

Computers Are Your Future

Chapter 6

Inside the System Unit

1

What You Will Learn . . .

- Understand how computers represent data
- Understand the measurements used to describe data transfer rates and data storage capacity
- The components inside the system unit
- How a CPU processes data
- The physical connections on the exterior of the system unit

2

Describing Hardware Performance

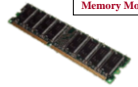



Hardware performance refers to the amount of data a computer can store and how fast it can process the data.

80 GB 7200 RPM
Hard Drive

Mach Speed
Socket 478 ATX
Motherboard

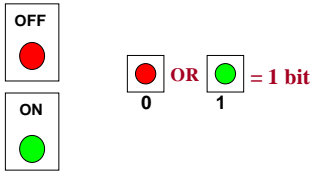
Intel Pentium 4
2.4Ghz Processor

512 MB
DDR SDRAM
Memory Module



3

How Computers Represent Data

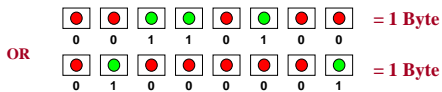


- > **Bit** (Binary digit) – Either a 0 or a 1
- > 0 means electricity is off
- > 1 means electricity is on

4

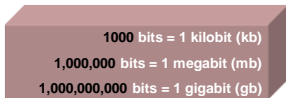
How Computers Represent Data

- > **Byte** – Eight bits grouped together to represent a character (an alphabetical letter, a number, or a punctuation symbol); 256 different combinations.



5

Bits



- > **Kilobits per second (Kbps)**, **megabits per second (Mbps)**, and **gigabits per second (Gbps)** are terms that describe units of data used in measuring data transfer rates.
 - Example: 56 Kbps modem

6

Bytes

8 bits = 1 Byte

1024 Bytes = 1 Kilobyte (KB)

1,048,576 Bytes = 1 Megabyte (MB)

1,043,741,824 Bytes = 1 Gigabyte (GB)

1,099,511,627,776 Bytes = 1 Terabyte (TB)

- > Examples: 200 GB hard drive
- > 700 MB of storage on a CD

7

Bytes

Most people use approximate values:

- > 1 Kilobyte (KB) = approx 1000 bytes
- > 1 Megabyte (MB) = approx 1 million bytes
- > 1 Gigabyte (GB) = approx 1 billion bytes
- > 1 Terabyte (TB) = approx 1 trillion bytes

8

Representing Characters: Character Codes

Character codes translate numerical data into characters readable by humans.

- **American Standard Code for Information Interchange (ASCII)** – Eight bits equals one character; only 256 combinations, used by servers and personal computers.
- **Extended Binary Coded Decimal Interchange Code (EBCDIC)** – Eight bits equals one character; used by IBM mainframe computers.
- **Unicode** – Sixteen bits equals one character; over 65,000 combinations; allows for international alphabets.

ASCII = 4

0 0 1 1 0 1 0 0

EBCDIC = 4

1 1 1 1 0 1 0 0

9

The System Unit



- The **system unit** is case that houses the computer's main hardware components.
- A **footprint** is the space taken up on the desk by the computer.
- **Form factor** refers to the way the internal components are mounted inside the system unit.

10

Types of System Units



11

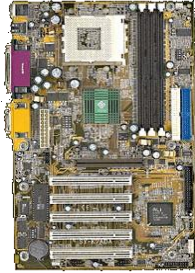
Inside the System Unit

- **Motherboard** (mainboard) – Large printed circuit board with thousands of electrical circuits
- **Power supply** – Transforms alternating current (AC) from wall outlets to direct current (DC) needed by the computer. Provides power to all components
- **Cooling fan** – Keeps the system unit cool
- **Drive bays** – Housing for the computer's hard drive, floppy drive, and CD / DVD drives

12

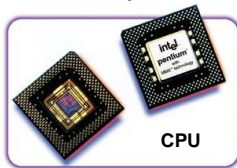
The Motherboard

- The motherboard provides the centralized connection point for the computer's components.
- Chips carry electrical current and contain electronic switches or transistors.

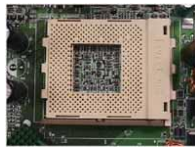


13

The Central Processing Unit: The Microprocessor



CPU



CPU socket

- **Central processing unit (CPU)** – A microprocessor that interprets and carries out instructions given by software. It controls the computer's components.

14

Components of the CPU

- **CU Control unit** – Coordinates and controls all parts of the computer system
- **ALU Arithmetic-logic unit** – Performs arithmetic or logical operations
- **Registers** – Temporarily store the most frequently used instructions and data

15

The Machine Cycle

- The processing cycle consists of two phases:
 - **Instruction Cycle**
 - **Fetch** – Gets the next program instruction from the computer's memory
 - **Decode** – Figures out what the program is telling the computer to do
 - **Execution Cycle**
 - **Execute** – Performs the requested action
 - **Store** – Stores the results to a register or to memory

16

The Arithmetic-Logic Unit

The arithmetic-logic unit (ALU) performs basic arithmetic and logic operations.

- Adds, subtracts, multiplies, and divides
- Compares data for 3 situations:
 - < less than
 - > greater than
 - = equality


17

Microprocessor Performance

- **Bus width** – The number of pathways within the CPU that transfer data; they are measured in bits (8, 16, 32, or 64)
- **Word size** – The maximum number of bits of data that the CPU can process at one time (8 bits, 16 bits, 32 bits, or 64 bits)
- **System Clock** – The electronic circuit that generates pulses at a rapid rate. The system clock synchronizes the computer's internal activities

18

Memory



Random Access Memory (RAM)


Read-Only Memory (ROM)

Flash Memory

Memory is the term used to describe chip-based devices that enable the computer to store program instructions and data for quick access by the CPU.

19

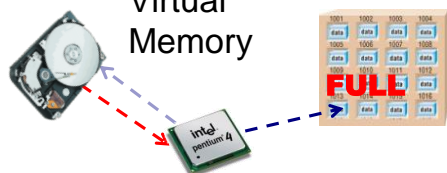
Random Access Memory (RAM)



- **RAM** is a type of memory that stores information temporarily so that it's available to the CPU.
- RAM is volatile; the memory's contents are erased when the power is turned off.
- Each byte of memory has a unique location or **memory address**.

20

Virtual Memory

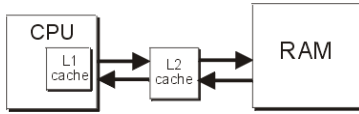


Virtual memory:

- Part of the hard disk is reserved as "virtual" RAM.
- When RAM memory becomes full, the CPU accesses the hard disk to store and retrieve data.
- Slower than RAM.

21

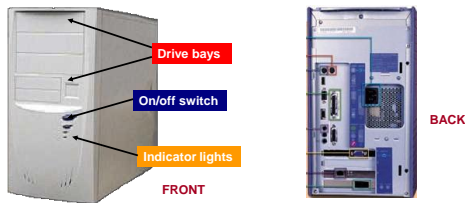
Cache Memory



- **Primary cache** (Level 1 or L1) – Located inside the CPU chip. The CPU uses L1 cache memory to store frequently used instructions and data.
- **Secondary cache** (Level 2 or L2; Backside Cache) – Located between the CPU and RAM.
- Cache memory is faster than RAM.

22

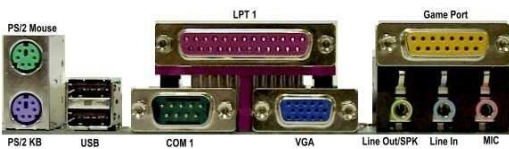
Outside the System Unit



- The **front panel** contains drive bays, various buttons, and indicator lights.
- **Connectors and ports** are physical receptacles located on the back to connect peripheral devices to the computer.

23

Types of Connectors

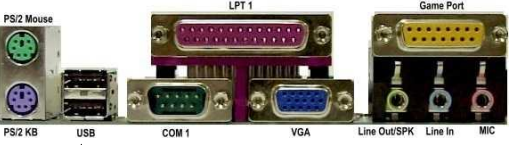


PS/2 port (mouse port) – Special serial port to connect mouse.

PS/2 port (keyboard port) – Special serial port to connect keyboard.

24

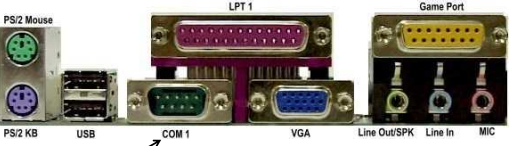
Types of Connectors



Universal Serial Bus (USB) – Allows up to 127 devices to be connected at a time.

25

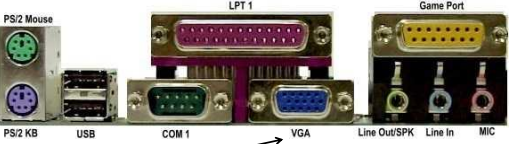
Types of Connectors



Serial port – Data flows in a series of pulses, one after another, one bit at a time; slow data transfer rate.

26

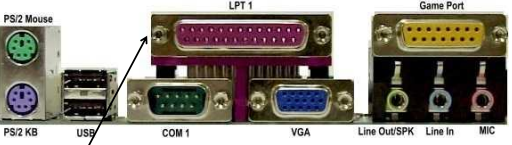
Types of Connectors



VGA connector – A 15 pin connector used for monitors

27

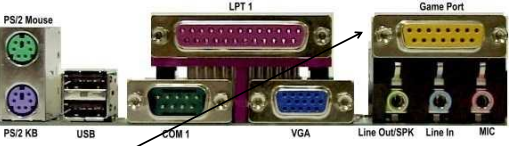
Types of Connectors



Parallel port – Data flows through eight wires allowing the transfer of eight bits of data simultaneously; faster than serial ports. Old-style printers are connected through a parallel port.

28

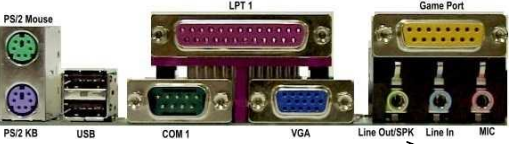
Types of Connectors



Game port – A connector for high speed access for graphics-intensive interaction.

29

Types of Connectors



Sound card connectors – Also called jacks, sound card connectors accept stereo mini-plugs. Microphone and speaker connectors are plugged into the card.

30
