

HARDWARE

There are five categories of Hardware:

- 1) Input Devices
- 2) Output Devices
- 3) Memory Devices (Primary Storage)
- 4) Storage Devices (Secondary Storage)
- 5) Processor (Central Processing Unit)

INPUT DEVICES

Input means to enter data, programs, commands and user responses into memory of a computer. An input device is therefore any device that transfers data from the outside world into a computer.

Here is a list of devices (will discuss their uses in class):

Manual Input Devices:

Keyboard Entry: Keyboard

Terminal Entry: Point of Sale Terminal, Dumb Terminal, Smart Terminal, Intelligent Terminal, Automated Teller Machine

Pointing Devices: Mouse, Track Ball, Glide Pad, Light Pen, The Graphical Tablet or Digitizing Pad, Electronic Notepad, Touch Screen, Gaming Devices (Joystick and Game Controller), Touch Pad, Pointing Stick, digital pen.

Source / Direct Data Entry Devices:

Barcode Reader

Smart Card

Optical Mark Recognition (OMR)

Optical Character recognition (OCR)

Magnetic Ink Character Reader (MICR)

Sensors

RFID (Radio frequency identification) Readers

Biometric Input

Multimedia Input:

Digitizers (Photo and Video): Digital Cameras and Digital Camcorders, Webcam, Voice-recognition systems

Sound Recording: MIDI (musical instrument digital interface) and Microphone

All of these Input Devices are used in the following Areas:

Home
Education
Small Office / Home Office
Mobile
Power users
Large Business

It is your job to fit each device to the related category. Another note: There are input devices for physically challenged users, special types of keyboards scanners and sensors please do some additional research on them.

OUTPUT DEVICES

To get processed information out of a computer, you need an output device. “Output” means to produce the results of processed data. The most common types of output are:

- 1) Soft copy: This is not a permanent copy. It includes output from a monitor, audio (sound) from speakers, electrical signals from modems and output from one computer to another.
- 2) Hard Copy: This is also called permanent output since it is printed for you to review away from the computer. Examples are printed reports and pictures.

Output Devices fall in the various Categories:

Display Devices:

Flat Panel Displays: LCD (Liquid Crystal Display), Electroluminescent Display (ELD), Electrophoretic Display (ED) and Plasma
CRT (Cathode Ray Tube) and Televisions
Graphics Adapter / Video Card
TV Card

Printing Devices:

Impact:

- 1) Dot Matrix
- 2) Daisy Wheel
- 3) “Band” or “Train” Printer
- 4) Line Printer

None Impact:

- 1) Inkjet Printer
- 2) Photo Printer
- 3) Laser Printer
- 4) Thermal Printer
- 5) Mobile Printer
- 6) Label and Postage Printer
- 7) Plotters and Large Format Printers

Other:

- 1) Disk or Tapes (I/O)
- 2) Modems (I/O)
- 3) Audio Output Devices: Sound Cards, Speakers, Headphones & Sub-Woofer
- 4) Sound Output Devices: Produces beeps and chirps, used for signals or warnings

- 5) Video Output Devices: Data projectors, Video Conferencing and VR (Virtual Reality)
- 6) Fax Machines (I/O)
- 7) Multifunction Peripheral (I/O)
- 8) Gaming Devices that produce force feedback
- 9) Simulators
- 10) Robots

N.B. I/O Stands for Input/Output

There are additional Terminologies that you will learn from this topic, such as: *Resolution, DPI, pixels, Refresh Rate, CPS, LPM, PPM, NLQ, Energy Star, DV, VGA, Dot-pitch, Infrared, Blue Tooth, toner, cartridge, mp3, and sampling rate.* Be sure to be familiar with these Terms.

Memory and Storage Devices Part I

Memory consists of electronic components that store instructions waiting to be executed by the processor, data needed by those instructions, and the results of processed data (information). The role of memory is to both store data and programs (stored program concept).

The System unit consists of two types of memory: volatile and nonvolatile. When the computer's power is turned off, volatile memory loses its contents but non-volatile memory does not lose its contents. RAM (Random Access Memory) is volatile and ROM (Read Only Memory) is non-volatile.

RAM and Cache (volatile)

RAM is called main memory, this consists of chips that can be read from and written to by the processor and other devices. There are three basic types of RAM chips:

1) Dynamic RAM: DRAM, Synchronous DRAM, Double Data Rate SDRAM (DDR SDRAM), DDR2 SDRAM and Rambus DRAM.

2) Static RAM

3) Magnetoresistive RAM (MRAM)

RAM chips are placed inside of memory slots on the motherboard; there are three types of memory modules: SIMMs (Single Inline Memory Module), DIMMs (Dual inline memory module) and RIMMs (Rambus inline memory module). The memory capacity for RAM is measured in Megabytes but with its growing capacity Gigabytes will soon be the norm. Average memory of a modern computer is 512 MB; more powerful computers contain 1GB to 2GB of RAM, it's very important to consider RAM when buying a PC.

Cache (pronounced cash)

This type of memory is used to improve performance (speeding up processor time) by storing instructions that have already been executed by the processor; there are three types of Cache: L1 cache, L2 cache and L3 cache, L stands for level and each level has a higher capacity.

ROM (non volatile)

These consists of Memory Chips that contain Permanent Data, hence ROM is non-volatile. When the power is removed Data is still held on the Chip. ROM chips often record data made by manufacturers of a chip this is usually called "firmware". Types of ROM: PROM (Programmable read only memory), EPROM (Erasable PROM) and EEPROM (Electrically Erasable PROM).

Other Technologies include Flash Memory (do research) and CMOS (Complementary metal-oxide semiconductor).

Memory and Storage Devices Part II

In a computer, storage is the place where data is held in an electromagnetic or optical form for access by a computer processor. There are two general usages.

- 1) Storage is frequently used to mean the devices and data connected to the computer through input/output operations - that is, hard disk and tape systems and other forms of storage that don't include computer memory and other in-computer storage.
- 2) In a more formal usage, storage has been divided into: (a) **primary storage**, which holds data in memory (sometimes called random access memory or RAM) and other "built-in" devices such as the processor's **L1 cache**, and (b) **secondary storage**, which holds data on hard disks, tapes, and other devices requiring input/output operations.

Primary Storage Devices: RAM and ROM Chips (discussed in Part I)

Secondary Storage:

Secondary Storage Devices Fall into various Categories:

- 1) Magnetic Disks (Direct Access Device): Hard Disk, Floppy Disk, Zip/Jazz Disk
- 2) Magnetic Tape(Sequential Access Device): Tape Reels, Tape Cartridge, Microfilm or Microfiche
- 3) Optical Storage (Direct Access Device): CD-ROM, DVD-ROM, WORM Disk,
- 4) Bistable Storage (Direct Access Device): USB Flash Drive, Flash Memory Cards

Sequential Access vs Direct Access: Sequential Access Storage devices retrieve data in the order it was stored (medium must be fast forwarded or rewind), while Direct Access Storage Devices can access data at any point unto the storage medium.

There are Advantages and Disadvantages of each storage medium, also technologies that govern how they function this will be discussed.

Here are some key terms to be aware of: Multimedia, Gigabyte, Megabyte, CD-R, CD-RW, DVD+R, DVD-R, DVD-RW, DVD+RW, DVD RAM, Formatting, backup, online storage, direct access, serial access and burning.

The Processor

The processor also called the central processing unit (CPU), interprets and carries out the basic instructions that operate a computer. The processor significantly impacts the overall computing power and manages most of the computers operations.

The processor is broken down into smaller categories:

- 1) *The Control Unit* 2) *The Arithmetic Logic Unit* 3) *Registers* 4) *System Clock*

The Control unit is the component of the processor that directs and coordinates most of the operations of the computer.

The Arithmetic Logic Unit performs calculations on the data in memory; it also does comparisons with other operations.

Registers are small high speed storage locations that temporarily hold data and instructions. Registers Store; Fetched instructions while the control unit decodes it and data, while the ALU computes it.

The System Clock is a small quartz circuit used for controlling timing operations. Each Tick equates a clock cycle (this is measured in Megahertz and Gigahertz). N.b. A hertz is one cycle per second. E.g. 3.8 GHz means 3.8 billion cycles per second.

Understanding the Machine Cycle: This is the process of Fetching, Decoding, Executing and Storing Instructions.

Understanding Pipelining: Processor fetches instructions before it completes the machine cycle, in other words with pipelining the processor does not have to wait for one instruction to complete.

AMD VS INTEL

Advanced Micro Devices and Intel are the world's leading Microprocessor producers. They are both in comparison good at producing these high speed chips but command their own loyalty base as to who is better. AMD has been known to produce faster chips at a lower price, while Intel makes more durable long lasting chips, for a premium price of course.

Note Intel and AMD are not the only players; there is also IBM, Motorola and other companies.

Other Keywords to Study: Pentium, Hyper Threading, Dual Core, Cache, Itanium, Xeon, Duron, Athlon.