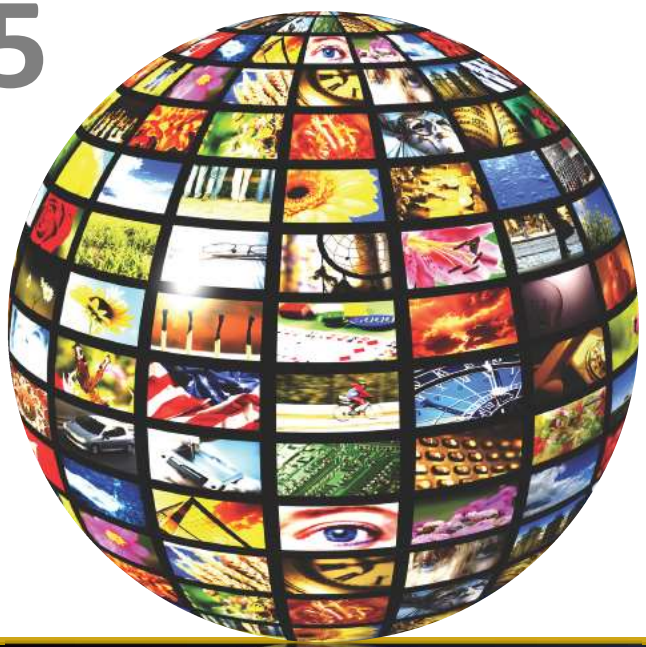
Chapter 5



The System Unit

Chapter 5

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

System Chassis

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

System Unit

- Contains system's electronic components and selected secondary storage devices

System Unit Types

1. Desktops
   - System unit is in a separate case
     - Tower Units
     - All-in-Ones
       - All components including monitor
2. Laptops
   - Portable and much smaller
     - Ultrabooks – laptop and tablet in one
     - Gaming – high end graphics

System Unit Types cont.

3. Tablets
   - Mini tablet
4. Smartphone
   - Most popular device – handheld computer
   - Extend the capabilities of cell phones
5. Wearables
   - Contain embedded computers

Components

- Although all devices come in many shapes and sizes they have similarities such as
  - System boards
  - Microprocessors
  - Memory

Desktop

Tablet

Smartphone

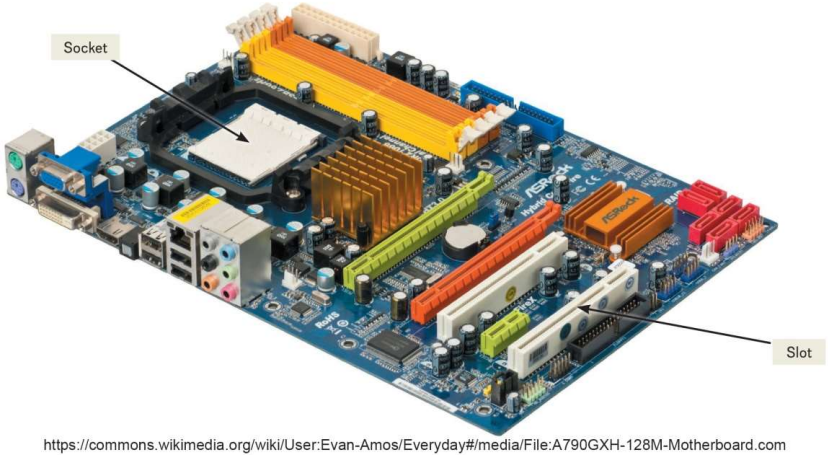
Laptop

Wearable

System Board

System board or 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

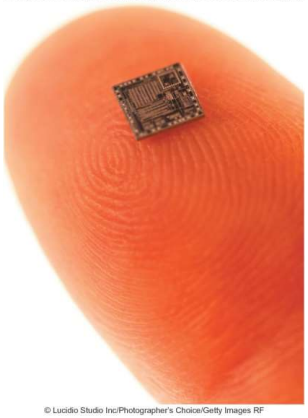


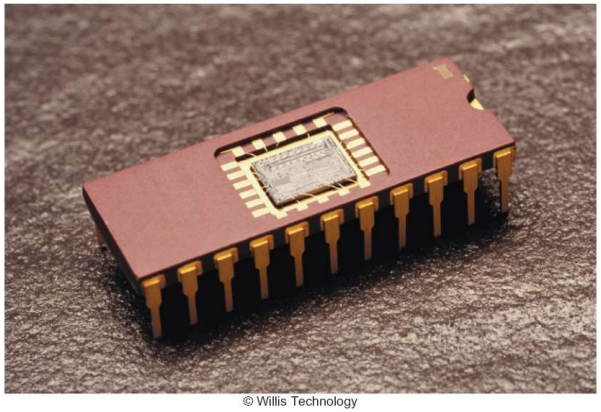
https://commons.wikimedia.org/wiki/User:Evan-Amos/Everyday#/media/File:A790GXH-128M-Motherboard.com

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





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 Chips

- 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 8 and Mac OS X support parallel processing

Processor	Manufacturer
A-Series	AMD
Cortex-A series	ARM
Edison	Intel
i7	Intel

Specialty Processors

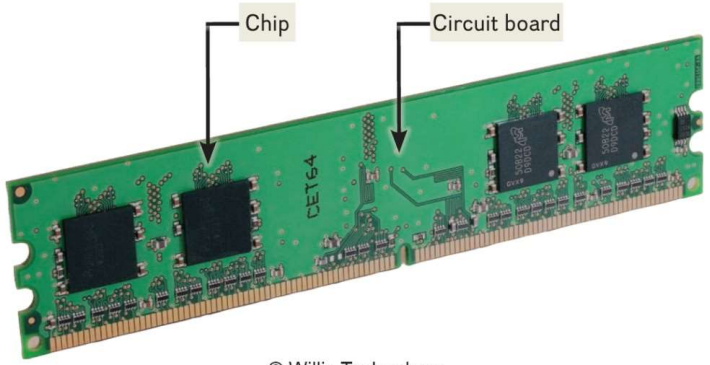
- Coprocessors
  - Designed to improve specific computing operations
  - Graphics Processing Unit (GPU) / Graphics coprocessors
  - Designed to handle a variety of specialized tasks
    - 3D images
    - Encrypting data
    - Standard features in gaming computers

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

- 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 continued

- 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

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

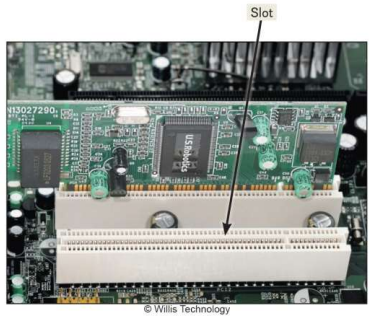
- Flash memory combines of the features of:
  - RAM, it can be updated
  - ROM, it is non-volatile
  - Contains startup information
    - BIOS (basic input/output system)
    - Amount of RAM
    - Type of keyboard, mouse, and secondary storage devices connected

Many ROM chips are being replaced by flash memory

Expansion Slots and Cards

Expands your system's capabilities

- 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
- SD cards
  - Expansion cards for mobile devices



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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

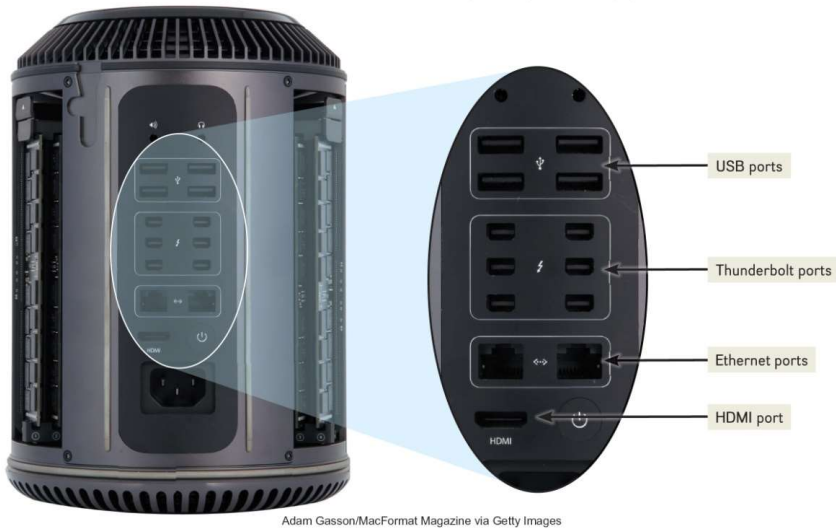
Principle types:

- 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

- Ports connect directly
  - To the system board
  - To cards inserted into slots on the system board
- Two Types
  - Standard Ports
  - Specialized Ports



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Standard Ports

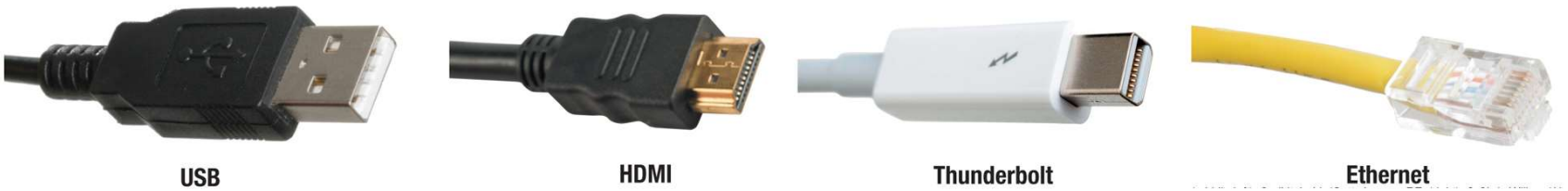
- USB
  - Keyboards, mice, printers, storage devices
- Ethernet
  - High speed networking
- HDMI – High Definition Multimedia Interface
  - High definition video and audio
- Thunderbolt
  - Provides high-speed connections
  - Can connect up to 7 separate devices through 1 port

Specialized Ports

- External Serial Advanced Technology Attachment (eSATA)
  - High-speed connection for external secondary storage
- Musical Instrument Digital Interface (MIDI)
  - Connect musical instruments
- Mini DisplayPort (MiniDP or mDP)
  - Connection to large monitors
- VGA & DVI
  - Connections to analog and digital monitors
- FireWire
  - High-speed connections to FireWire 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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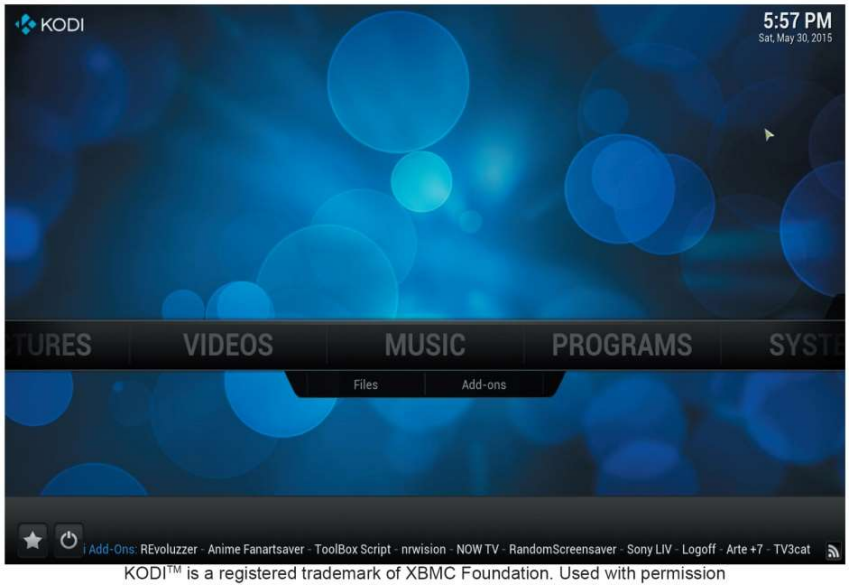
Making IT Work for You ~ TV Tuners

- Using Windows Media Center as a DVR
- Install TV Tuner to connect your computer or cable to your computer

Courtesy of Hauppauge



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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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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

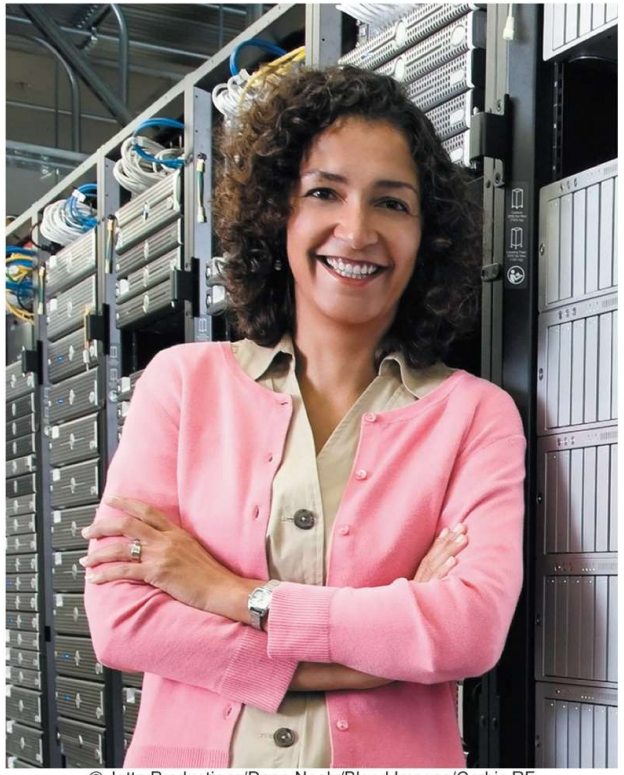
Character Encoding

Character encoding standards assign a unique sequence of bits to each character

- 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
  - Uses 16 bits
  - Recognized by virtually all computer systems

Careers In IT

- Computer technicians repair and install computer components and systems
- Employers look for:
  - Certification or associate degree in computer repair
  - Communication skills
- Continued education is required
- Computer technicians can expect to earn an annual salary of $37K to $47K



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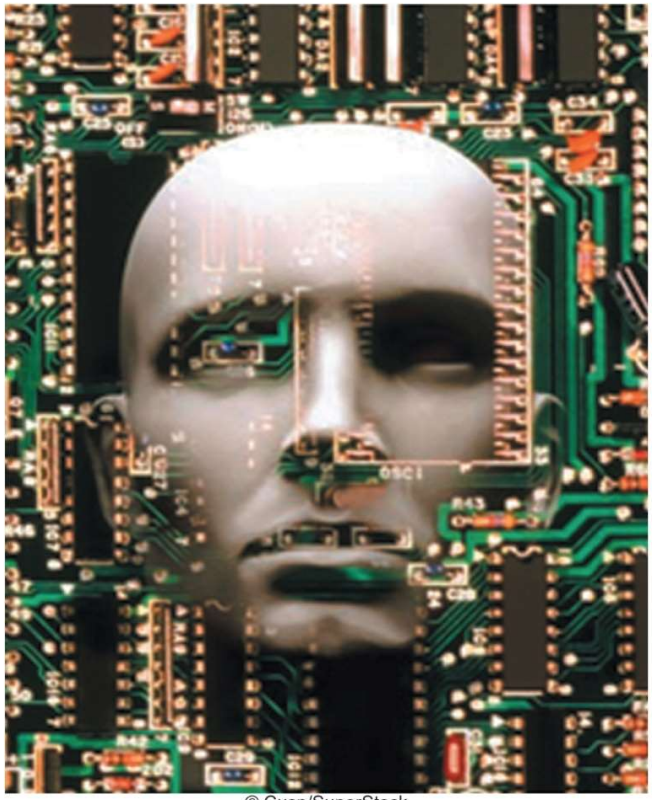
A Look to the Future

- Wearable computers
- Send and receive email while jogging
- Maintain your personal schedule book
- Remember the names of people at a party



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Open-Ended Questions (Page 1 of 3)

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.

Open-Ended Questions (Page 2 of 3)

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 SD cards.

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

Open-Ended Questions (Page 3 of 3)

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.