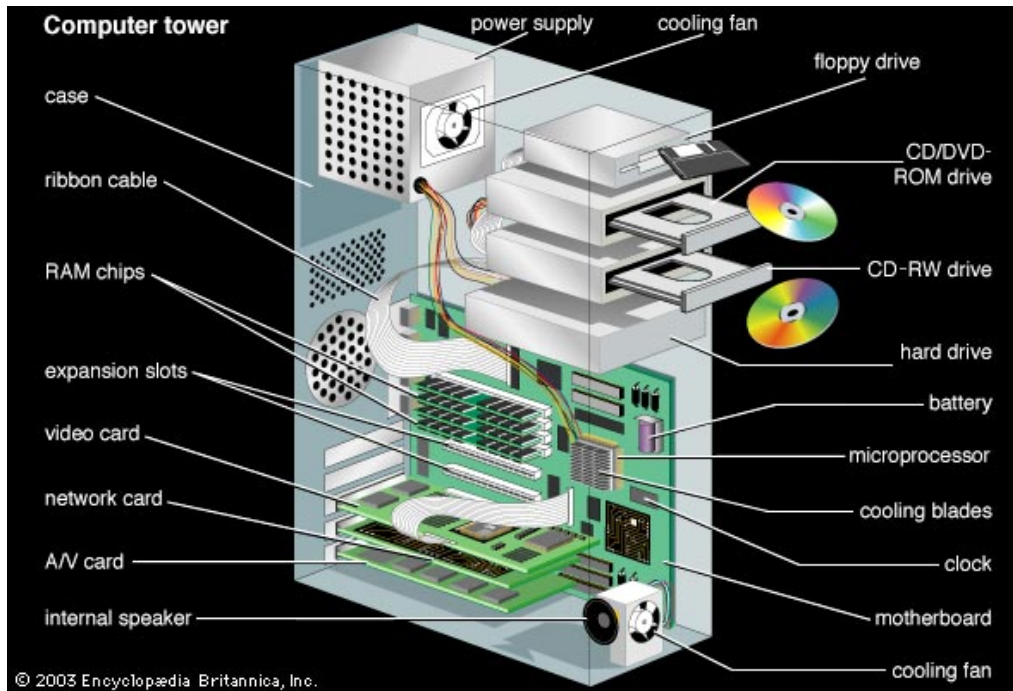# THE SYSTEM'S UNIT

Unit Overview

"What's in the box?" In this unit, the student will answer that question by delving into the inside of the computer. The common computer parts and their functions will also be identified. The student will also uncover the mystery surrounding many of the acronyms used in the computer industry.

Key Terms

Motherboard: A board that contains the main chips and circuitry of the computer hardware, including the CPU.	**System Bus:** The system bus is copper tracing on the motherboard that transports data between the CPU and memory.
Microprocessor: The microprocessor is the central processing unit or processor contained on a chip.	**Memory:** The electronic circuitry that temporarily holds data and program instructions needed by the CPU.
Chipset: A part of the motherboard that guides and controls the flow of data between the computer's components.	**Megahertz:** One measure of a computer's microprocessor speed is equal to one million cycles per second.

Computer Internal Layout

Computer tower

- case
- ribbon cable
- RAM chips
- expansion slots
- video card
- network card
- A/V card
- internal speaker
- power supply
- cooling fan
- floppy drive
- CD/DVD-ROM drive
- CD-RW drive
- hard drive
- battery
- microprocessor
- cooling blades
- clock
- motherboard
- cooling fan

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The system's unit is the computer tower or computer case that contains the electronic components of the computer system. The motherboard is the main system unit component. It is a flat circuit board contained within the computer's housing. Laptop computers usually have the same components as their desktop brethren but in a much more compact form. To help illustrate the layout of a computer more easily, we will focus this lesson on desktop computers.

Computer Case

The *computer case* is important because it provides protection for the internal electronic components of the computer. The computer case must also provide sufficient ventilation (so the electronics don't overheat) and room for expansion. Most computer cases are designed to accommodate specific motherboard types.

Case Front Panel

The *case front panel* of this computer case contains four 5.25 inch drive expansion bays, which could be used for a CD/DVD-ROM drive or CD-RW, BluRay disc drive, hard drive bay, SD card reader, etc. The case also contains one 3.5 inch expansion drive bay, which could be used for a Zip Drive or floppy disk drive which could be used for many of the same (but smaller like USB ports or an SD card reader) ways as the 5.25 inch bays. Typically, the front panel of a computer case contains an on/off switch, a power indicator light, and a hard disk drive activity light. In addition, many computer case front panels contain USB ports for easily connecting digital cameras and other electronic devices to the computer.

Case Rear Panel

The *case rear panel* contains many openings, which are shown in the picture to the left. The expansion slot covers can be removed to connect a variety of expansion cards (which in this diagram is filled with a video card, network car, and a modem). The small holes down the right side of the case rear panel are used to increase ventilation. Additionally, there are numerous other slots for everything to headphones to USB ports.

Expansion Slot Covers

Case Fan

Because computer components generate a lot of heat, the computer *case fan* is essential for maintaining the functionality of the computer. The case fan is the primary source for cooling internal components for most computers (as some custom or higher end computers may use liquid cooling). Some computer cases are built to accommodate additional case fans.

Power Supply and Cables

The *power supply* provides the electricity supply to the motherboard and computer drives. Power supplies usually have wattages of 200 watts to 750 or 1000 watts, but more powerful models are available. The *power supply cables* contain red, yellow, and black wires. The black wires are ground wires, while the red wire supplies five volts of power and the yellow wire supplies twelve volts of power. The power cable connector connects the power supply with the computer's drives.

Floppy Disk Drive

The *floppy disk drive* allows you to transfer files using 3.5 inch disks (or back, back, back in the day 5.25 inch discs that were bendable (i.e. floppy) – that is why they were called "floppy discs", and the name stayed with the smaller 3.5 inch disks even though they were not floppy anymore). Floppies have / are largely disappeared, but you may still run into them from time to time. Fun note: Commonly, the icon that is used to "save" your work with software today (like Microsoft Word or Adobe Acrobat) uses an image of an old floppy disk.

Optical Disk Drive

The *optical disk drive* allows you to install software, play music CDs and watch DVD or Blu-Ray movies. This drive can also be used to make music disks, copy movies, and backup data, photos, etc.
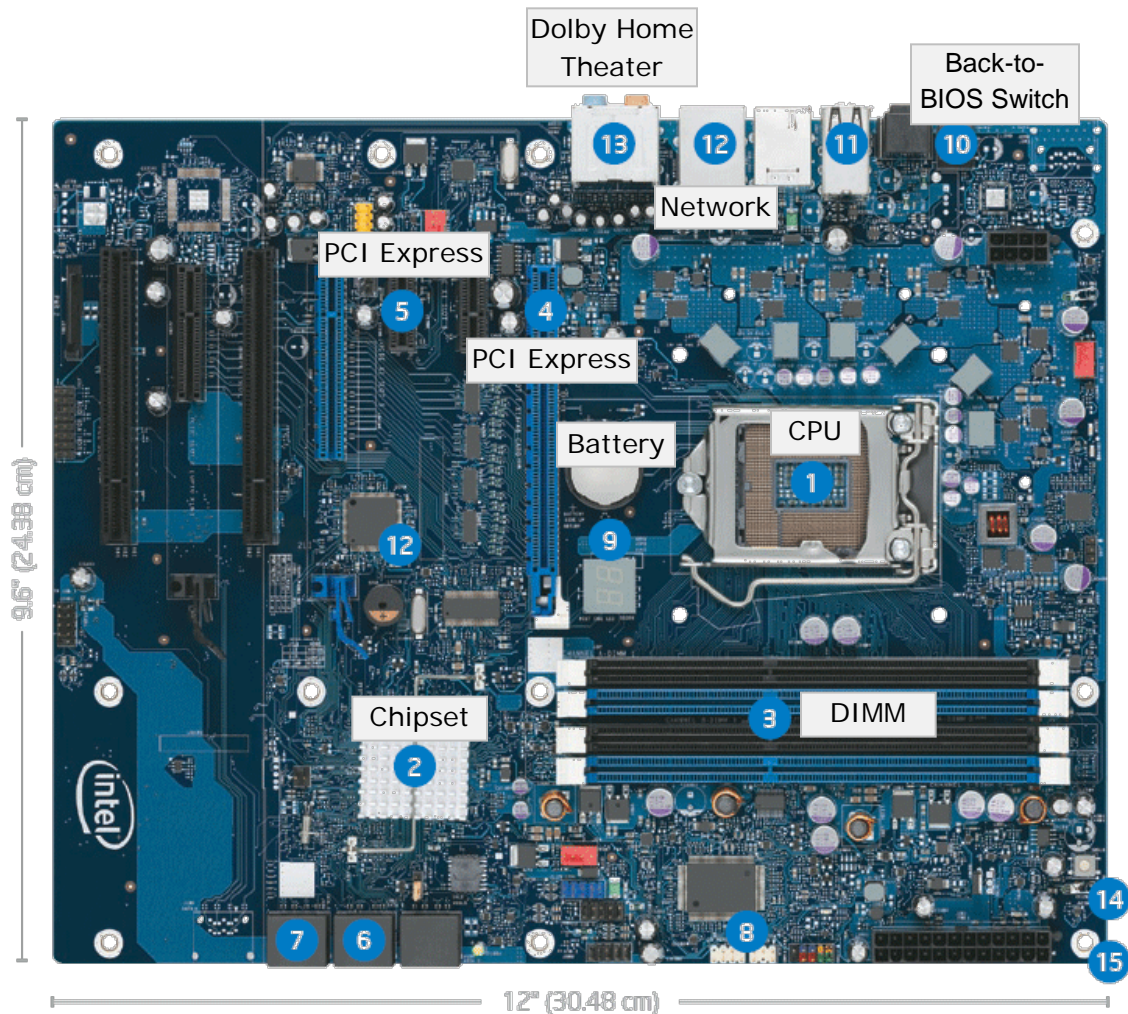
Hard Drive
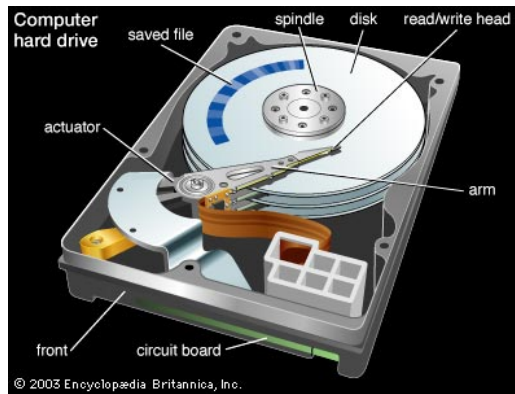
The computer *hard drive* contains disks that are made of aluminum or glass, or ceramic. The disks in a typical hard drive cannot be removed or replaced. Hard drives are today usually measured in either gigabytes or terabytes (a thousand gigabytes). So your laptop might have a 500 GB (gigabytes) hard drive but your desktop may have a 2 TB (terabyte) hard drive which would be equal to 2000 GB. *One terabyte can hold 120 dual-layered (8.4 Gigabyte) DVD's within it.* The hard disk drive stores the files and programs that are used by your computer every day. The hard disk drive is usually referred to as **Drive "C:"**

Motherboard

The *motherboard* is a circuit board inside the computer and is the main system unit component. The motherboard uses electrical paths to connect each component of the computer. The motherboard has slots or sockets for the central processing unit, memory, video, audio, etc. Everything inside the computer is connected to the motherboard.

Labels on the diagram: Dolby Home Theater — 13, 12, Network, Back-to-BIOS Switch — 11, 10, PCI Express — 5, 4, PCI Express, Battery — 9, CPU — 1, 12, Chipset — 2, DIMM — 3, 7, 6, 8, 14, 15

Dimensions: 9.6" (24.38 cm), 12" (30.48 cm)

Chipset

The *chipset* is the most important element of the motherboard. It guides and controls the flow of data between the computer's components (CPU, memory, etc.). This microchip is kind of like a cop or traffic light at an intersection telling the cars (data) when and where it can go.

Motherboard Battery

The *motherboard battery's* main purpose is to maintain the computer clock's time and the computer's Basic Input/Output System (BIOS) or UEFI (Unified Extensible Firmware Interface) settings when the computer is turned off.

System Bus

The *system bus* connects the major components of a computer (CPU, Memory, etc.) system for the transfer of data (information) between the parts of the computer, kind of like a highway (system bus) linking buildings together with the cars being the data / electrical signals. They can be seen as the metal colored lines ("tracing") on a circuit boards). Bus speed is commonly measured in megahertz (MHz) with some even in the gigahertz range (GHz).

UEFI (Unified Extensible Firmware Interface) and BIOS: Basic Input/Output System

UEFI has largely replaced BIOS, but their function is largely the same and both are often referred by the older BIOS name.

The *UEFI / BIOS program* is written permanently on the UEFI / BIOS chip. The UEFI / BIOS program controls the computer when it is first turned on. It sets up the computer's hardware and performs systems checks. Then it turns over control to the computer's operating system. The *BIOS* stores information in CMOS (Complementary Metal Oxide Semiconductor). The UEFI / BIOS program can be accessed through the computer's setup. You can think of the BIOS or the UEFI as a sort of built in operating system for the motherboard before it loads the more familiar "bigger" operating systems from the hard drive (such as Microsoft Windows or OS X).

Back-to-BIOS Switch

This is a switch for resetting your BIOS / UEFI back to the default settings in case the motherboard cannot boot up. This would be similar to how your phone can be erased and "reset" with the "factory settings" if your phone stopped working for some reason.

Microprocessor

The *microprocessor* contains the *central processing unit* or *CPU* and the cache memory. The *CPU* is the "brain" of the computer. Intel makes most of the CPU's on the market today. The Intel Core "i" series processors are the newest, smartest, and fastest processors.

The *CPU* is comprised of three parts: *the control unit*, *the arithmetic/logic unit*, *and the memory*. The *control unit* manages the computer by obtaining, interpreting,

implementing, and saving the data inside the computer. The *arithmetic/logic unit* conducts all of the mathematical calculations and logical comparisons and stores the most frequently used instructions and data in the CPU's cache memory. The speed at which a processor runs is measured in mega hertz (MHz) or gigahertz (GHz). The larger the number of MHz / GHz the faster the processor will work. The memory stores the program instructions and data that the processor is currently using.

Memory Components

The *DIMM sockets*, or *Dual Inline Memory Module sockets* are the location on the motherboard where the Random Access Memory (RAM) is installed. *DIMM* stands for *Dual Inline Memory Module* and refers to the fact that both sides of the memory card have separate connections to the DIMM socket.

Everything that is done on the computer is temporarily stored in the RAM until it is saved to a disk. There are two types of RAM: *static RAM (SRAM)* and *dynamic RAM (DRAM)*. As long as power is maintained, SRAM will hold its content without involvement from the CPU. DRAM must be continuously refreshed from the CPU in order to maintain its contents.

As of, 2016, most desktop and laptop computers have between 2 to 8 GB of Ram, with some higher end consumer systems (those you can usually buy in a store) having as much as 32 GB. 32-bit systems can only have up to 4 GB of Ram, while 64-bit systems can go as high as 123 GB. Most computers today use DDR-RAM (currently DDR3 or DDR4).

"ROM," or read only memory, holds the programs and data that were permanently recorded into memory at the factory. ROM cannot be changed by the user and its contents remain even, when power is turned off. The *boot routine* of the computer is stored in ROM.

Video Card

The *video card* is the component that operates the monitor. It interprets instructions from Windows or another program and displays images, graphics and videos on the screen. The video card contains a processor chip and memory.

GPU

GPU stands for *Graphics Processing Unit*. The video card is in charge of controlling the video display. Much like the CPU's relationship with the motherboard, the brain of the video card is the GPU. It is responsible for making the decisions for processing the video card's graphical input and output data. It is often either located under the fan or equipped with its own dedicated fan. Also, many modern CPUs may include an integrated GPU within the CPU itself.

PCIe Slot

PCI Express largely replaced the older PCI slot. They are used to connect expansion hardware (like an extra video card) to the motherboard. PCIe slots can transfer data at up to 16 GB's per second.

Audio Cables

Audio cables connect multimedia drives, such as the CD-ROM and DVD drives to the computer's sound card. The audio cables enable sound data to be transferred so it can be decoded and played. The computer's sound card and speakers determine the computer's sound quality. There are various cords / cables that are used (such as: standard 3.5mm audio cable, TOSLINK, S/PDIF, etc.)
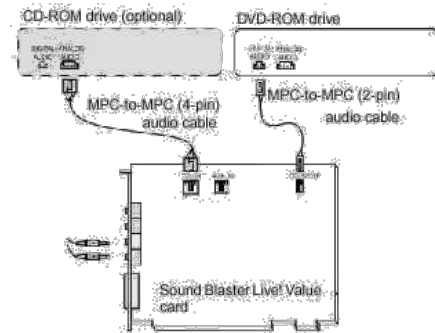
IDE, PATA, SATA, eSATA Connectors

These are all names for connectors that connect devices to the motherboard, with IDE being the oldest (and mostly no longer used) and the SATA variants being the newest.
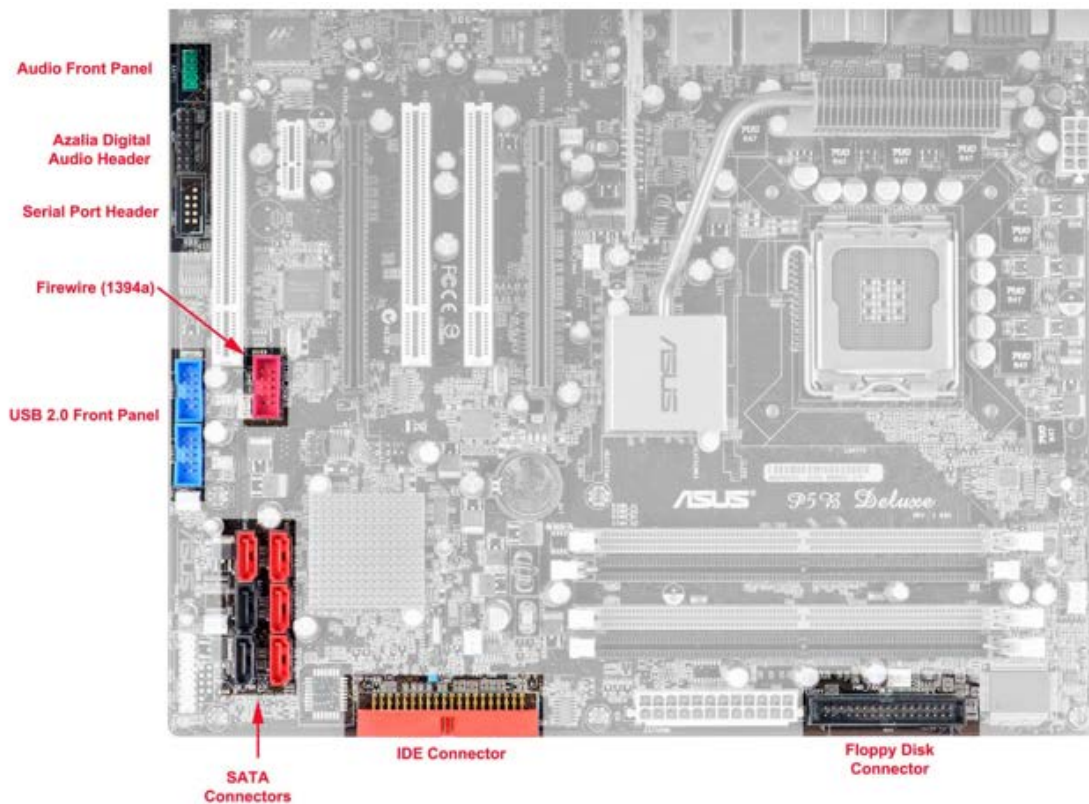
Peripherals

Peripherals are all external devices that will not be installed inside the case. They will allow you to interact with the computer by inputting commands, viewing the screen, as well as printing out documents and pictures.

I/O is short for *input and output*. *USB ports* or *Universal Serial Bus ports* are used to connect a variety of devices such as a mouse, keyboard, digital cameras, and even printers. Most peripherals are connected by USB (Universal Serial Bus) ports (such as: mice, keyboards, printers, etc.). Monitors will use VGA (older), DVI, HDMI ports, or the newest innovation… DisplayPorts.

PS/2 Keyboard Port

S/PDIF Ports

Serial ATA Port

USB 2.0 Ports

Center/Subwoofer
Side Speakers

Microphone
Line-Out
Wi-Fi Antenna In

PS/2 Mouse Port

Serial Port

IEEE 1394 Port

RJ-45 LAN Ports

Rear Speakers

Line-In