/R (1/0)

- BSR Control word
  - To set PC7= 0 000 111 1 (0FH)
  - To reset PC7= 0 000 111 0 (0EH)
  - To set PC3 = 0 000 011 1 (07H)

Ports

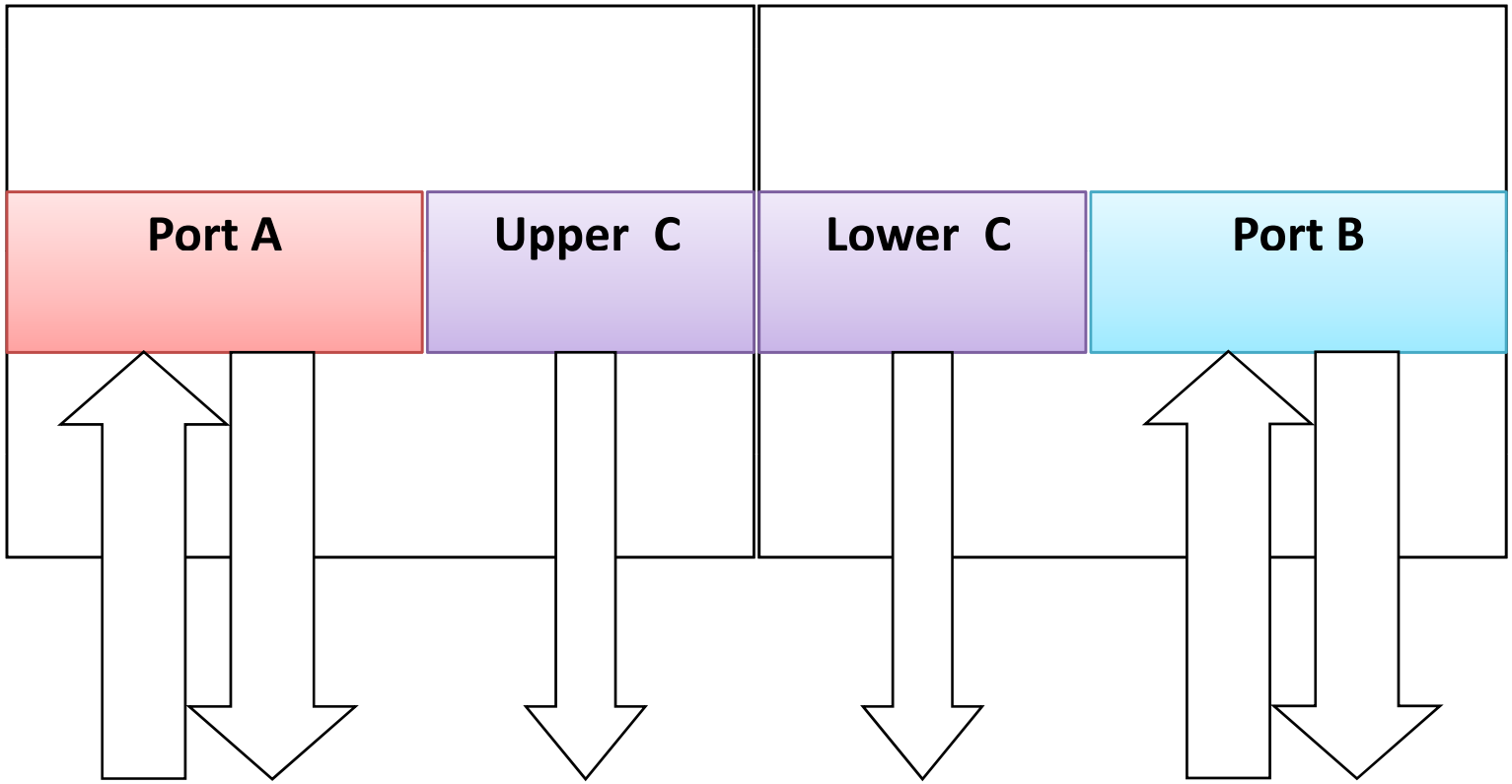
- Control register controls the overall operation of 8255
- All three ports A, B and C are grouped into two



Operation modes

- 8255 has three modes:
  - mode 0: basic input-output
  - mode 1: strobed input-output
  - mode 2: strobed bidirectinal bus I/O
- In mode 0
  - two 8-bit ports and two 4-bit ports
  - any port can be input or output
  - Outputs are latched, inputs are not latched

Mode 0



Operation mode 1

- In mode 1:

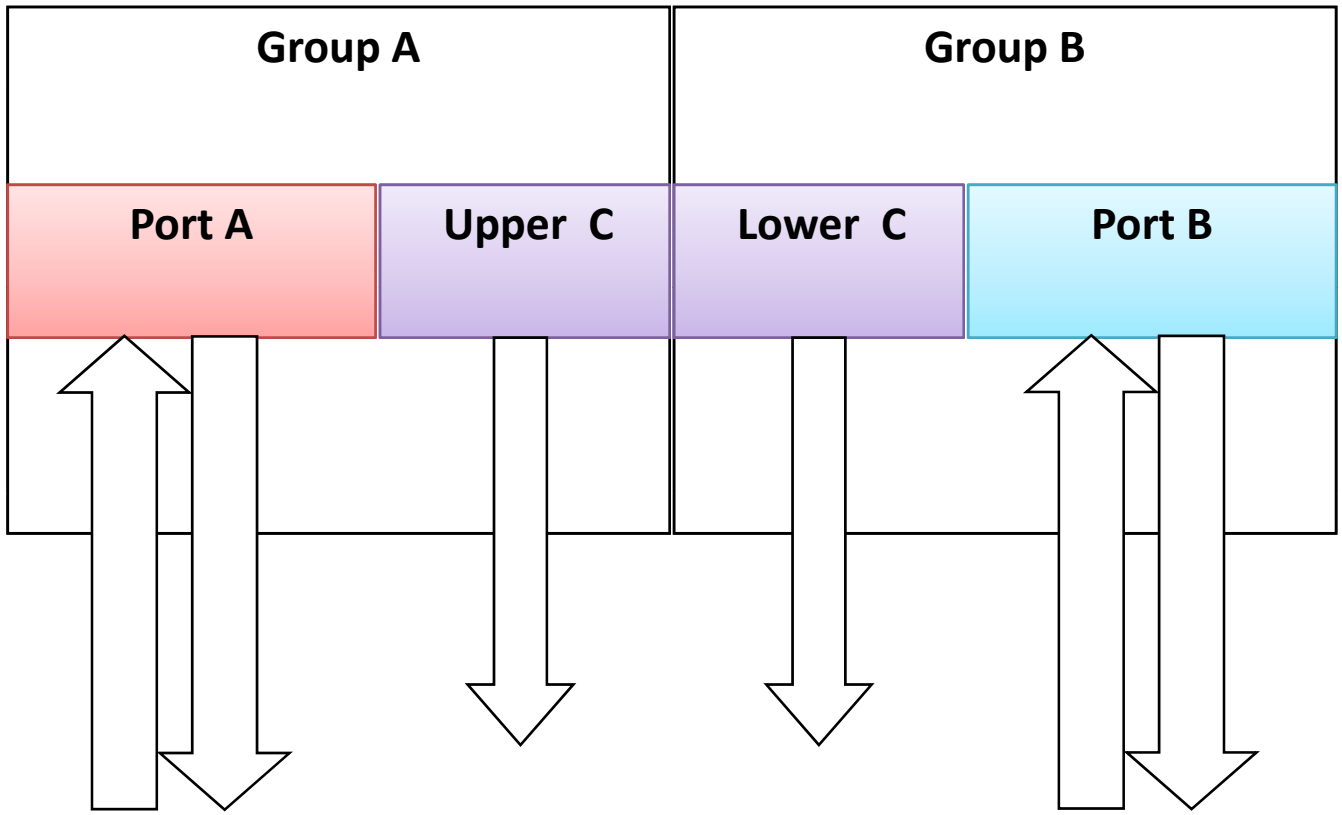
  -three ports are divided into two groups

  -each group contains one 8-bit port and one 4-bit control/data port

  - 8-bit port can be either input or output and both latched

  - 4-bit port used for control and status of 8-bit data port

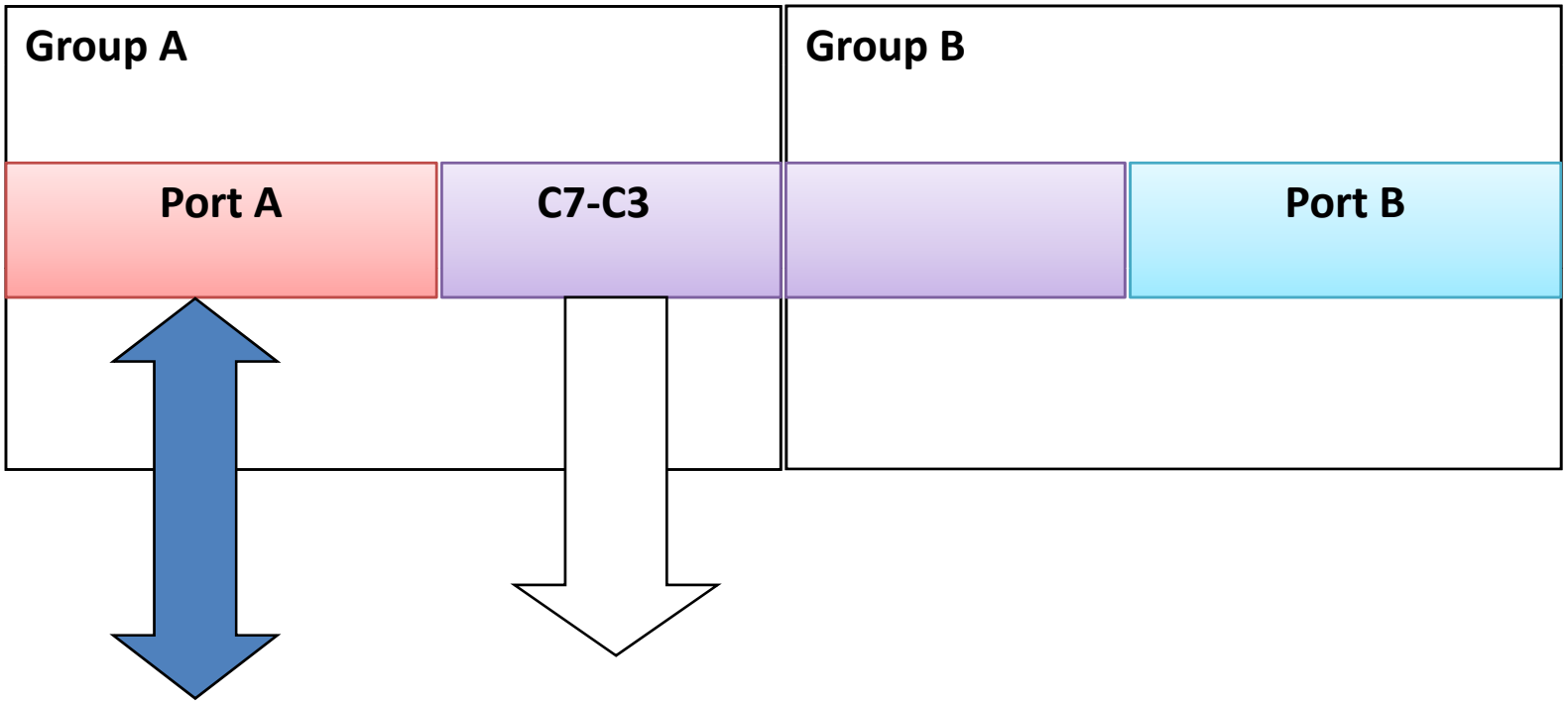
Mode 1



Operation mode 2

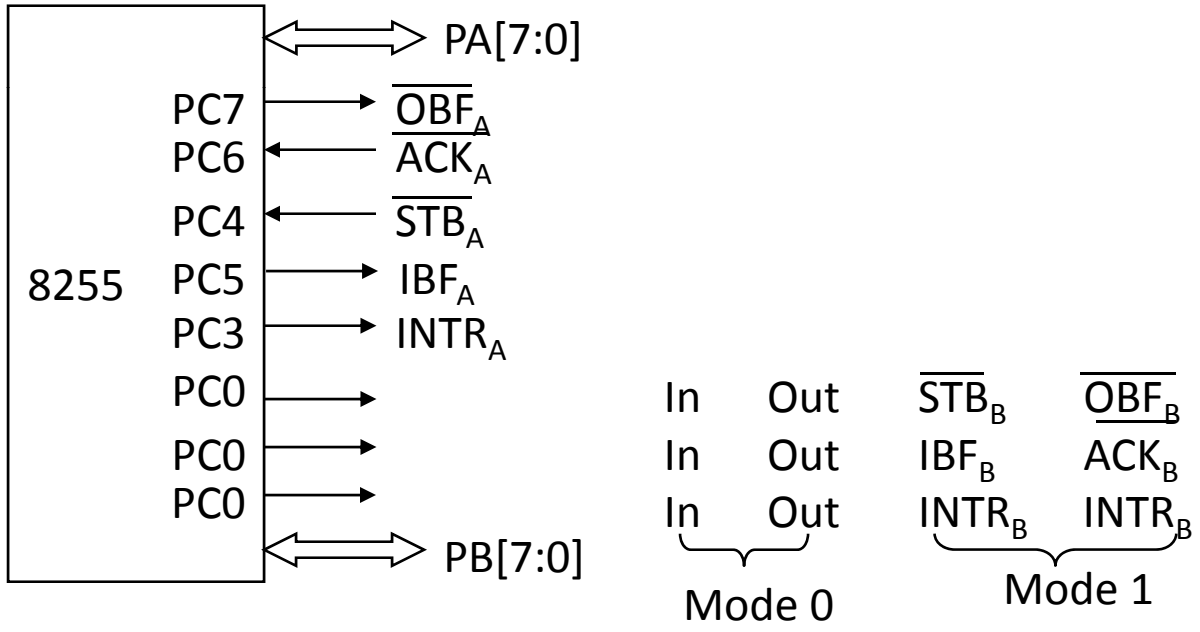
- In mode 2
  - only port A is used
  - port A becomes an 8-bit bidiectional bus
  - port C acts as control port (only pins PC3-PC7 are used)

Mode 2



Programming 8255

- Mode 2:
  - Port A is programmed to be bi-directional
  - Port C is for handshaking
  - Port B can be either input or output in mode 0 or mode 1



Reference

- R S Gaonkar, “Microprocessor Architecture”, Chapter 15

Thanks