IO System
8255A – Programmable Parallel Port

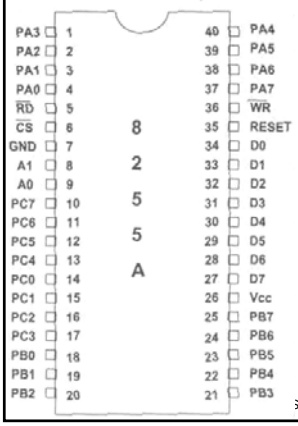
Lecture 20

8255 Programmable Peripheral Interfacing

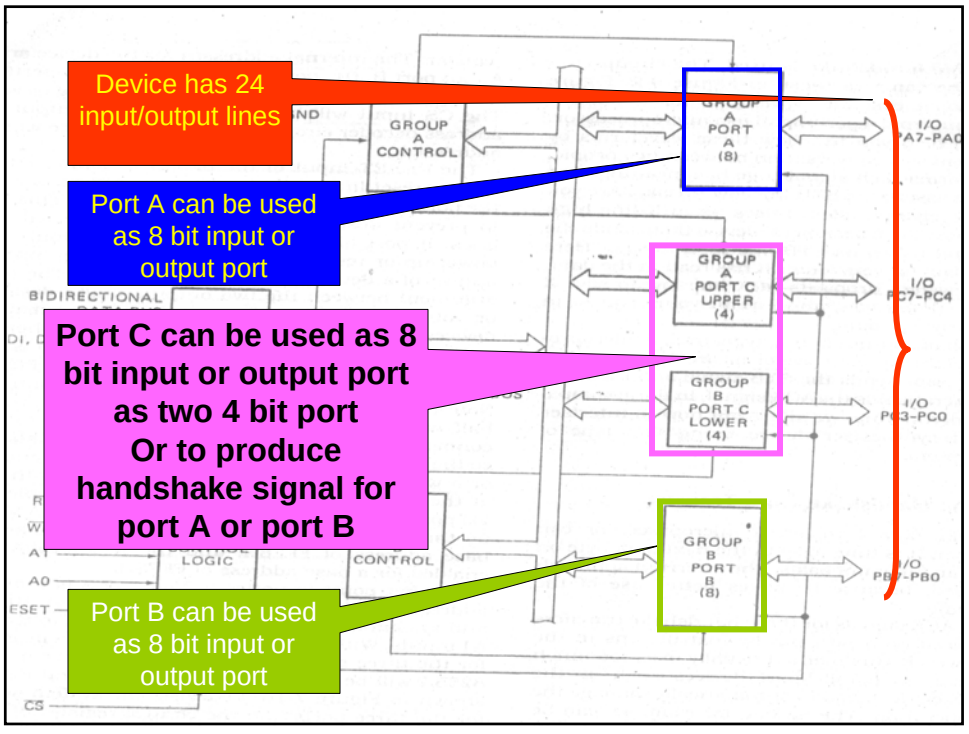
- one of the most widely used I/O chips.
  - It can be used for both memory-mapped and direct I/O
  - Provide a flexible parallel interface including, single bit, 4-bit and byte-wide input and output port
    - All these features configuration through software
- The 8255 is a 40-pin DIP chip
  - It has three separately accessible ports
    - Port A, Port B and Port C
    - The source and destination registers within 8255A is selected by MP through A0 and A1 lines of 8255A
      - Port A → A1A0 → 00
      - Port B → A1A0 → 01
      - Port C → A1A0 → 10

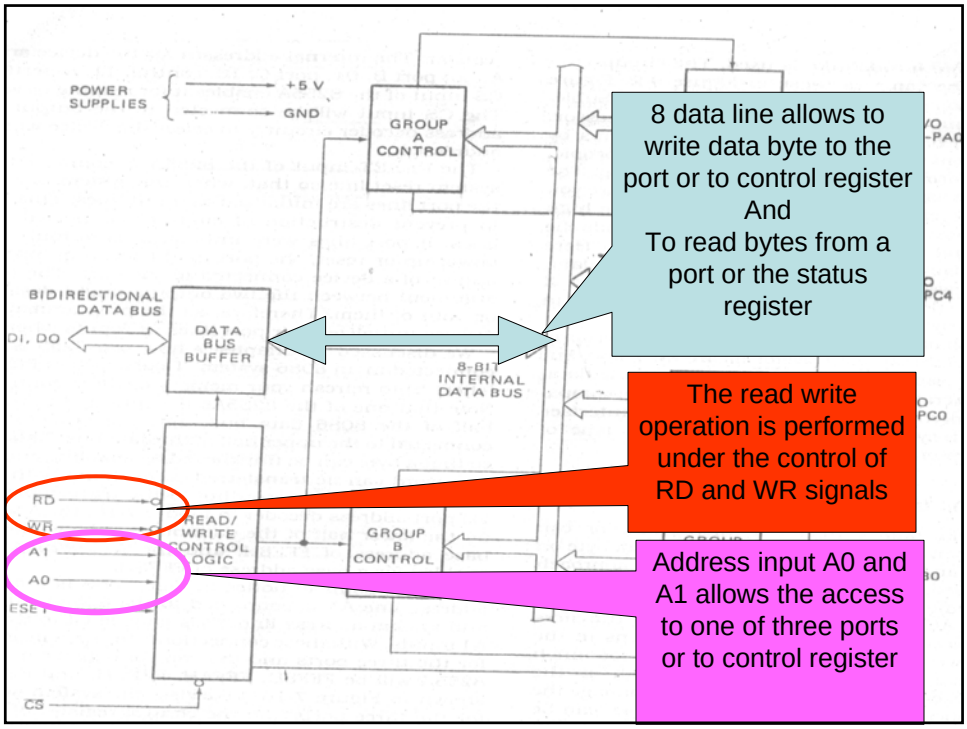
8255 Programmable Peripheral Interfacing

- More important,
  - one can program the individual ports of the 8255 to be input or output, and change them dynamically
    - Contains a 8 bit internal control register for programming the ports
    - In addition, the 8255 can be used to interface the CPU to devices using handshake signals



- **PA0 - PA7**
  - **This 8-bit port A can be programmed**
    - **all as input or all as output or all bits as bidirectional input/output.**
- **PB0-PB7**
  - **This 8-bit port B can be programmed**
    - **all as input or all as output. Port B cannot be used as a bidirectional port**
- **PC0-PC7**
  - **This 8-bit port C can be all input or all output.**
    - **It can also be split into two parts,**
      - CU (upper bits PC4 - PC7) and
      - CL (lower bits PCO - PC3)





Mode selection of the 8255A

- While ports A, B, and C are used for I/O data, it is the control register that must be programmed to select the operation mode of the three ports A, B, and C
- The ports of the 8255 can be programmed in any of the following modes:
  - Mode 0:
    - Port A, B and C can be programmed as simple input and output without handshake
  - Mode 1:
    - Port A and B can be programmed as input out with single hand shake
  - Mode 2:
    - Port A can be used as bidirectional input output port

Mode 0

- simple I/O mode
  - In this mode, any of the ports A, B, C_L, and C_U can be programmed as simple input or output without handshaking
- If port A and B are initialized in mode 0
  - The two halves of the port C can be used together as an additional 8 bit port

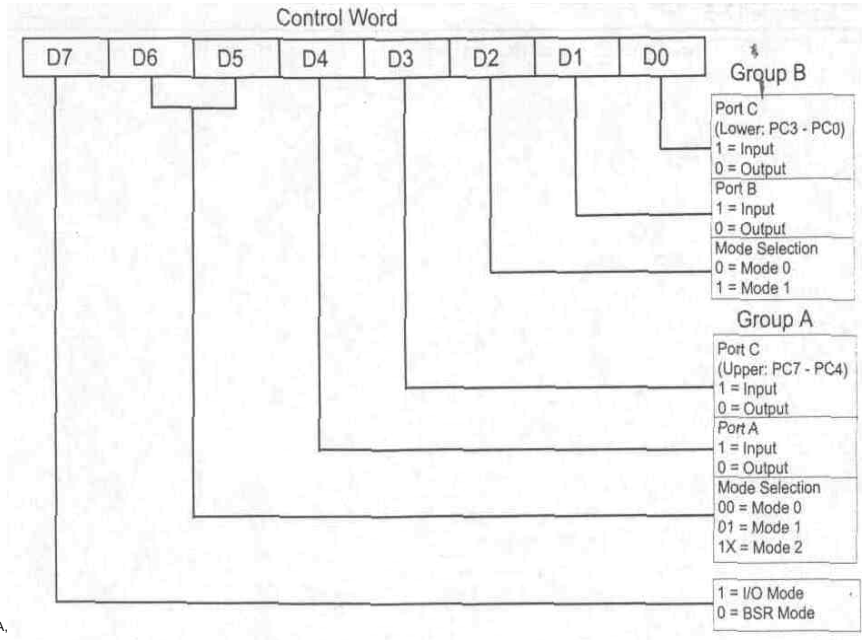
Mode 1

- Ports A and B can be used as input or output ports with handshaking capabilities.
  - Handshaking signals are provided by port C
- When Port A or Port B is used for a handshake Input or output operations
  - Some of the pins of Port C functions as handshake lines
  - PC0, PC1 and PC2 functions as handshake lines if Port B is initialized in mode 1
  - PC3,4 and 5 if Port A is in Mode 1

Mode 2

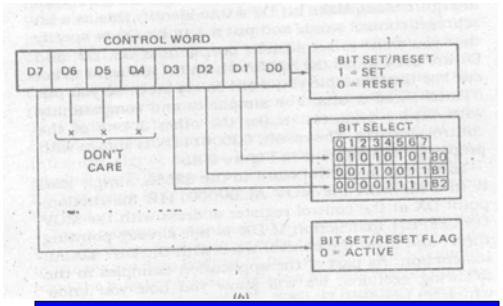
- Only port A can be used as a bidirectional I/O port with handshaking capabilities whose signals are provided by port C
  - Port B can be used either in simple I/O mode or handshake mode 1
- Only Port A can be initialized in mode 2
  - Port A cane be used for bidirectional handshake data transfer
  - Data can be input and output on the same 8 lines
  - Can be implemented to transfer data to and from floppy disk drive controller
  - For port A in mode 2 pins PC3-PC7 are used as handshake
  - PC0 to PC3 used as I/O

Control Word Format (I/O Mode)

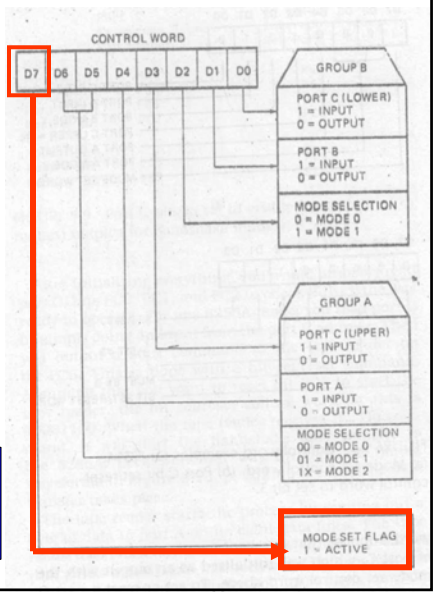


Control word - sending

MSB of the control word indicate the mode of the operation for the ports



Bit Set or Reset control word format when output is set or reset on a pin of port C



Example:

Program the control word as fol:

- Port B as mode 1 input
- Port A as mode 0 output
- Port C upper as inputs
- Port C lower as output