I/O Organization

Introduction

- An I/O module allows for communication between a computer system and a peripheral device.

- Each I/O module interfaces to the system bus and control one or more peripheral devices.

- Some examples of peripheral devices include graphics cards, image scanners, digital cameras, speakers and microphones.
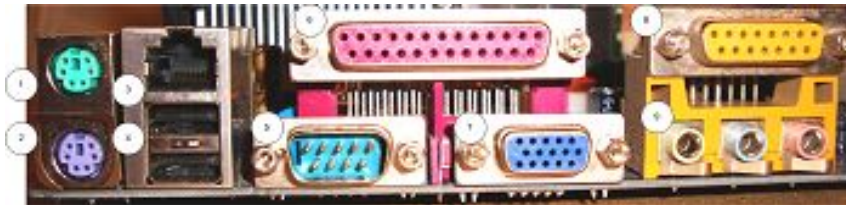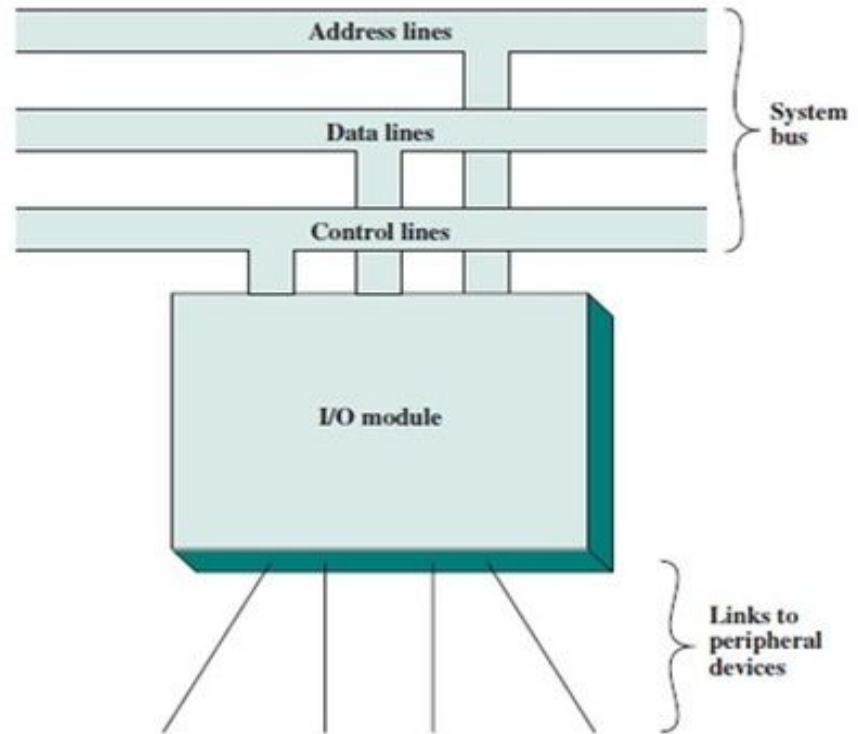

Fig.: Input/Output Ports on a Computer

Generic model of I/O moduule

- I/O is an interaction or communication between a system that processes data and an outside source.

- I/O device is a piece of h/w used by human or system to communicate with computer.

Buses

- It is a group of wires through which data is transmitted.
- The speed of a bus is measured in megahertz(MHz).
- The size of a bus(its width) is how many bits it can transfer at a time.
- It can be unidirectional or bidirectional.

For example,

A 64 bit computer has buses with 64 bit width.

Types of Buses

1. **Address bus:** It is a one-way pathway that allows information to pass in one direction only, carries information about where data is stored in memory.
2. **Data bus:** It is a two-way pathway carrying the actual data (information) to and from the main memory.
3. **Control bus:** It holds the control and timing signals needed to coordinate all of the computer's activities.

I/O module key tasks / Functions

- **Control and timing** – It manages data flow between a computer's internal resources and any connected external devices.

- **Processor communication** – This involves transfer of data between the processor and an I/O module, accepting and decoding commands sent by the processor, reporting of current status.

I/O module key tasks / Functions

- **Device communication** – It needs to be able to perform standard device communications, such as reporting of status.
- **Data buffering** – It manages the speed discrepancy that exists between the speed of transfer of data between the processor and memory and peripheral devices.
- **Error detection** – Detecting errors, whether mechanical (a paper jam in printer) & reporting them to the processor.

I/O module Structure
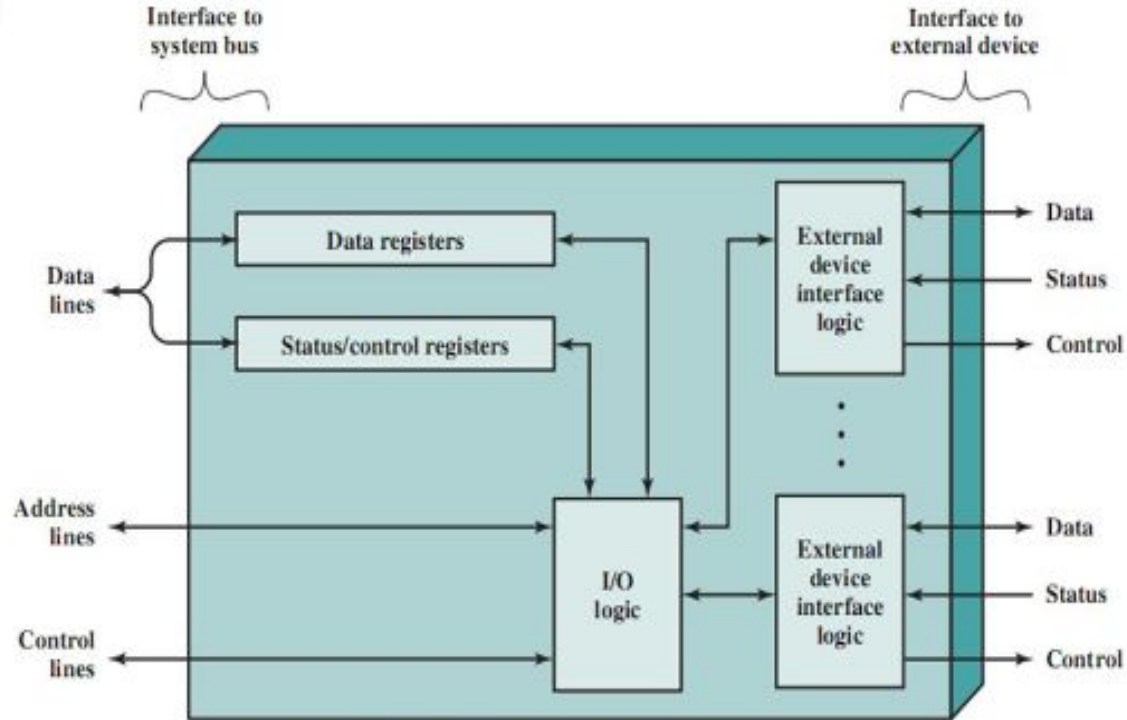
Block Diagram of an I/O Module

I/O module Structure

- CPU checks I/O module device status
- I/O module returns status
- If ready, CPU requests data transfer
- I/O module gets data from device
- I/O module transfers data to CPU

I/O Techniques/Types

I/O Structure consists of Programmed I/O, Interrupt driven I/O, DMA, CPU, Memory, External devices, these are all connected with the help of Peripheral I/O Buses and General I/O Buses.

1) Programmed I/O
2) Interrupt driven I/O
3) Direct Memory Access (DMA)