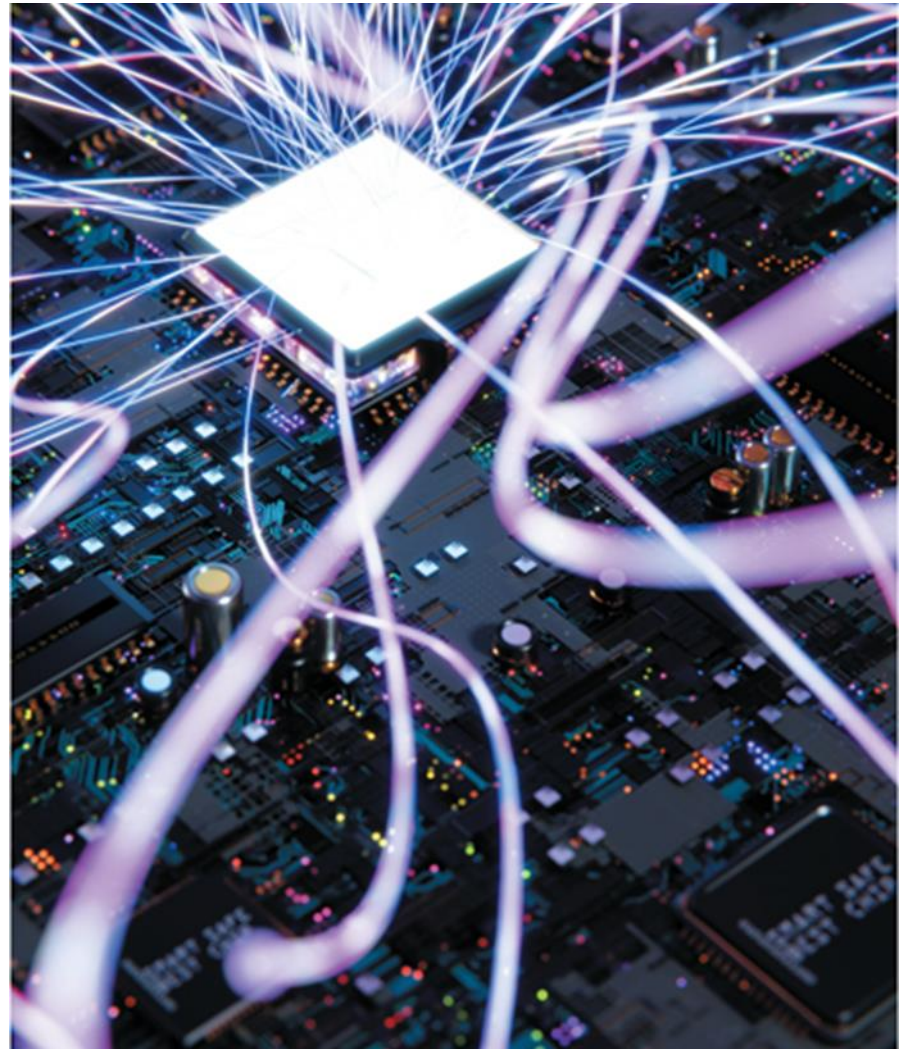# Chapter 5

System Unit

Computing Essentials 2023
O'Leary

Learning Objectives

1. Differentiate between the five basic types of system units.

2. Describe system boards, including sockets, slots, and bus lines.

3. Recognize different microprocessors, including microprocessor chips and specialty processors.

4. Compare different types of computer memory, including RAM, ROM, and flash memory.

5. Explain expansion slots and cards.

6. Describe bus lines, bus widths, and expansion buses.

7. Describe ports, including standard and specialized ports.

8. Identify power supplies for desktop, laptop, tablet, and mobile devices.

9. Explain how a computer can represent numbers and encode characters electronically.

Introduction

Speed, capacity, and flexibility determine the power of personal computers.

Knowledge of a computer's power allows you to make good buying decisions and to determine if your current system will run new applications.

Competent end users need to understand the functionality of the basic components of the system unit.

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System Unit Basics

Container that houses most of the electronic components that make up a computer system.

- System Chassis.

Personal Computer - Most widely used type of computer.

Five most common types.

- Smartphones.

- Tablets.

- Laptops.

- Desktops.

- Wearable Computers.

Making IT Work for You ~ Gaming

Mobile gaming.

Console gaming.

PC gaming.

Kazuo Horiike/Jiji Press/Newscom

Components

Although all devices come in many shapes and sizes they have similarities such as.

- System boards.

- Microprocessors.

- Memory.

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Ivan Marc Sanchez/Alamy Stock Photo

Godfried Edelman/iStock/Getty Images

System Board

System board, also known as the main board or motherboard, controls communication for the entire computer system.

All components and devices connect to the system board.

Data path and traffic monitor.

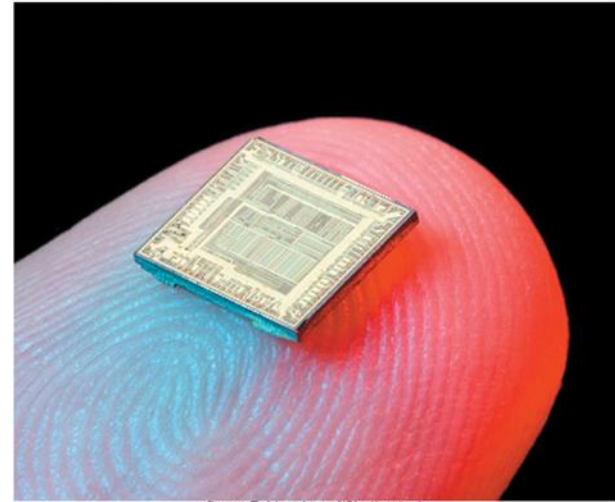- Allows various components to communication efficiently with one another.

Sockets and Chips

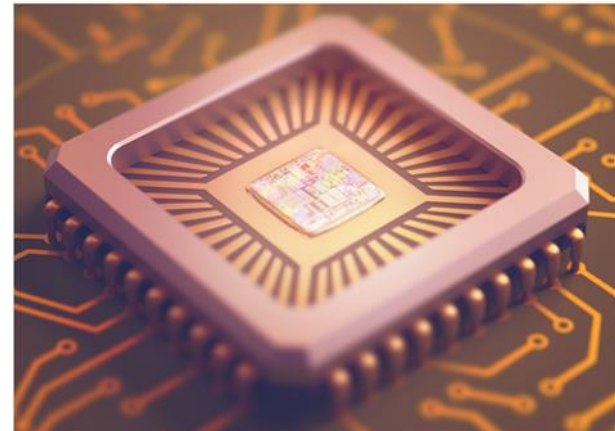The system board contains a variety of electronic components .

Sockets – the connection point for chips.

Chips.

- Tiny circuit boards etched onto squares of silicon.

- Also called silicon chip, semiconductor, or integrated circuit.

- Mounted on chip carriers.

Szasz-Fabian Jozsef/Shutterstock

Slots and Bus Lines

Additional system board components:

Slots.

- Provide a connection point for specialized cards or circuit boards.

- Provide expansion capabilities for the computer.

Bus lines.

- Connecting lines that provide pathways to support communication among electronic components.

Microprocessor

Central Processing Unit (CPU) or Processor.

- Contained on a single chip call a microprocessor.

- Brains of the computer.

Two Basic Components of the CPU.

Control unit.

- Tells the computer system how to carry out a program's instruction.

Arithmetic-logic unit (ALU).

- Performs arithmetic and logical operations.

Microprocessor Speed

Chip capacities are expressed in word size.

- Word is the number of bits that can be processed at one time: 16, 32 or 64.

Clock Speed.

- Processing speed or the number of times the CPU fetches and processes data or instructions in a second.

Unit	Speed
Microsecond	Millionth of a second
Nanosecond	Billionth of a second
Picosecond	Trillionth of a second
Femtosecond	Quadrillionth of a second

Multicore Chips

Multicore Processors.

Two or more separate and independent CPUs within a system unit.

- Quad-core supports 4 core processes.

Parallel Processing.

- Computer's ability to divided tasks into parts that can be distributed across each core.

- Windows 11 and macOS Big Sur support parallel processing.

Processor	Manufacturer
Ryzen 5000	AMD
M1	Apple
Alder Lake	Intel

Specialty Processors

Coprocessors.

Designed to improve specific computing operations.

Graphics Processing Unit (GPU) / Graphics coprocessors.

Designed to handle a variety of specialized tasks.

- 3D images.

- Encrypting data.

- Standard features in gaming computers.

Memory

Holding area for data, instructions, and information.

Contained on chips connected to the system board.

Three well-known types of memory chips:

RAM.

*   Random Access Memory.

ROM.

*   Read Only Memory.

Flash Memory.

RAM [1]

Random Access Memory (RAM) chips hold programs and data that the CPU is presently processing.

- Volatile or temporary – contents are lost when computer is powered off.

Cache memory – temporary, high-speed holding area between the memory and CPU.

- Additional RAM can be added using an expansion module called a DIMM (Dual in-line memory module).

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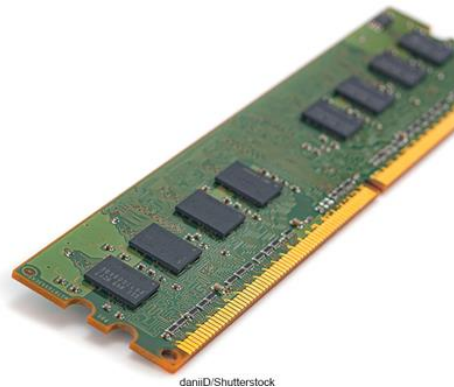
RAM [2]

Virtual Memory.

• Dividing a program between memory and storage enabling the system to run very large programs.

Memory is expressed in bytes.

Unit	Capacity
Megabyte (MB)	1 million bytes
Gigabyte (GB)	1 billion bytes
Terabyte (TB)	1 trillion bytes
Petabyte (PB)	1 quadrillion bytes

ROM

Read-only memory (ROM).

- Information stored by the manufacturer.

- Non-volatile and cannot be changed.

CPU can read, or retrieve data and programs in ROM but the computer cannot change ROM.

Contain special instructions.

- Start the computer.

- Access memory.

- Handle keyboard input.

Flash Memory

Flash memory combines the features of:

RAM, it can be updated.

ROM, it is non-volatile.

Contains startup information.

BIOS (basic input/output system).

- Amount of RAM.

- Type of keyboard, mouse, and secondary storage devices connected.

Many ROM chips are being replaced by flash memory!

Expansion Slots and Cards

Expands your system's capabilities.

SD cards.

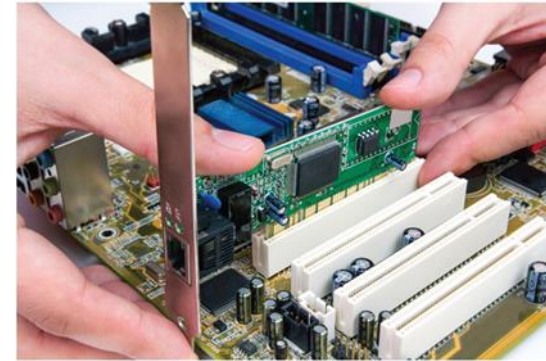Expansion cards for phones, tablets, and laptops.

- Graphics cards for high quality 3D graphics.

- Network interface cards (NIC) connect devices to networks via cables.

- Wireless network cards connect devices to networks without cables.

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anmbph/Shutterstock

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Bus Lines/Bus

Connect parts of the CPU to each other and various other components on the system board.

Pathway for bits representing data and instructions.

Bus width.

- Number of bits that can travel simultaneously down a bus.

Architecture and design are tied to the speed and power for the computer.

Two basic categories of buses.

- System bus – connects CPU to memory.

- Expansion bus – connects CPU to other components.

Expansion Buses

Principle types:

Universal Serial Bus (USB).

- Connects external USB devices onto the USB bus.

FireWire.

- Primarily used to connect audio and video equipment to the system board.

PCI Express (PCIe).

- Single dedicated path for each connected device.

Ports

Socket for connecting external devices to the system unit.

Some ports connect directly to the system board, others connect to cards inserted into slots on the system board.

Two Types.

- Standard Ports.

- Specialized Ports.

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Standard Ports

USB.

- Keyboards, mice, printers, storage devices.

- Variations of USB ports include: USB-A, USB-B, USB-C, and Thunderbolt 3 (a high speed version of USB-C).

HDMI – High Definition Multimedia Interface.

- High definition video and audio.

Ethernet.

- High speed networking.

Specialized Ports

DisplayPort (DP).

- Connects to large monitors.

- Popular on gaming computers.

DVI (Digital Video Interface).

- Connect digital monitors to computer.

- Can only send video signals, not audio.

FireWire.

- High-speed connections to FireWire devices such as camcorders and storage devices.

Cables

Used to connect external devices to the system unit via the ports.

One end of the cable is attached to the device and the other end has a connector that is attached to a matching connector on the port.

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Power Supply

Computers require direct current (DC) power converting alternating current (AC) from wall outlets or batteries.

- Desktop computers have a power supply unit in the system unit.

- Laptops use AC adapters in the system unit.

- Tablets and mobile devices use internal AC adapters.

- Smartphones can use wireless charging platforms.

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hodim/Shutterstock

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Electronic Data and Instructions

Digital electronic signals.

- Recognized by computers.

Analog signals.

- Continuous signal.

- Created by voices.

Conversion must take place from analog to digital before processing can occur.

Numeric Representation

Two-state binary system consists of only two digits called bits.

- On = 1; negative charge.

- Off = 0; no charge.

Byte = 8 bits grouped together.

Hexadecimal system.

- Uses 16 digits to represent binary numbers.

(0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, F)

Decimal	Binary	Hex
00	00000000	00
01	00000001	01
02	00000010	02
03	00000011	03
04	00000100	04
05	00000101	05
06	00000110	06
07	00000111	07
08	00001000	08
09	00001001	09
10	00001010	0A
11	00001011	0B
12	00001100	0C
13	00001101	0D
14	00001110	0E
15	00001111	0F

Figure

Character Encoding

ASCII.

- American Standard Code for Information Interchange.

- Used by personal computers.

EBCDIC.

- Extended Binary coded Decimal Interchange Code.

- Used by mainframe computers.

Unicode.

- New encoding due to explosion of the Internet.

- Can be written in UTF-16 or UTF-8.

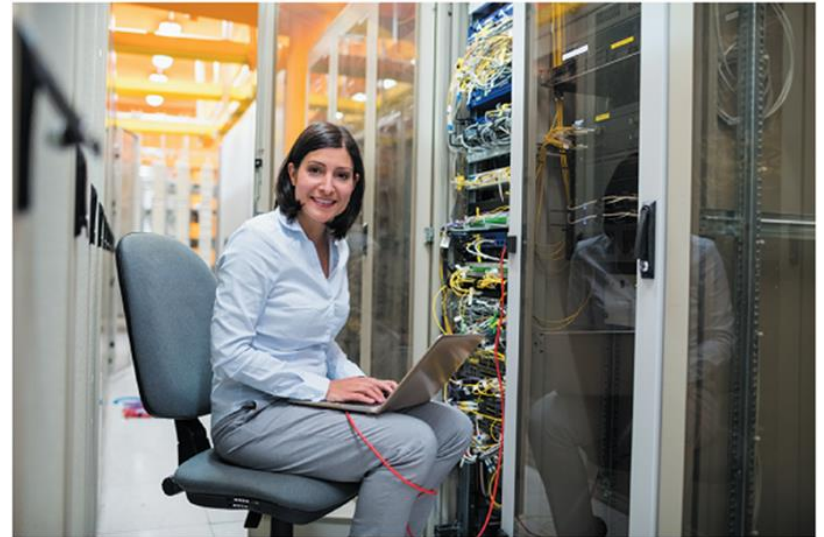- Recognized by virtually all computer systems.

Careers in IT

Computer technicians repair and install computer components and systems.

Employers look for:

- Certification or associate's degree in computer repair.

- Communication skills.

Continued education is required.

Computer technicians can expect to earn an annual salary from approximately $27,000 to $58,000.

A Look to the Future

Brain-Computer Interfaces.

May soon be able to image all the brain's electrical impulses.

Victoria Shapiro/Shutterstock

Open Ended Questions

1. Describe the five most common types of personal computers.

2. Describe system boards including sockets, chips, chip carriers, slots, and bus lines.

3. Discuss microprocessor components, chips, and specialty processors.

4. Define computer memory, including RAM, ROM, and flash memory.

5. Define expansion slots, cards (including graphics cards), network interface cards, wireless network cards, and S D cards.

6. Describe bus lines, bus width, system bus, and expansion bus.

7. Define ports including standard and specialized ports. Give examples of each.

8. Describe power supply including power supply units and AC adapters.

9. Discuss electronic data and instructions.

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