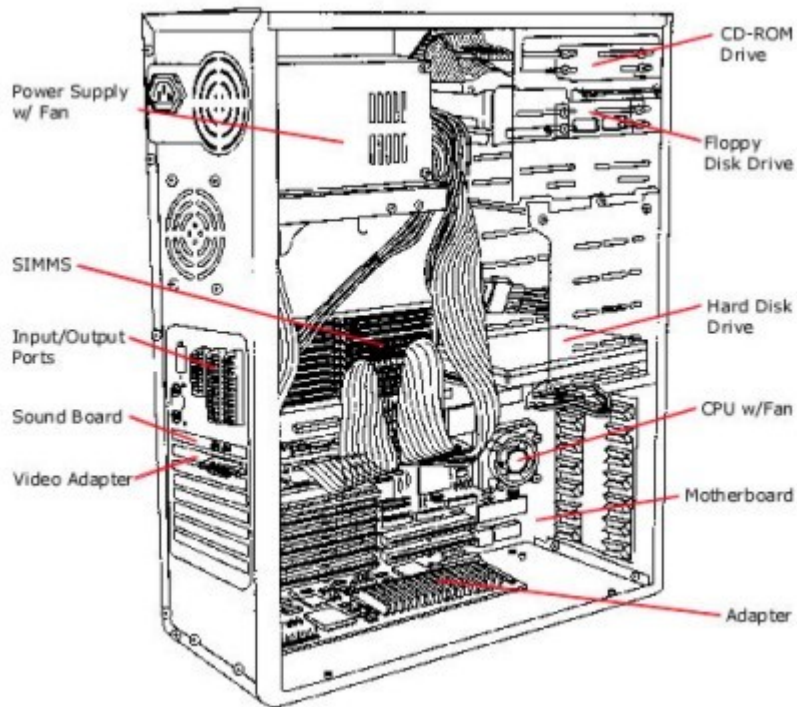# PC-HARDWARE

a workshop by col-me.info

PORTS:
In computer hardware, a 'port' serves as an interface between the computer and other computers or peripheral devices. Physically, a port is a specialized outlet on a piece of equipment to which a plug or cable connects.

There are physically male or female ports. On Hardware parts, they are usually female, as protruding ports break easier. Like for example, where USB cable or your ethernet (internet) cable gets plugged in – that's ports.
Ports use a 'handshake' system to talk to each other and verify hardware and other data.

Common ports are for example:
PS/2 ports
Firewire/USB
Telephone modem
Ethernet cable
--> fotogallery on:
http://en.wikipedia.org/wiki/Computer_port_(hardware)#Example_ports

There are electronically two types of ports:

- *Serial ports* (send/receive one bit at a time – mostly replaced now by USB/Firewire/Ethernet devices, that send data rather in a stream); was mainly used for Modems and Terminals; is still in use, as it is a cheap port,

standardized and highly spread. Visual ports get nowadays replaced by VGA ports. Common applications for serial ports are Dial-up modems, barcode scanner, GPS systems, printers....

- *Parallel ports* (send multiple bits at the same time) – also known as printer port, using the IEEE1284 standard for bi-directional communication. These ports are programmable. They are actually quite 'old' (around 1970 the first parallel port printer went on the market) and were mainly used for printers, scanners, zip-drives, joysticks.... Today they belong to the legacy ports (ports, that are considered as being obsolete and don't get included in hardware anymore)

- *Hotports* can be added and removed, while the system is running – also called PlugnPlay ports (such as USB, Firewire – most of the ports are hotports; not the PS/2 port!! It's even dangerous to unplug/plug it, while system is running).

- *Software ports* are virtual ports, used for communication (UDP and TCP ports for example);

PLUGS:
Plugs connect electrical circuits – like if you are connecting two electrical cables with each other (seen when you mount a lamp for example). There are hundreds of different kinds of plugs. In computer electronics it is basically the 'other' parts of the ports – also called connectors. Connectors connect either two parts of cables, or connect a wire/cable to an electric terminal. Plugs are roughly differentiated in male and female parts, although there's also a hermaphrodite version of plugs. Plugs at the computer are for example a USB-cable, an internet cable, an audio cable (from your speakers for example).

BUS:
It is a subsystem that transfers data between computer components inside a computer or between computers, where it connects more peripherals over one set. An internal bus connects the internal components to the motherboard, the CPU and the memories. External busses connect external devices to the motherboard. External bus is for example a SCSI attachment (disk/tape) or USB;
The PCI is for example a computer bus, used to attach devices to a motherboard (the SCSI cables for example). Busses are part of the chipsets, usually used in PC's to take care of audio and graphics.

INTERFACE:
Interface generally refers to an abstraction that an entity provides of itself to the outside. It basically provides translation between entities which do not speak the same language, such as between a human and a computer. Your remote control is an interface between you and your TV, English language is the interface between people, the interface between a human and a computer is called a user interface (the windows, programmes, etc...)... Interfaces between hardware components are physical interfaces.

PCB (PRINTED CURCUIT BOARD):
A PCB is used to electrically connect electronic components. The cards in your computer are all made out of PCB's – which you find in all electronical equipment. Those are the plates, where electronical components are mounted on and connect each other through vias.
Usually the plates are etched with several techniques used. These PCB's are cheap and highly reliable.

CARDS:
A card is actually a PCB, that you can add in an expansion slot on the motherboard. These slots are often busses and are connected to the motherboard. Common are video, sound or network cards, TV tuner cards, that add some kind of functionality to your PC. These cards are called external/expansion cards in opposite of on-board or internal cards, that are delivered already on the

motherboard (like for example sound and videocards). You may want additional functionality like a better graphic card or a better soundcard.

PROCESSOR:
The Processor or CPU (Central Processing Unit)is a machine that can execute computer programs. The term is first used in computer industries around the 1960s. Now we are using mainly standardized CPU's and modern microprocessors are found in everything (cars, cellphones or children toys....).
Before the integrated circuit (IC, microchip, microcircuit or chip and is simply a minituarized electronic circuit) came on the market, 'CPU's' were built out of relays (for example – relays nowadays are taking care of lights in hallways, that turn themselves off after some time).
The introduction of the microprocessor influenced the CPU enormously – the company intel built the first microprocessor in the 1970s. With the advent and success of the PC's, the term CPU was now applied exclusively to the microprocessors. So CPU's nowadays are one little chip, that make the processing much faster, than it was ever possible before.

MEMORIES AND STORAGES:
Memories are also often called storages – they are components, devices and recording media that retain digital data. The harddisk is for example a storage device. There's a hierarchy between memories and storages. The lower the storage, the longer it takes the CPU to access it.
RAM (Random-access memory) is used for primary storage, but it is a memory, that is cleared out at the start up of the computer. So the computer, in order that it actually is able to start up, needs a storage, that is not emptied. A small computer memory, called non-volatile memory, is accessed containing a start up programe (BIOS), which is accessing the secondary storages (like the harddisk, or the CD-ROM drive) to search for boot sequences.
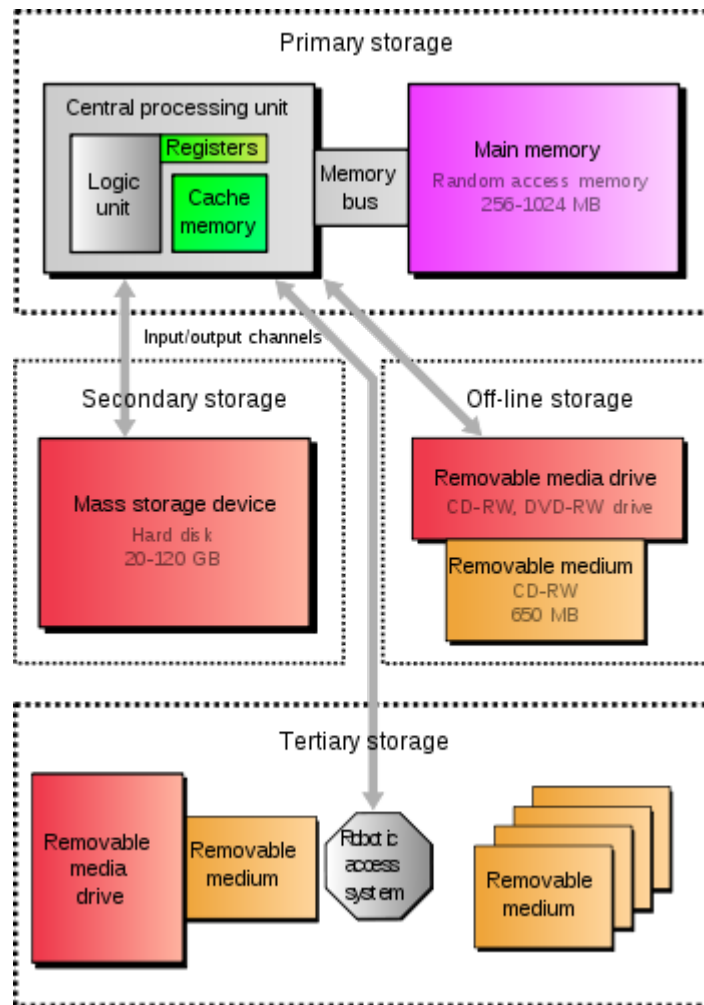
ROM – like in CD-ROM actually refers to a Read-only memory (which are not always read-only).

The secondary storage is actually not directly accessed by the CPU. The CPU uses for intermediate storage the primary memories. Secondary storages are non-volatile – meaning they don't lose data, when you shut down the machine. Secondary storages are for example harddisks, flash memories, USB-sticks, floppy disks, punch cards.....

Tertiary storage involves usually a robotic mechanism which inserts or removes physical tapes.

Offline storage is storage, that is not (always) connected and is not under control of the CPU (or not always). They are used to make backups of data (in case the computer breaks).

For visualisation of the hierarchy tree please see the picture below.

Primary storage

Central processing unit

Registers

Logic unit

Cache memory

Memory bus

Main memory
Random access memory
256-1024 MB

Input/output channels

Secondary storage

Mass storage device
Hard disk
20-120 GB

Off-line storage

Removable media drive
CD-RW, DVD-RW drive

Removable medium
CD-RW
650 MB

Tertiary storage

Removable media drive

Removable medium

Robotic access system

Removable medium

Hierarchy of memory and storage devices

CACHE
The cache is a collection of data duplicating original values stored elsewhere
or computed earlier, where the original data is expensive to fetch (owing to
longer access time) or to compute, compared to the cost of reading the cache. In
other words, a cache is a temporary storage area where frequently accessed data
can be stored for rapid access. Once the data is stored in the cache, future use
can be made by accessing the cached copy rather than re-fetching or recomputing
the original data, so that the average access time is shorter. The cache is also
used in your browser to access webpages faster.

MASTER/SLAVE
 Master/slave is a communication model where one device or process has
unidirectional control over one or more other devices. Once a master/slave
relationship between devices or processes is established, the direction of
control is always from the master to the slaves. In some systems a master is
elected from a group of eligible devices, with the other devices acting in the
role of slaves.
In our machine the master/slave relationship is important to add physical
storage devices. Usually you have place for four devices (like two harddisks,
two CD-ROMs) which are connected to the motherboard by SCSI cables. The physical
devices have to be 'jumpered' — means it has to be told, whether it is in the
position of master or in the position of the slave.

In this case, the master/slave relationship is not hierarchically, but simply tells in which order the devices are connected to the cable.
The terms master/slave have also called a controversial debate upon the terms, that can be understood as being discriminating.

BIOS
BIOS stands for Basic Input/Output System and is a firmware interface for computers. The BIOS is boot firmware, designed to be the first code run by a computer when powered on. The initial function of the BIOS is to identify, test, and initialize system devices such as the video display card, hard disk, and floppy disk and other hardware. This is to prepare the machine into a known state, so that software stored on compatible media can be loaded, executed, and given control of the PC. This process is known as booting, or booting up, which is short for bootstrapping.