

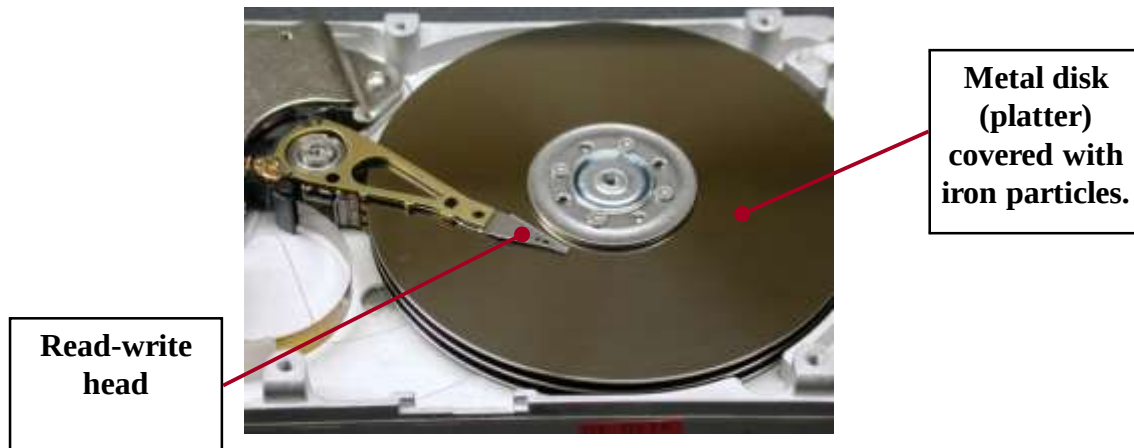
System Devices

Hard Disk

- **Primary storage** (memory) - volatile - contents lost when power is turned off.
- **Secondary storage** (disk drives) - non-volatile - can store files when power is turned off.
- In memory, voltages are used to store data as binary 1's and binary 0's. It was decided to mimic the situation for secondary storage using **magnetism** instead of electrical voltages to represent the binary data.

System Devices

- A metal disk (**platter**) is coated with tiny iron particles which can be magnetised to **north** and **south** to represent the binary digits 0 and 1.
- A **read-write head** is used to magnetise the particles on the disk surface to represent the data held in RAM. The computer can now be switched off and a copy of the data is safe for later use.



System Devices

Hard disks can be **internal** or **external**. The internal standards are:

- **IDE** (Integrated Drive Electronics). The disks connect to the motherboard using a ribbon cable. Each cable can hold two drives - **master** and **slave**. The drive is set as master or slave by positioning a **jumper** switch on the back of the drive. There are two IDE connectors and a total of four drives can be connected.



System Devices

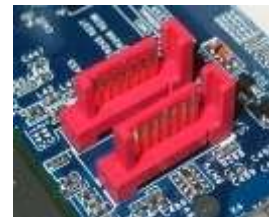
- **SATA** (Serial Advanced Technology Attachment) allow faster data transfer speeds than IDE. There is no master/slave arrangement with SATA and each drive has it's own cable. The cables are much smaller and allow better air circulation in the system unit.



Motherboard connectors



IDE



SATA

System Devices

External hard disk drives can be IDE or SATA and can be **mains powered** or **host powered**. Host powered drives receive their power from the USB port.



**Mains
Powered**



**Host
Powered**

Hard disk drives are also now found in video recorders, digital music players, digital camcorders, digital cameras and mobile phones.

2½ inch Notebook Drive



1 inch Microdrive



Microdrive



System Devices

Optical drives

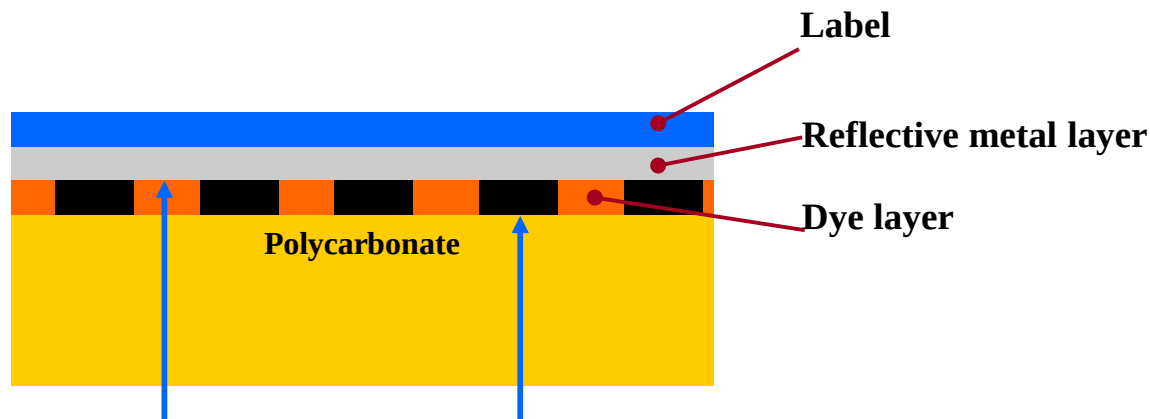
- Optical drives use lasers to sense **pits** and **lands** mechanically pressed into a polycarbonate disk. These pits and lands represent the binary 0's and 1's and so can store computer data.
- A thin layer of metal reflect the laser light. As the disk rotates, the laser senses the pits and lands and reads the data from the disk. The laser only operates at a **single intensity** as it only scans the surface of the disk to detect the pits and lands.



System Devices

CD-R (blank CD's) use a dye layer to mimic the lands and pits created mechanically on commercial disks.

- The laser used has **two intensities**.
- At the **high setting**, it burns spots on the dye layer changing it from transparent to opaque. This allows data to be written as spots of transparency and opacity.
- At the low setting, it reads these differences



System Devices

The CD-RW (re-writable) disk is similar but the laser has **three intensities**. The third and highest is needed to turn the burned areas of the dye layer back to their original condition. The dye layer can now be re-burned to hold new data.

The three laser intensities are:

- **Intensity 1** - Read data
- **Intensity 2** - Burn data
- **Intensity 3** - Erase data

The CD-R disk has a capacity of 650MB to 800MB.

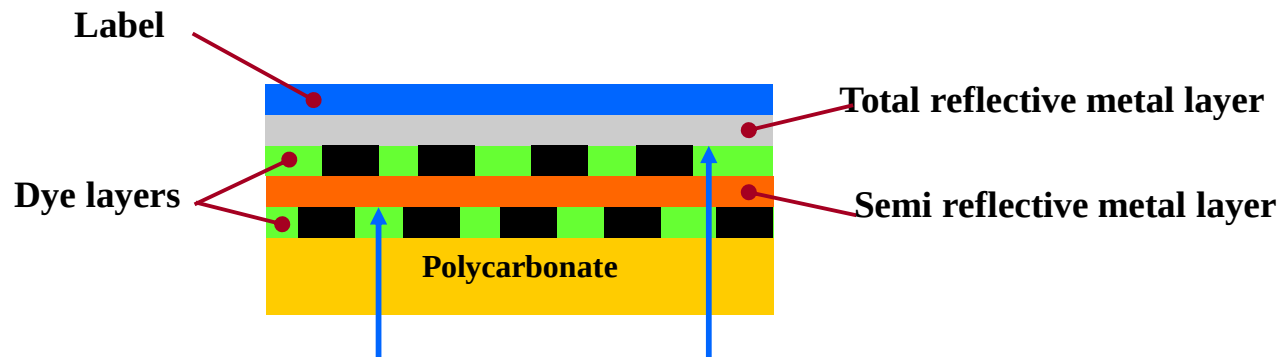
System Devices

DVD's hold a lot more data than CD's. They can have several layers, each holding **4.7GB** of data.

The possibilities are:

Number of sides	1	1	2	2
Number of layers	1	2	1	2
Disk capacity	4.7GB	8.5GB	9.4GB	17GB

Dual layer disks have two reflective layers, one which can be penetrated at a certain intensity



System Devices

DVD Formats

1	DVD-ROM	Read only. Mechanically stamped and manufactured as single or double layer and as single sided or double sided.
2	DVD-R	Single or dual layer disks and can be single or double sided. They can be written to only once.
3	DVD-RW	Same as DVD-R but can be written to several times.
4	DVD+R	These are single or dual layer disks and can be single or double sided. They can be written to only once.
5	DVD+RW	These are the same as DVD+R only that they can be written to several times.

DVD-R and DVD+R are incompatible with each other. Manufacturers have produced **DVD±R** drives capable of reading and writing to both standards.

System Devices

A number of new high capacity formats have come onto the market.

These are:

1	HD-DVD	Uses a new laser technology resulting in layer of 15GB instead of the 4.7GB on standard DVD. This gives a total capacity of a double sided - double layered disk as 60GB.
2	Blu-Ray	Higher capacity than HD-DVD - 25GB of data/layer. A dual layer disk can hold 50GB. Technically, a double sided and double layered disk can hold 100GB of data.



Blu-Ray



HD-DVD

System Devices

Card readers

Replaces floppy drives in new computers. They can read media cards from most digital cameras:

- Microdrive:
- Smartmedia:
- SD memory card:
- Memory stick/Duo/Pro:
- xD picture card:



Card reader drive



System Devices

Monitors

A computer monitor displays images generated by the graphics card.

Monitors are almost exclusively **LCD** (Liquid Crystal Display). **CRT** (Cathode Ray Tube) monitors are rare and are now as expensive as LCD monitors.



19 inch Widescreen LCD

System Devices

The **aspect ratio** of a computer monitor is the ratio between the width and height of the screen. The aspect ratios are:

- **Standard monitor** - 4:3
- **Widescreen monitor** - 16:9

Most LCD monitors offer a **VGA** and a **DVI** connection. The VGA connector is used for analogue signals and the DVI connector is used for digital. As the computer is a digital machine, it is best if no conversion is required and so the best option is the DVI connection.



DVI



VGA

System Devices

Resolution

Standard monitor

- **XGA** (Extended Graphics Array) - **1024 x 768**
- **SXGA** (Super Extended Graphics Array) - **1280 x 1024**
- **UXGA** (Ultra Extended Graphics Array) - **1600 x 1200**
- **QXGA** (Quad Extended Graphics Array) - **2048 x 1536**

Widescreen

- **WXGA** (Wide XGA) - **1280 x 800**
- **WSXGA** (Wide SXGA) - **1680 x 1050**
- **WUXGA** (Wide UXGA) - **1920 x 1200**

LCD monitors - **native resolution** at which the image is crisp.
Other resolutions are possible but the image quality decreases.

System Devices

Keyboard

Primary input device - divided into sections:

- **Typing keys** - contains the letter and number keys, shift keys, spacebar, return key etc.
- **Numeric keypad** - These keys are arranged as on a calculator.
- **Function keys** - programmable keys used by software for special functions. E.g. - F1 - Help.
- **Control keys** - screen and cursor control.

System Devices

- Most common arrangement is called **QWERTY** after the first six keys.
- Other arrangements are available including **Dvorak**, **ABCDEF**, **AZERTY** etc.



QWERTY



Dvorak

System Devices

Keyboards are available wired or wireless:

- **Wired** - These are either **PS/2** or **USB**.
- **Wireless** - The keyboard uses batteries.



Wireless keyboard

Rubber keyboard - useful for use with notebook computers. Leaves users less prone to **RSI** (Repetitive Strain Injury)



System Devices

Mouse

Input device - uses point and click technology

There are two main types:

- **Ball mouse** - uses a ball to roll across the surface and move rollers attached to sensors inside the mouse - reflecting the ball movement as cursor movement.
- **Optical mouse** - camera takes thousands of images per second and sends them for digital processing. The red LED lights up the surface for the camera.



Optical
mouse



Ball mouse

System Devices

Printers

Output devices - produce a **hardcopy** (permanent and readable) of computer data. The can print onto paper, transparency, photographic paper, card etc.

There are two main technologies involved:

- **Inkjet (Bubble-jet)**
- **Laser**



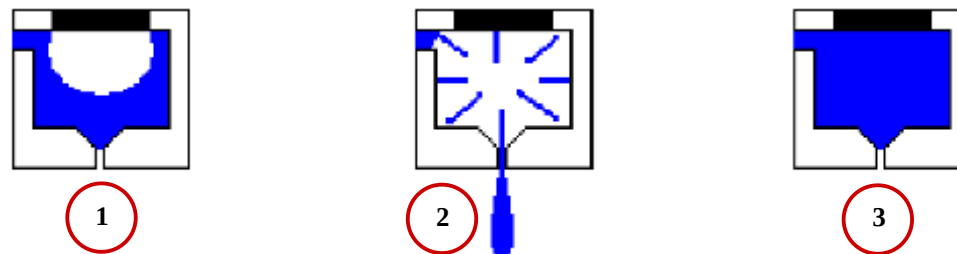
Laser

System Devices

- **Inkjet** - uses an electric charge to vibrate a membrane. When the membrane flexes downwards, it ejects an ink droplet through the nozzle (1). When it flexes upwards, it draws more ink into the reservoir (2).



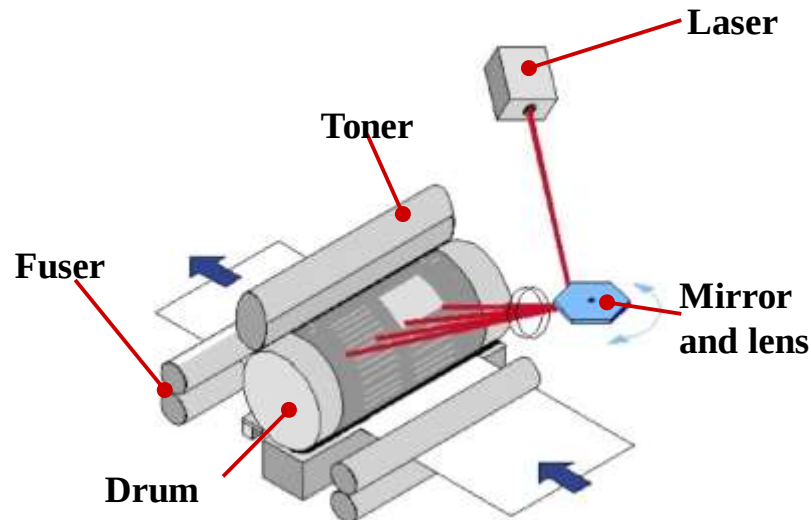
- **Bubblejet** - a heating element locally heats ink to form a bubble (1). As the bubble expands, it forces ink through the nozzle (2). When it bursts, it causes a vacuum which draws ink into the reservoir (3).



System Devices

Laser printers use **toner** (powdered ink) instead of liquid ink as in inkjet printers.

- Laser printers produce images using dots. The image is created using a **laser beam** and a **mirror -lens** arrangement on a **drum** coated with magnetically charged **toner** and then transferred from the drum to the paper. The paper is then fed through a heated **fuser** which fuses the toner to the paper as ink.



System Devices

Printers are available as **A4**, **A3** and even **A2**, but if larger drawings and images are required, a plotter is more suitable.

Plotters use inkjet technology and are available in **A3**, **A2**, **A1** and **A0**. They take up much less space than an equivalent inkjet or laser, but are more expensive.



Plotter

System Devices

Computer Specification

- Intel Core Duo Processor - 2.66MHz 64-Bit CPU, 128 KB L1 cache, 4MB L2 Cache, 1333MHz FSB
- Windows Vista Business
- 4GB DDR2 Memory - 667MHz
- 500GB SATA HDD 10,000rpm
- 256MB DDR2 NVIDIA PCI-Express Graphics
- 19" Widescreen LCD - 0.22mm Dot Pitch, Res -1490 x 900
- 7:1 Surround Sound Inc. Woofer
- PCI-E Mainboard - nForce SLI, Micro ATX
- 6 x USB2 Ports - 2 Front
- 2 x 1394 Ports - 1 Front
- Broadcom GB LAN Network Connection
- Multi Card Reader
- 18X SATA Dual Format Dual Layer DVDRW Drive
- 550W Power Supply
- Logitech Wireless Internet Keyboard and Wireless Optical Mouse

Basic Logic Gates and Basic Digital Design

NOT, AND, and OR Gates

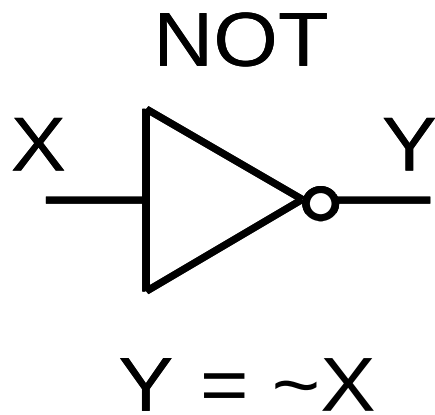
NAND and NOR Gates

DeMorgan's Theorem

Exclusive-OR (XOR) Gate

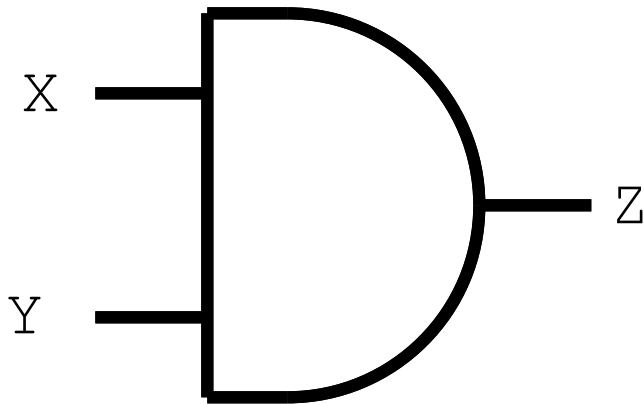
Multiple-input Gates

NOT Gate



AND Gate

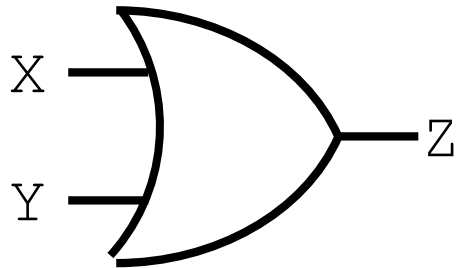
AND



$$Z = X \& Y$$

OR Gate

OR



$$Z = X \mid Y$$

INTRODUCTION

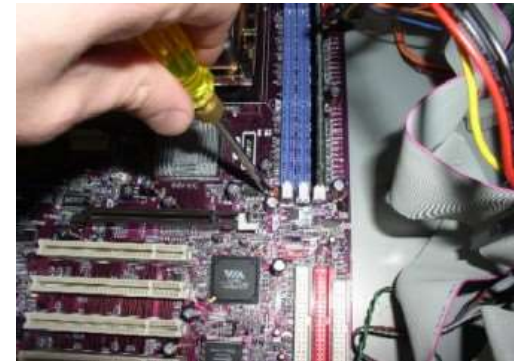
- Things to Prepare before Assembly
- Anti-static wrist strap
- Set of screwdrivers and pliers
- Piece of cloth
- CPU Thermal compound (recommended)
- PC components



STEP 1

Installing the motherboard

- Make sure you have all the components in place and a nice, clean and big enough place to work with.
- Put your antic-static wrist strap on to prevent your components from getting affected. Make sure your hands are clean before starting.
- Unscrew and open the side doors of the cabinet
- Lay the cabinet on its side
- Put the motherboard in place
- Drive in all the required screws on the motherboard screw mounting points.



Installing the CPU

- CPU is the heart of a computer so make sure you handle it properly and do not drop it or mishandle it.
- DO NOT touch the pins.
- Get hold of your motherboard and CPU manual
- There is a golden mark on the CPU to help you assist. Consult both your motherboard and CPU manual to see which position it fits exactly
- Lift the CPU lever on the motherboard
- Place the CPU properly on the motherboard
- Pull down the lever to secure the CPU in place



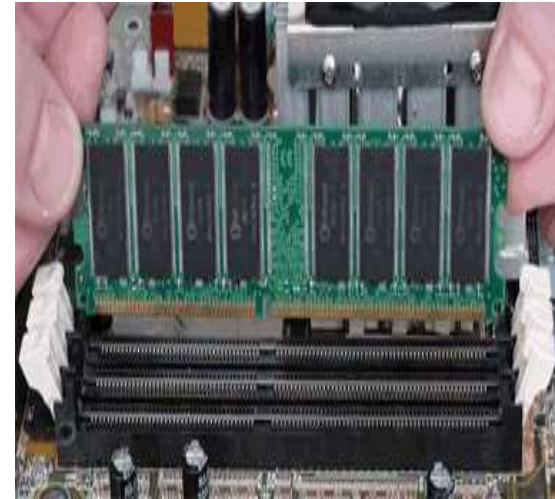
Installing the heat sink

- After installing the processor we proceed to installing the heat sink. There are different kinds of heat sinks that are bundled with the processor and each has a different way of installation.
- Place the heat sink on the processor
- Secure the heat sink with the lever or screws.
- After this you will need to connect the cable of the heat sink fan on the motherboard. Again look into the motherboard manual on where to connect it and then connect it to the right port to get your heat sink in operational mode.



Installing the RAM

- The newer RAMs ie. DDR RAMs are easy to install as you don't have to worry about placing which side where into the slot.
- DDR RAM terminals are split into 2 lengths to fit in to the RAM connector.
- Push down the RAM into the slot
- Make sure the both the clips hold the RAM properly



Installing the power supply

- We will now install the power supply as the components we install after this will require power cables to be connected to them.
- Place the PSU into the case bracket
- Put the screws in place tightly



Installing the video card

- First you will need to find out whether your video card is AGP or PCI-E. AGP graphics cards have become redundant and are being phased out of the market quickly.
- Remove the back plate on the case corresponding to the graphics card
- Push the card into the slot
- Secure the card with a screw
- Plug in the power connection from PSU (if required)
- High-end graphics cards need dedicated power supply usually a 4/6 pin plug.



Installing the hard disk

- Hard disks are **fragile** and needs to handled carefully.
- Place the hard drive into the bay
- Secure the drive with screws
- Connect the power cable from PSU to hard disk
- Connect the PATA (IDE) or SATA cable from motherboard into the drive



Installing optical drive

- The installation an optical drive is exactly similar to an hard drive.
- Place the optical drive into the bay
- Drive in the screws
- Connect the power cable and data cable
- **Tip:** When installing multiple optical drives take care of jumper settings. Make sure you make one as primary and other slave by using the jumper. This is not applicable if the drives are SATA drives.



Connecting various cables

- You will need to consult your motherboard manual for finding the appropriate port for connecting various cables at the right places on the motherboard.
- Connect the large ATX power connector to the power supply port on your motherboard
- Next get hold of the smaller square power connector which supplies power to the processor and connect it to the appropriate port by taking help from your motherboard manual
- Connect the ATX case cables for power, reset button in the appropriate port of the motherboard
- Connect the front USB/audio panel cable in the motherboard
- Plug the cable of ATX case cooling fans



- Get the rest of the PC components like monitor, keyboard, mouse, speakers etc. which we will connect now.
- Connect the VGA cable of the monitor into the VGA port
- If mouse/keyboard are PS/2 then connect them to PS/2 ports or else use the USB port
- Connect the speaker cable in the audio port
- Plug in the power cable from PSU into the UPS
- Also plug in the power cable of the monitor
- **DOUBLE CHECK ALL CABLES BEFORE POWER ON the PC!**



Installing the OS and drivers

- Insert OS CD/DVD into CD/DVD rom drive.
- Set the first boot device to CD/DVD drive in BIOS
- Pop in the OS disk
- Reboot the PC
- Install the OS
- Install drivers from motherboard CD (applicable only to Windows OS)
- **All Done! PC is now ready to use!**

Glossary and Abbreviation:

CPU – Central Processing Unit

RAM – Random Memory Access

DDR -Double Data Rate

SDRAM – Synchronous Dynamic
Random Access Memory

PSU -Power Supply Unit

AGP – Accelerated Graphics Port

PCI-E – Peripheral Component
Interconnect- Express

SATA – Serial Advanced Technology
Attachment