

EXPERIMENT NO: 1

AIM:- Introduction to computer hardware, physical identification of major components of a computer system such as mother board, RAM modules, daughter cards , bus slots , SMPS ,internal storage devices, interfacing ports.

Computer hardware includes the physical parts of a computer, such as the case, central processing unit (CPU), monitor, mouse, keyboard, computer data storage, graphics card, sound card, speakers and motherboard.

Hardware is typically directed by the software to execute any command or instruction. A combination of hardware and software forms a usable computing system, although other systems exist with only hardware.

MOTHER BOARD

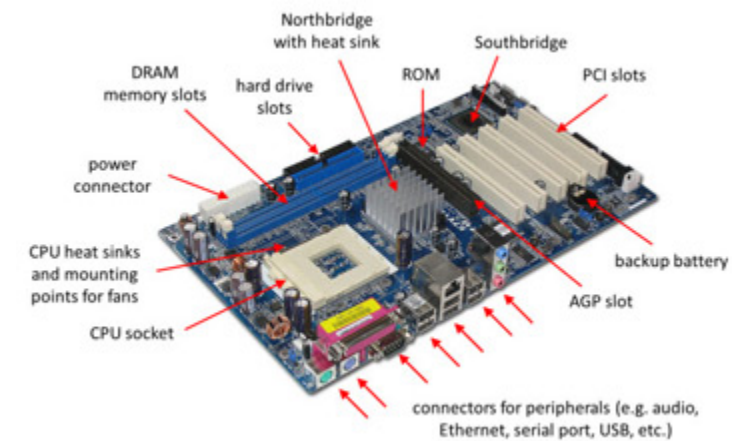
A **motherboard** (also called **main board** , main **circuit board**, **system board**, **baseboard**, **planar board**, **logic board**, or **mobo**) is the main printed circuit board (PCB) in general-purpose computers and other expandable systems. It holds and allows communication between many of the crucial electronic components of a system, such as the central processing unit (CPU) and memory, and provides connectors for other peripherals. Unlike a backplane, a motherboard usually contains significant sub-systems, such as the central processor, the chipset's input/output and memory controllers, interface connectors, and other components integrated for general use.

Location of mother board

In Desktop PC: In a desktop PC, there is a big rectangular computer case. Once the case is opened to expose inside the machine, there is a green/blue/brown/red large square printed circuit plate. This plate is the motherboard of the PC.

In laptop: While opening the bottom cover of the laptop, we will get exposed to the large PCB board which is the motherboard.

In smartphone: While opening the back cover of the smartphone, and screws up some pins then we will find the motherboard.



PARTS OF MOTHER BOARD

1) RAM chip and RAM Slot

RAM stands for Random Access Memory. It is also called the **main memory**. RAM is a **temporary data storage** device in computers and other devices. Data stored in RAM will get erased as soon as power is turned off.

RAM has **bidirectional data transfer** capacity from CPU to memory during a write operation and from RAM to CPU during the reading operation. It acts as a mediator for data transfer from CPU to other devices like HDD, cdrom, PEN drives.

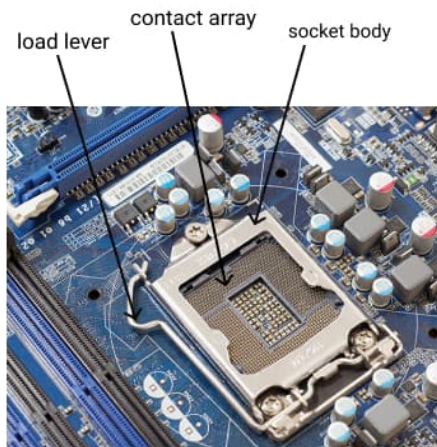
It is called **Random-access memory** because any memory address of RAM can be accessed directly from any location. If row number and column number are known then data in any memory location can be accessed.

Various types of RAM are available in the market some of them are DRAM, SDRAM, DDR, SRAM, CMOS RAM, VRAM etc. Generally available RAM in the PC market is from 2 GB to 16 GB.

2) CPU Chip and Socket



CPU Chip



CPU Socket

CPU stands for Central Processing Unit. Considered as the **brain of the computer** and other electronic devices because all the decision making tasks of the computer is performed by the CPU. It is a large printed circuit board where all

the components and peripherals are directly or indirectly connected. The main function of the CPU is to execute basic arithmetical, logical, and input/output operations.

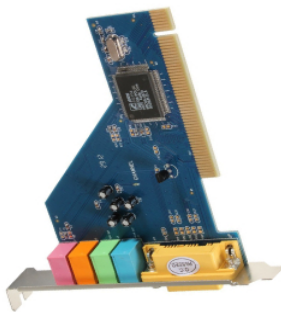
CPU consists of 3 main typical components. ALU, CU

ALU: Arithmetical Logical Unit (ALU) is a digital circuit(gates) of CPU which is used for performing all arithmetical and logical operations. Some normal arithmetical operations performed by ALU are addition, subtraction, multiplication, and division. Some logical operations performed by ALU are comparisons between numbers and letters. A single CPU may also contain more than one ALU.

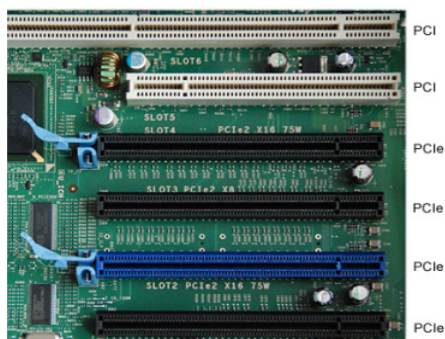
CU: Control Unit (CU) is a digital circuit of CPU which controls all the operations within the CPU. It allows and teaches various logical units, I/O devices, the memory of computer how to respond to a program's instructions of the various components as well as the user.

Memory Unit(MU)

3) PCI Slots and PCI Chip



PCI Chip



PCI Slots

Peripheral Component Interconnected(PCI) is an attached hardware component of motherboard for connecting various hardware components like modems, disk controller, NIC cards, Sound Card, graphics cards, SSD add-on cards, RAID cards, extra USB and serial port required so PCI slots help increasing motherboard capabilities without adding or replacing the motherboard.

If there is only limited ports and slots on the motherboard to connects various types of hardware devices like saying graphics card port(AGP port) then you can use PCI slots to connects Graphics cards and enjoy the same features. Same way if you have limited USB port in your computer system and want more than you can use a USB expansion card and get more USB port in your system.

It was introduced in 1992, before that **ISA, EISA** was used for the same purpose. Later in 2004 **PCIe slot** is developed and it is replacing **PCI slots, AGP slots,** and **ISA slots**.

4) AGP Slot and Chip

Accelerated Graphics Port Slot(AGP Slot) is a kind of expansion slot like a PCI slot but mainly designed for graphics cards. It was first introduced by Intel in 1996. We can easily locate this expansion slot because it is usually presented in **brown color**.

5) North Bridge

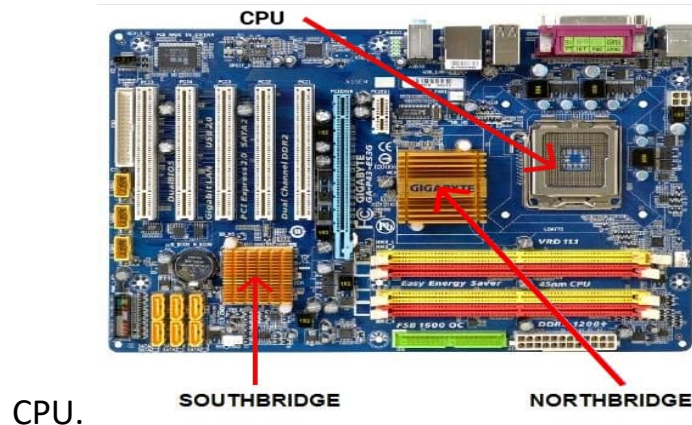
North Bridge is also called Host bridge or Memory Controller Hub. It acts as the primary controller in the motherboard which directs traffics to and from the CPU. So, the performance of the computer also depends on the northbridge chip. It does lots of processing so it generally comes with a heatsink.

Characteristics of North Bridge:

- It connects southbridge to the CPU.
- It handles and communicates faster components on the motherboard like Main Memory, AGP, PCIe, ROM, and CPU.
- It acts as a controller in bus speed on the motherboard.

- Generally, it does lots of work with the CPU, so it is located near to the CPU generally with the heatsink.
- It is a core component and is directly connected to the CPU.

In some processors of Intel, all the functioning of northbridge is performed by



6) South Bridge

Southbridge is an IC chip that generally handles and controls IO functioning in the motherboard. Unlike Northbridge, it does not have direct with CPU. It generally handles low-speed devices because its communication speed is lower. Instruction from CPU reaches northbridge then from northbridge to southbridge. It is connected to the PCI bus, ISA buses, IDE buses, audio, serial devices like mouse, keyboard, USB ports, etc, and SATA hard disk connector.

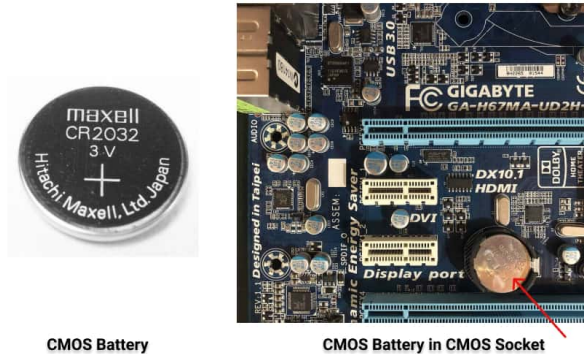
In size, it is smaller than the northbridge. And in some southbridge, we can find heatsink attached to it.

7) CMOS Backup Battery

CMOS stands for "**Complementary Metal Oxide Semiconductor**" and found in both laptop and desktop PC as a small circular coin shape. CMOS stores a wide range of system information like current system clock, date, time, pulses, mostly used hardware settings, BIOS configuration settings, BOOT sequences, BIOS master/admin password, GPU and virtualization settings, power management, etc. They can save those set for a longer time around 2 to 10 years. CMOS works continuously even if you shut down your system because it is continually holding

all those setting mention above. CMOS is also called as **CMOS RAM**, **COS-MOS**, **NVRAM**(Non-Volatile RAM) in the market.

It is also called RTC(Real Time Clock) of the computer system because even computer is shut down it is able to store all the required information that the system required to boot the system next time.



CMOS Battery

CMOS Battery in CMOS Socket

8)Power Supply Plug

The main work of the Power Supply port in the Motherboard is to provide power to Motherboard and its attached components and peripherals.

i) 24 (20 + 4) ATX power supply

In modern PCs, ATX power supply is provided which is 24 Pin(20 + 4) Main Power Supply Connector (Older Pcs only have 20 Pin)

ii) 4 Pin or 8 Pin Connector

This port in the motherboard is to provide dedicated power to the CPU. Older PCs may not have this Plugin motherboard but modern computers can do lots of works like overclocking so, a dedicated cable is provided to the CPU.

8Pin connector can be split into two and each split part can be used as 4 pin connector.

iii) PCI-Express 6-Pin or 8-Pin Connector

This is required to power the PCI-E port. PCI-E slot required 75W power to operate.

The older PC does not have this.

iv) Molex

Molex pin is 4 power pin which is required to supply power to older CDROM and hard drives. Molex is nowadays used for Case Fan. (some have some do not have)

Molex connector comes with Mini Molex connectors, which is used for floppy disk drives in much older PCs.

v) SATA power supply

Modern hard drives and CDROM uses SATA cable for power. In motherboard, it is L-shape port and so its cable is connected to SATA port in one way only. In motherboard, it has 15 pins. It provides features of hot-swappable hard drives ie. plug and play hard drive features.

9) SATA and PATA Port and Connector

PATA stands for Parallel Advanced Technology Attachment. It is 40 pins long and wide ribbon cable used for connecting mass storage devices like hard disks(HDD or SSD), optical drives to the computer. It was launched in 1986 by Western Digital and Compaq. Every cable of PATA has two or three connectors, of which one is attached to the adapter interfacing and the remaining are plugged into secondary storage devices.

In modern computers, it is not used. It is outdated technology and is replaced by SATA Technology

SATA stands for Serial Advanced Technology Attachment. It is 7 pin cable which is shorter and powerful than the PATA connector and its function is the same as the PATA connector.

10) Parallel Port

A parallel port is used to transfer in a parallel manner through multiple communication channels. Used for printers, scanner, Zip Drive, external HDD, tape backup devices, external CD ROM, etc.

11) Serial Port

With a serial port, only one bit of data gets transfer at a time. It is found in an older PC to connect older keyboards, PDAs, external modems.

RAM MODULES

A memory module is another name for a RAM chip. It is often used as a general term used to describe SIMM, DIMM, and SO-DIMM memory. While there are several different types of memory modules available, they all serve the same purpose, which is to store temporary data while the computer is running.

Memory modules come in different sizes and have several different pin configurations. For example, the original SIMMs had 30 pins (which are metal contacts that connect to the motherboard). However, newer SIMM chips have 72 pins. DIMMs commonly come in 168-pin configurations, but some DIMMs have as many as 240 pins. SO-DIMMs have a smaller form factor than standard DIMM chips, and come in 72-pin, 144-pin, and 200-pin configurations.

While "memory module" is the technical term used to describe computer memory, the terms "RAM," "memory," and "RAM chip" are just as acceptable. But remember, while memory terms may be interchangeable, the memory itself is not. This is because most computers only accept one type of memory. Therefore, if you decide to upgrade you computer's RAM, make sure the memory modules you buy are compatible with your machine.



DAUGHTER BOARD / DAUGHTER CARD

The daughter board is a computer hardware. It is also known as the piggyback board, riser card, daughter board, daughter card or daughter card. A daughter board is a printed circuit board which is connected to the motherboard or expansion card. As compared to the motherboard, it is smaller in size. A daughter board does not act as an expansion card. An expansion card adds extra new functions to the computer. But a daughter board that is connected to the motherboard adds or supports the main functions of the motherboard.

Daughter boards are directly connected to the motherboards. We know that expansion cards are connected to the motherboard by using the bus and other serial interfaces. But daughter board is directly connected to the board by soldering. As an update of the motherboard or expansion card, daughter boards are released to extend the features and services of the motherboard or expansion cards.



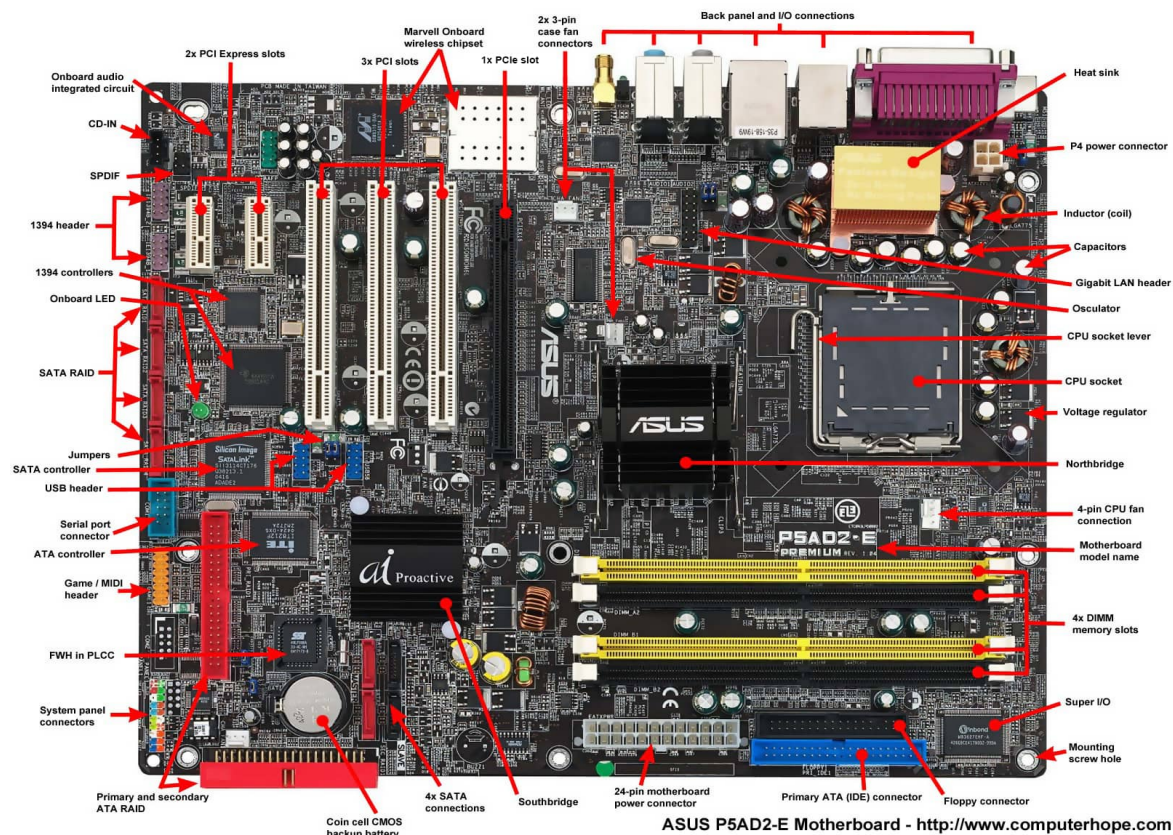
BUS SLOT/EXPANSION SLOT

A **bus slot** or **expansion port**, an **expansion slot** is a connection or port inside a computer on the motherboard or riser card. It provides an installation point for a hardware expansion card to be connected. For example, if we wanted to install a new video card in the computer, we'd purchase a video expansion card and install that card into the compatible expansion slot.

EXPANSION/ BUS SLOTS AND DEVICES CONNECTED

- **AGP** - Video card.
- **AMR** - Modem, sound card.
- **CNR** - Modem, network card, sound card.
- **EISA** - SCSI, network card, video card.
- **ISA** - Network card, sound card, video card.
- **PCI** - Network card, SCSI, sound card, video card.
- **PCI Express** - Video card, modem, sound card, network card.
- **VESA**- Video card.

Many of the expansion card slots above are obsolete. We're most likely only going to encounter AGP, PCI, and PCI Express when working with computers today.



ASUS P5AD2-E Motherboard - <http://www.computerhope.com>

SMPS (SWITCHED MODE POWER SUPPLY)

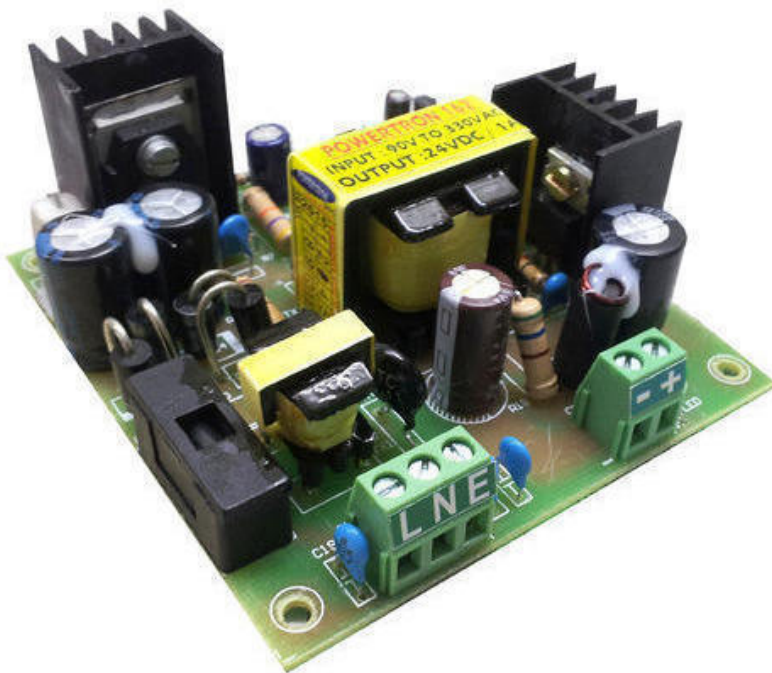
The SMPS is **Switched Mode Power Supply** also known as **Switching Mode Power Supply**. SMPS is an electronic power supply system that makes use of a switching regulator to transfer electrical power effectively. It is a PSU (power supply unit) and is usually used in computers to change the voltage to the appropriate range for the computer.

There are four main types of SMPS such as

- DC to DC Converter
- AC to DC Converter

- Fly back Converter
- Forward Converter

The AC to DC conversion part in the input section makes the difference between AC to DC converter and DC to DC converter. The Fly back converter is used for Low power applications. Also there are Buck Converter and Boost converter in the SMPS types which decrease or increase the output voltage depending upon the requirements. The other type of SMPS include Self-oscillating fly-back converter, Buck-boost converter, Cuk, Sepic, etc.



Working principles of SMPS

In the SMPS device, the switching regulators are used which switches on and off the load current to maintain and regulate the voltage output. Suitable power generation for a system is the mean voltage between off and on. Unlike the linear power supply, the SMPS carry transistor switches among low dissipation, full-on

and full-off phase, and spend much less time in high dissipation cycles, which decreases depleted strength.

Benefits of SMPS

- The switch-mode power source is small in scale.
- The SMPS is very lightweight.
- SMPS power consumption is typically 60 to 70 per cent, which is ideal for use.
- SMPS is strongly anti-interference.
- The SMPS production range is large.

Limitations of SMPS

- The complexity of SMPS is very large.
- The production reflection is high and its control is weak in the case of SMPS.
- Use of SMPS can only be a step-down regulator.
- In SMPS, the voltage output is just one.

INTERNAL STORAGE DEVICES

Some storage devices are classed as 'internal' which means they are inside the computer case.

Most computers have some form of internal storage. The most common type of internal storage is the hard disk.

HARD DISK

At the most basic level, internal storage is needed to hold the operating system so that the computer is able to access the input and output devices.

It will also be used to store the applications software that you use and more than likely, the original copies of your data files.

Internal storage allows the data and applications to be loaded very rapidly into memory, ready for use. The data can be accessed much faster than data which is stored on an external storage device. This is because internal storage devices are connected directly to the motherboard and its data bus whereas external devices are connected through a hardware interface such as USB, which means they are considerably slower to access.

Internal storage also means that if the computer is moved around, it will still retain its most commonly used data.

The main disadvantage of internal storage is that when the hard disk fails (and it will), all the data and applications may be lost.

This can be avoided to some extent by using more than one hard disk within the machine. Each hard disk has a copy of all the data, so if one fails the other can carry on. This is called a RAID array. An alternative is to use external drives for backup



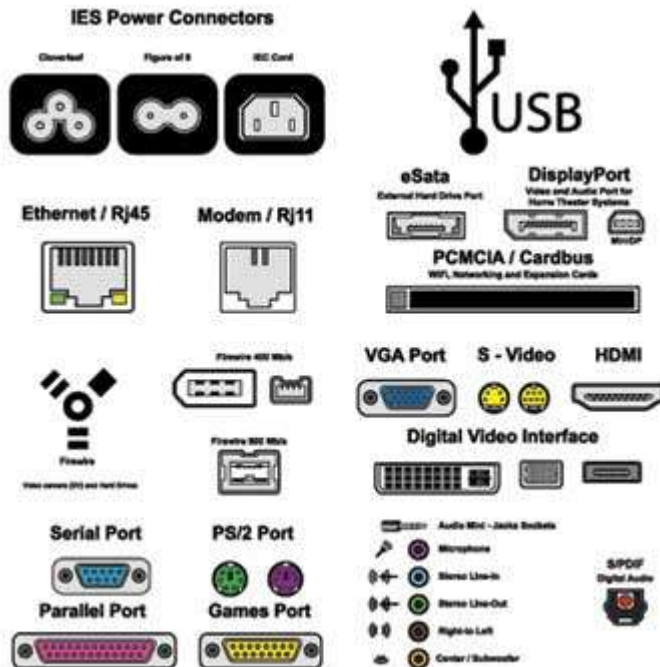
INTERFACING PORTS

A port is a physical docking point using which an external device can be connected to the computer. It can also be programmatic docking point through which information flows from a program to the computer or over the Internet.

Characteristics of Ports

A port has the following characteristics –

- External devices are connected to a computer using cables and ports.
- Ports are slots on the motherboard into which a cable of external device is plugged in.
- Examples of external devices attached via ports are the mouse, keyboard, monitor, microphone, speakers, etc.



Types of ports –

Serial Port

- Used for external modems and older computer mouse
- Two versions: 9 pin, 25 pin model
- Data travels at 115 kilobits per second



Parallel Port

- Used for scanners and printers
- Also called printer port
- 25 pin model
- IEEE 1284-compliant Centronics port

Parallel Port (DB25)



PS/2 Port

- Used for old computer keyboard and mouse
- Also called mouse port
- Most of the old computers provide two PS/2 port, each for the mouse and keyboard
- IEEE 1284-compliant Centronics port



Universal Serial Bus (or USB) Port

- It can connect all kinds of external USB devices such as external hard disk, printer, scanner, mouse, keyboard, etc.
- It was introduced in 1997.
- Most of the computers provide two USB ports as minimum.
- Data travels at 12 megabits per seconds.
- USB compliant devices can get power from a USB port



VGA Port

- Connects monitor to a computer's video card.
- It has 15 holes.
- Similar to the serial port connector. However, serial port connector has pins, VGA port has holes.

- Power Connector
- Three-pronged plug.
- Connects to the computer's power cable that plugs into a power bar or wall socket.



Firewire Port

- Transfers large amount of data at very fast speed.
- Connects camcorders and video equipment to the computer.
- Data travels at 400 to 800 megabits per seconds.
- Invented by Apple.
- It has three variants: 4-Pin FireWire 400 connector, 6-Pin FireWire 400 connector, and 9-Pin FireWire 800 connector.



Modem Port

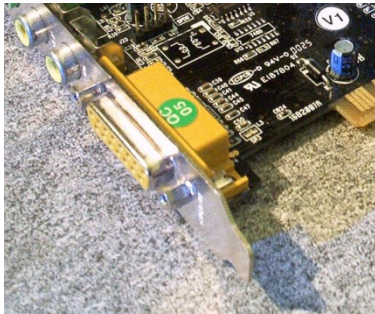
- Connects a PC's modem to the telephone network.
- Ethernet Port
- Connects to a network and high speed Internet.
- Connects the network cable to a computer.
- This port resides on an Ethernet Card.
- Data travels at 10 megabits to 1000 megabits per seconds depending upon the network bandwidth.



Game Port

- Connect a joystick to a PC

- Now replaced by USB
- Digital Video Interface, DVI port
- Connects Flat panel LCD monitor to the computer's high-end video graphic cards.
- Very popular among video card manufacturers.



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