Unit 1 - Hardware

The Internal Components of a Personal Computer (PC)

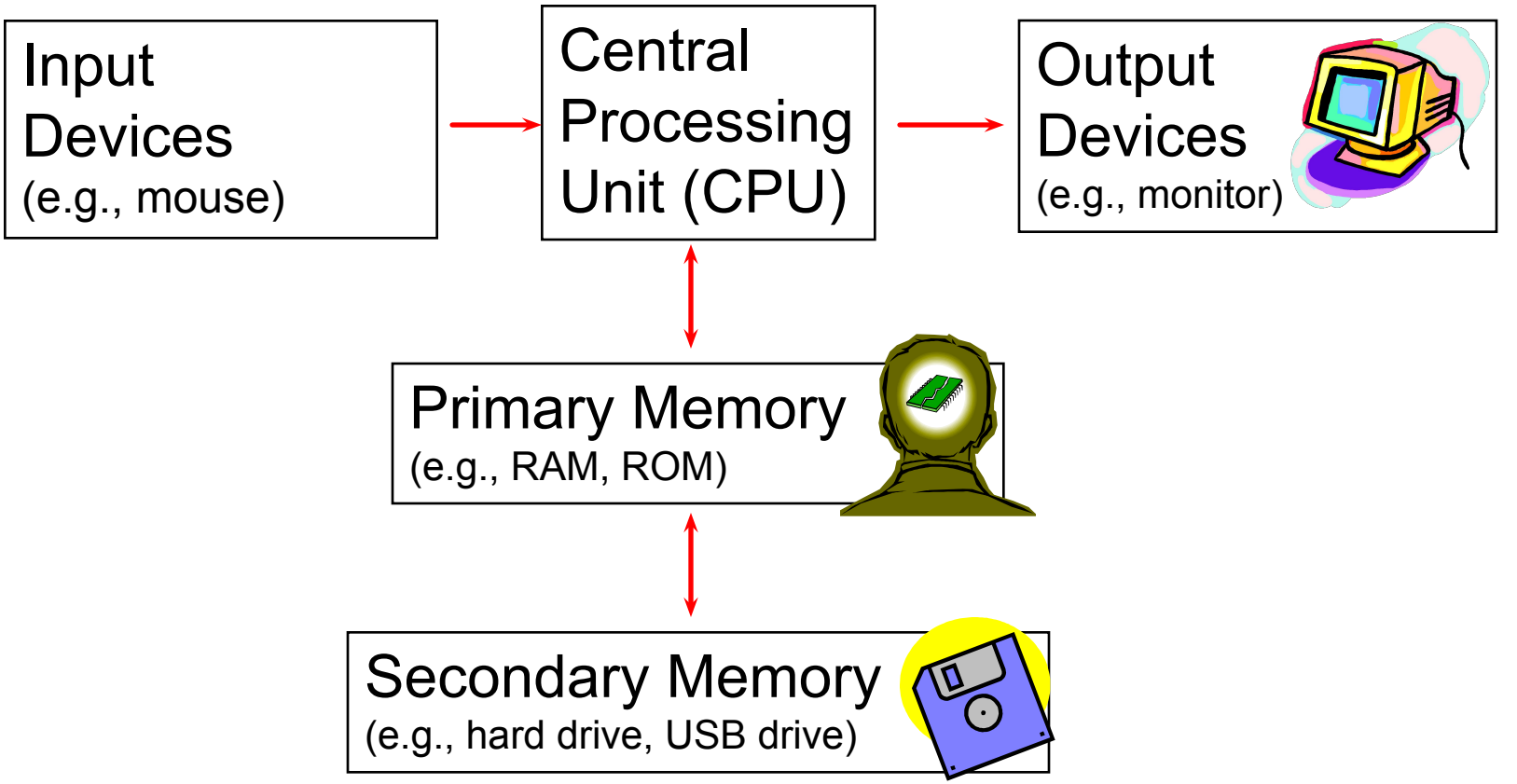
Intro to Computers Videos

Computer History and Overview

Internal Components

HARDWARE

- **Hardware** refers to the physical components that make up a computer system
- Five categories of hardware:



Hardware

- **Input devices** refer to equipment that puts data into a form a computer can process
Examples: keyboard, mouse, webcam, etc.

- **Output devices** refer to equipment that translates processed information from the CPU into a form that can be understood by a human.
Examples: monitor (screen), sound (speakers)

- **CPU** is a unit that reads and executes computer program instructions

Hardware

- **Primary memory** refers to memory where the data and programs that are *in use at the time* are stored. As programmers, this memory holds the values of our variables. Primary memory can be directly accessed by the CPU in order to perform operations.

  Examples: RAM, cache memory, etc.

- **Secondary memory** refers to memory where a user stores data and programs for as long as desired.

  Examples: Hard drive, CDs/DVDs, USB sticks, etc.

INTERNAL COMPONENTS

Major internal components of a PC

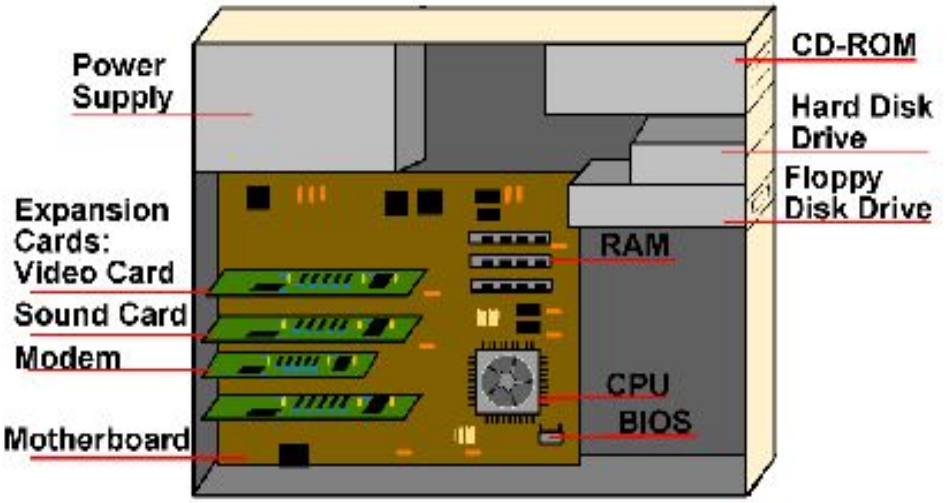
- Motherboard
- Central Processing Unit (CPU)
- Memory (RAM and ROM)
- Hard drive
- Expansion Slots
- Power supply unit

A midi-tower case (cover removed)

Inside the Computer Chassis

Inside Computer Case

Inside the Computer Chassis

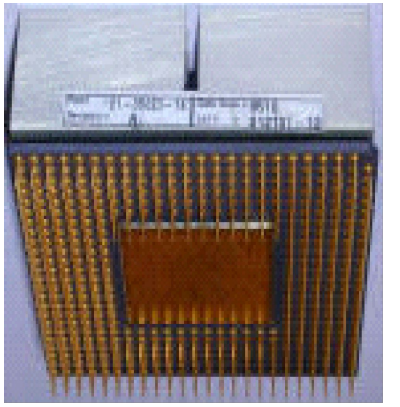


Components Inside a Computer

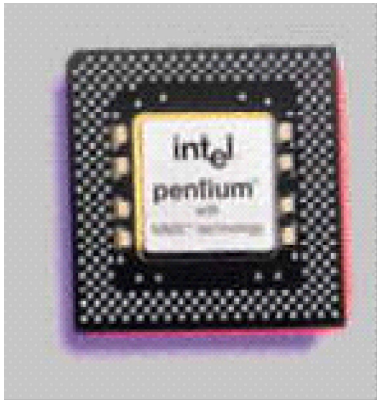
(Wires not shown)

CPU (Central Processing Unit)

- The CPU can be referred to as the *brain* of the PC.



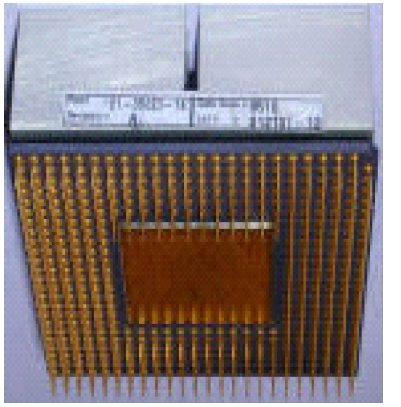
- *ALL* instructions are sent to the CPU using a specific and complex set of codes.

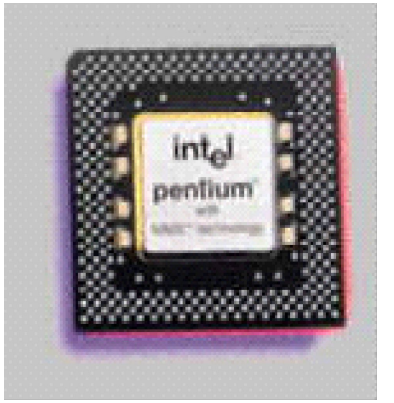


- The CPU performs calculations and makes decisions for other components.

CPU (Central Processing Unit)

- Although the instructions performed by the CPU are relatively simple, the CPU can execute many millions of instructions every second. This is what makes the PC such a powerful tool.





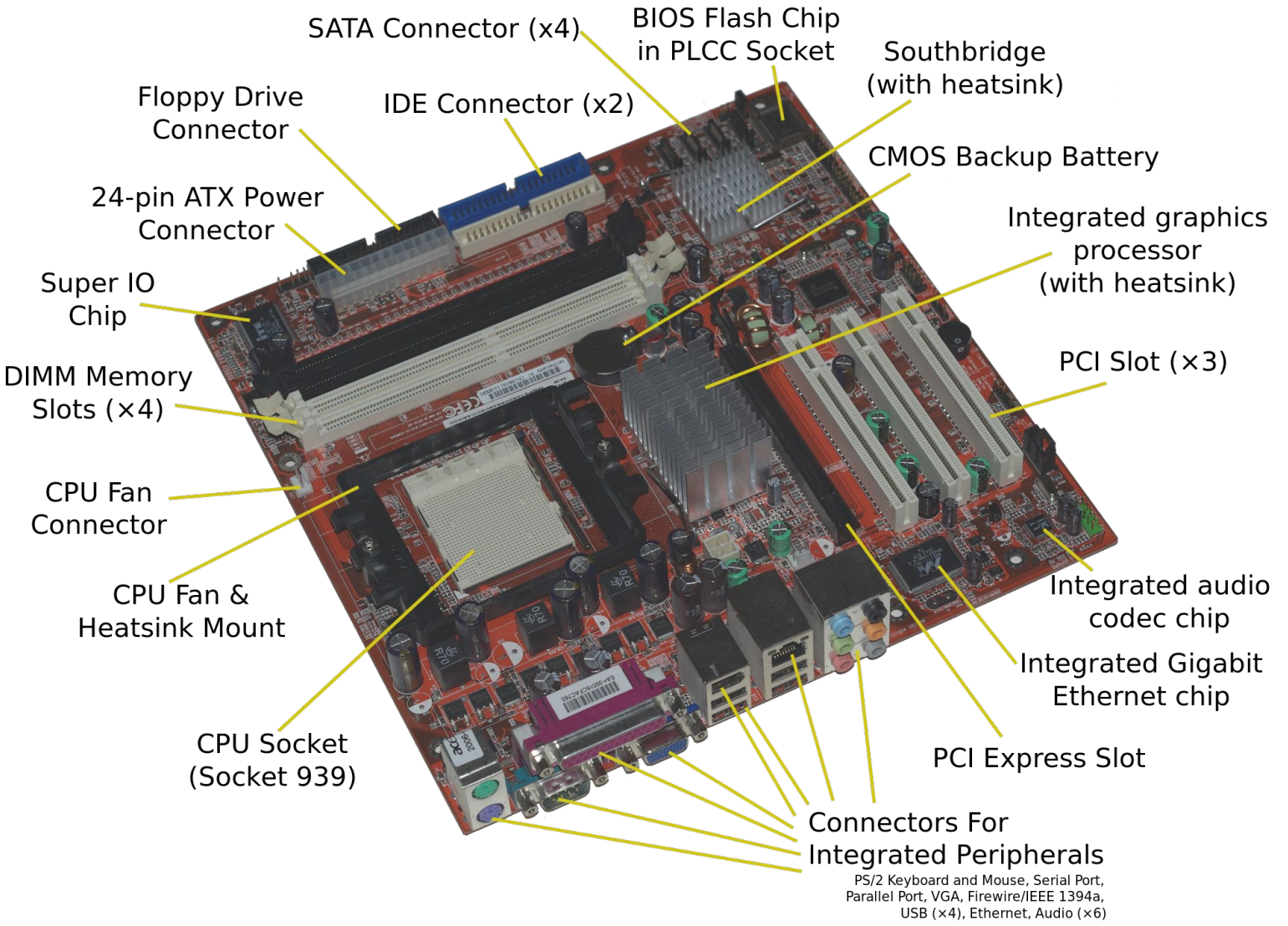
MOTHERBOARD

- The motherboard holds the CPU, memory chips (RAM and ROM), expansion slots, power connectors and any other microchips required for the PC to function.

- Think of it as the *central nervous system* of the computer: everything plugs into it and it regulates communication between components.

- Better components require better motherboards!

MOTHERBOARD

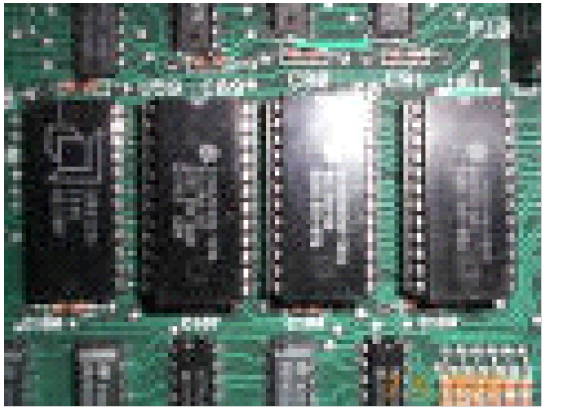


MEMORY

- There are two distinct types of memory within every PC:
  - **ROM - Read Only Memory**
  - **RAM - Random Access Memory**

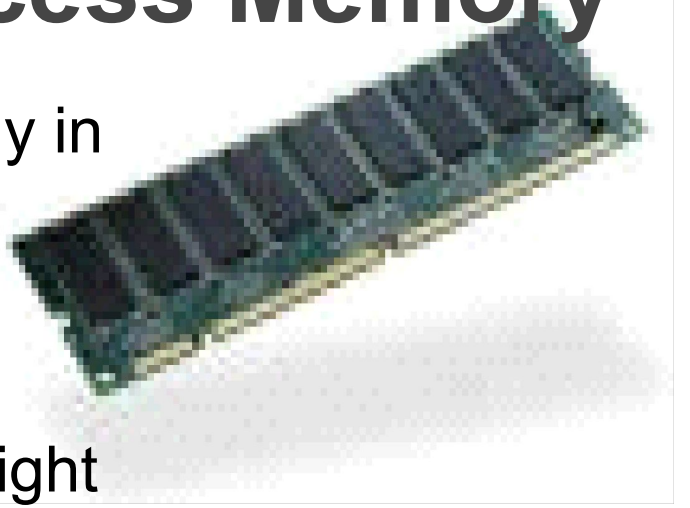
ROM (Read Only Memory)

- ROM is a special type of memory that stores information that has been programmed into the PC during construction. The PC user cannot change this information.



- For example, ROM contains the information that is used when the PC is turned on or reset (loading the BIOS – Basic Input/Output System).

RAM - Random Access Memory



- RAM contains data that is currently in use by programs running on the computer
- When a program is finished with some data, it may not be lost right away, but it will be replaced if another program needs the space.
- Space in RAM is limited, so programs need to avoid using too much of it.
- Data in RAM is volatile: lost when the power to the computer is turned off.

HARD DRIVE

- If data held in RAM is to be kept permanently, it should be saved to the hard drive.

- Much slower than RAM, so not good for immediate use by CPU.

- Data persists even if the power is disconnected!

Ribbon Cable

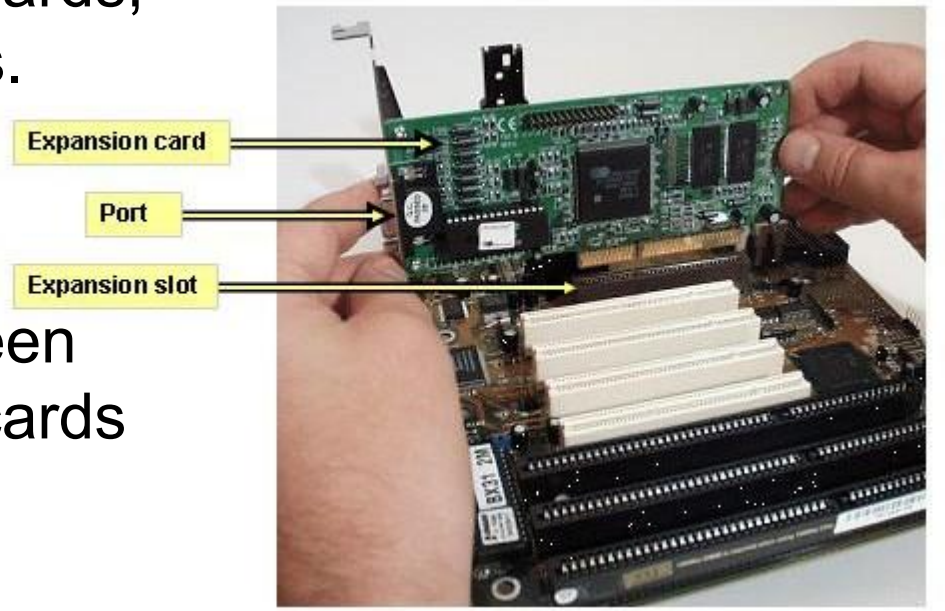
- A flat, thin cable containing many parallel wires through which data is transmitted between parts of a computer.
e.g. it is used to connect disk drivers and disk driver controllers.

- An example of a *bus* -- an electronic line that transfers data from one place to another place in a computer.

EXPANSION SLOTS

- Expansion slots allow a PC to grow. They can be used to add new devices such as sound cards, video cards, or network cards.

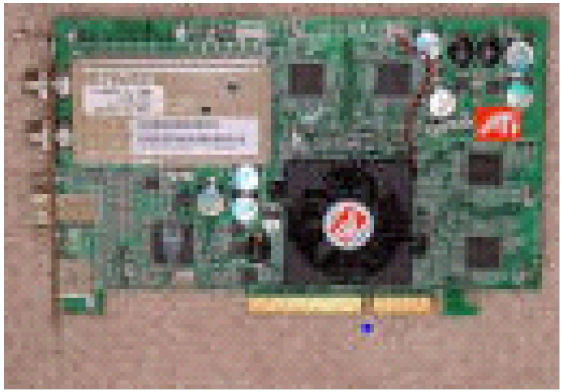
- Expansion slots are high-performance links between the CPU and the expansion cards (rather than cables).



VIDEO CARD

- The video card is responsible for displaying images on to the monitor.

- Made for PCI, AGP, or PCI-express expansion slots.

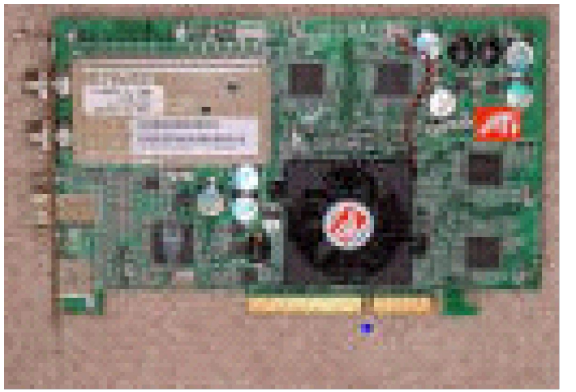


- Fastest: PCI-express

- You can also run more than one video card (if your motherboard allows it) for gaming purposes. Like having two brains!

VIDEO CARD

- The video card receives image data from the CPU and stores the information in Video RAM (VRAM).



- A special video chip then scans this data and converts it to a digital image.

- This digital image is then converted to data that can be displayed using the monitor.

POWER SUPPLY

- The power supply is responsible for converting the incoming AC power from your plug to the 3.3 V, 5V, and 12v DC power that is required by the PC.

POWER SUPPLY

- 3.3v and 5v supply is used to power the circuit boards on the PC. The 12v supply is used to power motor-driven devices such as hard drives or CD-ROMs, and fans.