Discovering Computers

FUNDAMENTALS, Third Edition

Chapter 4
The Components of the System Unit
44 slides

Chapter 4 Objectives

- Differentiate among various styles of system units
- Describe the components of a processor and how they complete a machine cycle
- Define a bit and describe how a series of bits represents data
- Differentiate among the various types of memory
- Describe the types of expansion slots and adapter cards
- Explain the differences among a serial port, a parallel port, a USB port, and other ports
- Describe how buses contribute to a computer's processing speed
- Identify components in mobile computers and mobile devices
- Understand how to clean a system unit

The System Unit

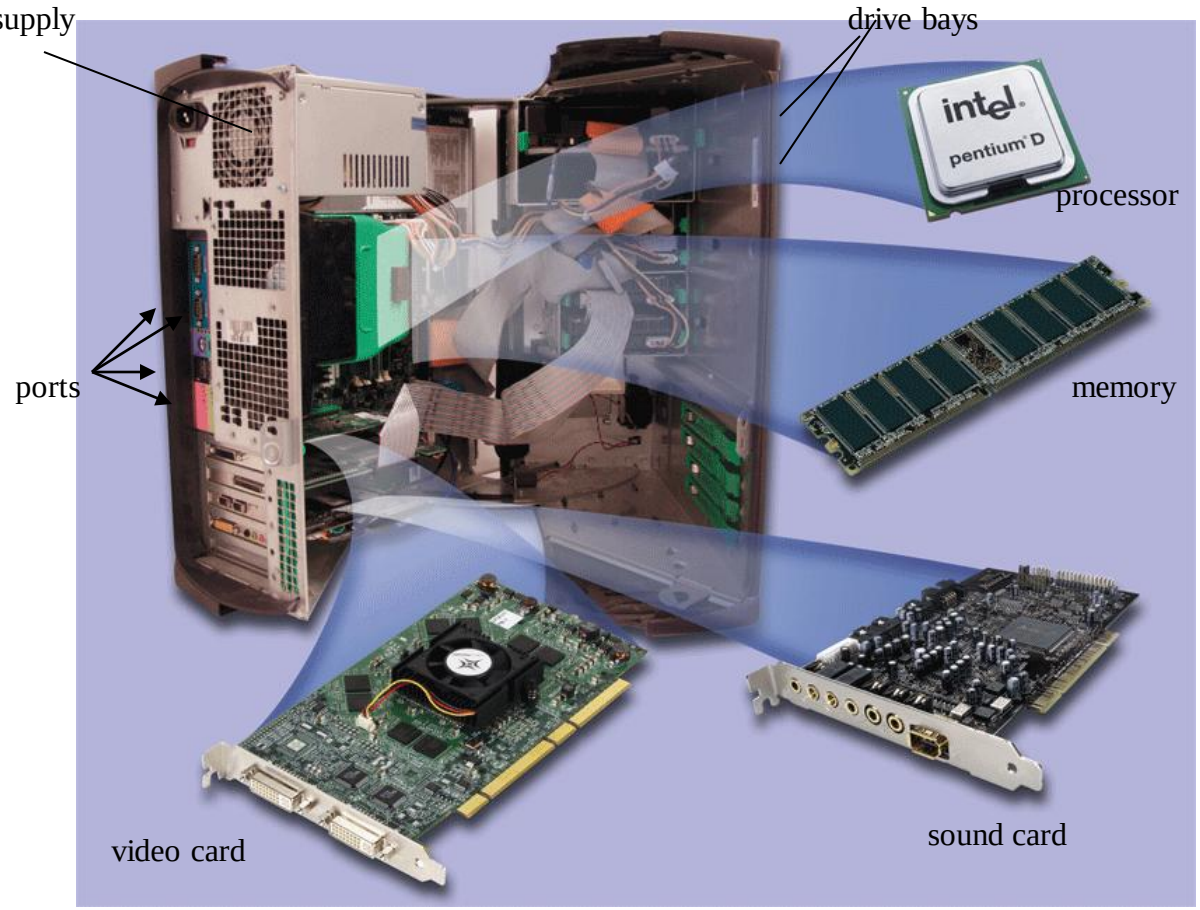
- What is the system unit?
  - **Case that contains electronic components of the computer used to process data**

p. 134 Fig. 4-1

The System Unit

- What are common components inside the system unit?

- **Processor**
- **Memory**
- **Adapter cards**
  - **Sound card**
  - **Video card**
- **Ports**
- **Drive bays**
- **Power supply**

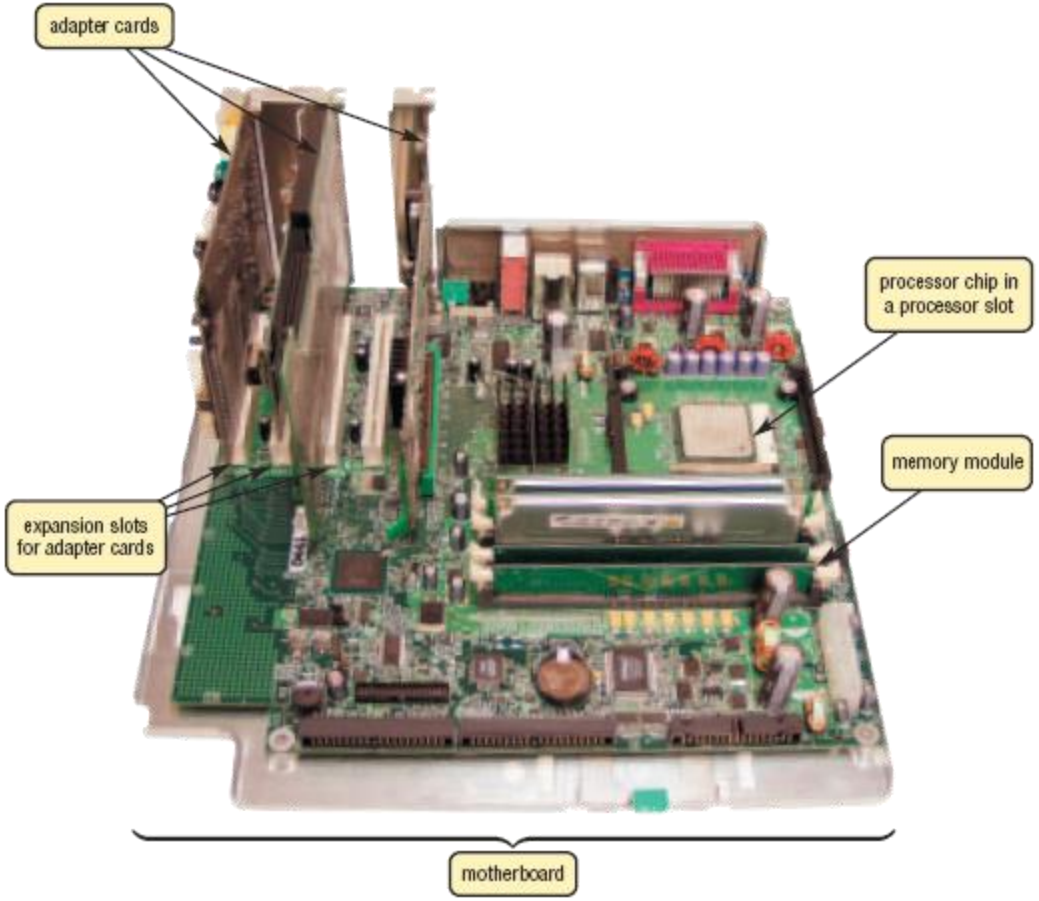


p. 135 Fig. 4-2

Next

The System Unit

- What is the motherboard?
  - **Main circuit board in system unit**
  - **Contains adapter cards, processor chips, and memory modules**



Click to view Web Link,
click Chapter 4, Click Web Link
from left navigation,
then click Motherboards below
Chapter 4

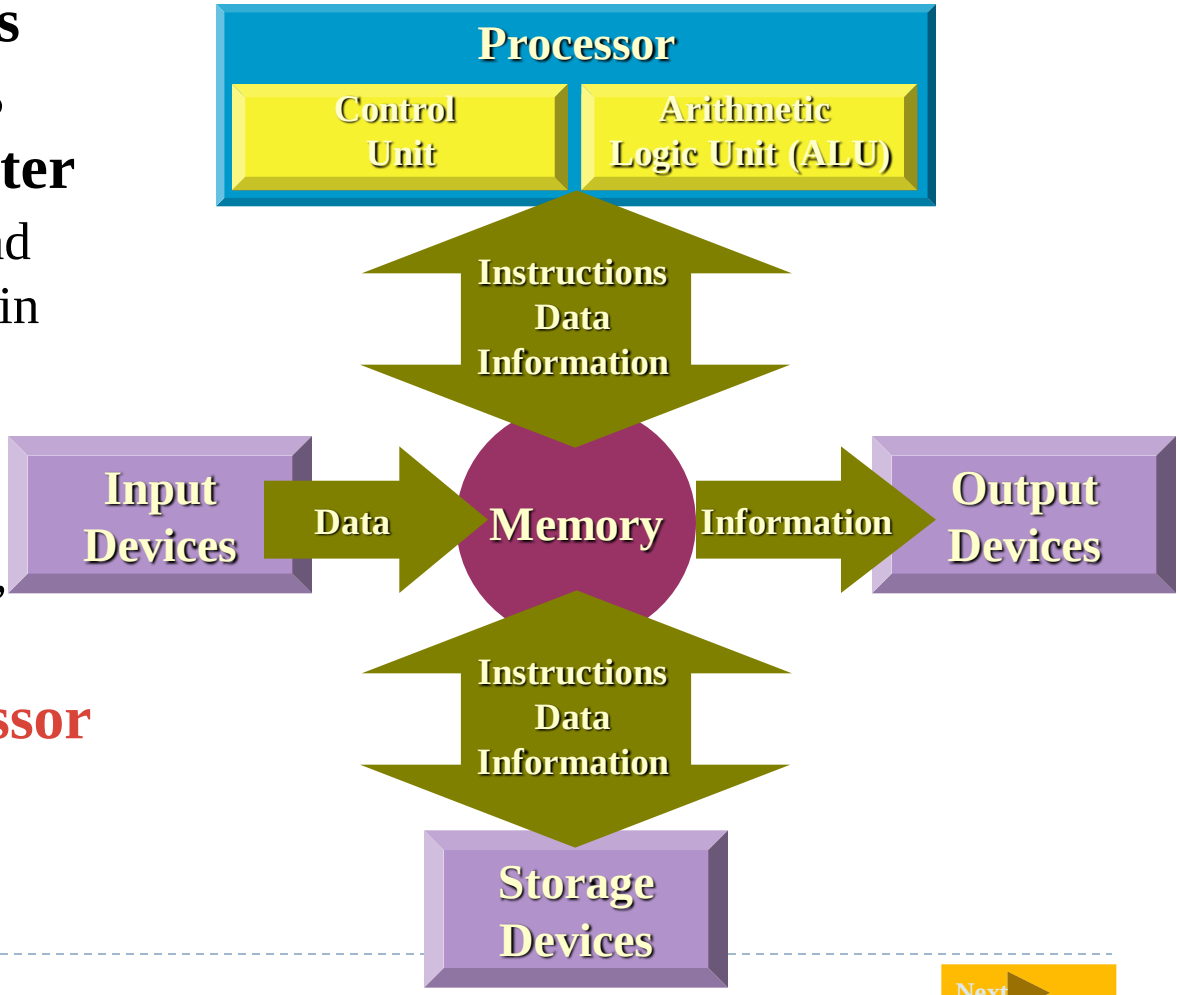
The System Unit

- What is a chip?
  - **Small piece of semi-conducting material on which integrated circuits are etched**
    - Integrated circuits contain many microscopic pathways capable of carrying electrical current
  - **Chips are packaged so they can be attached to a circuit board**

Next

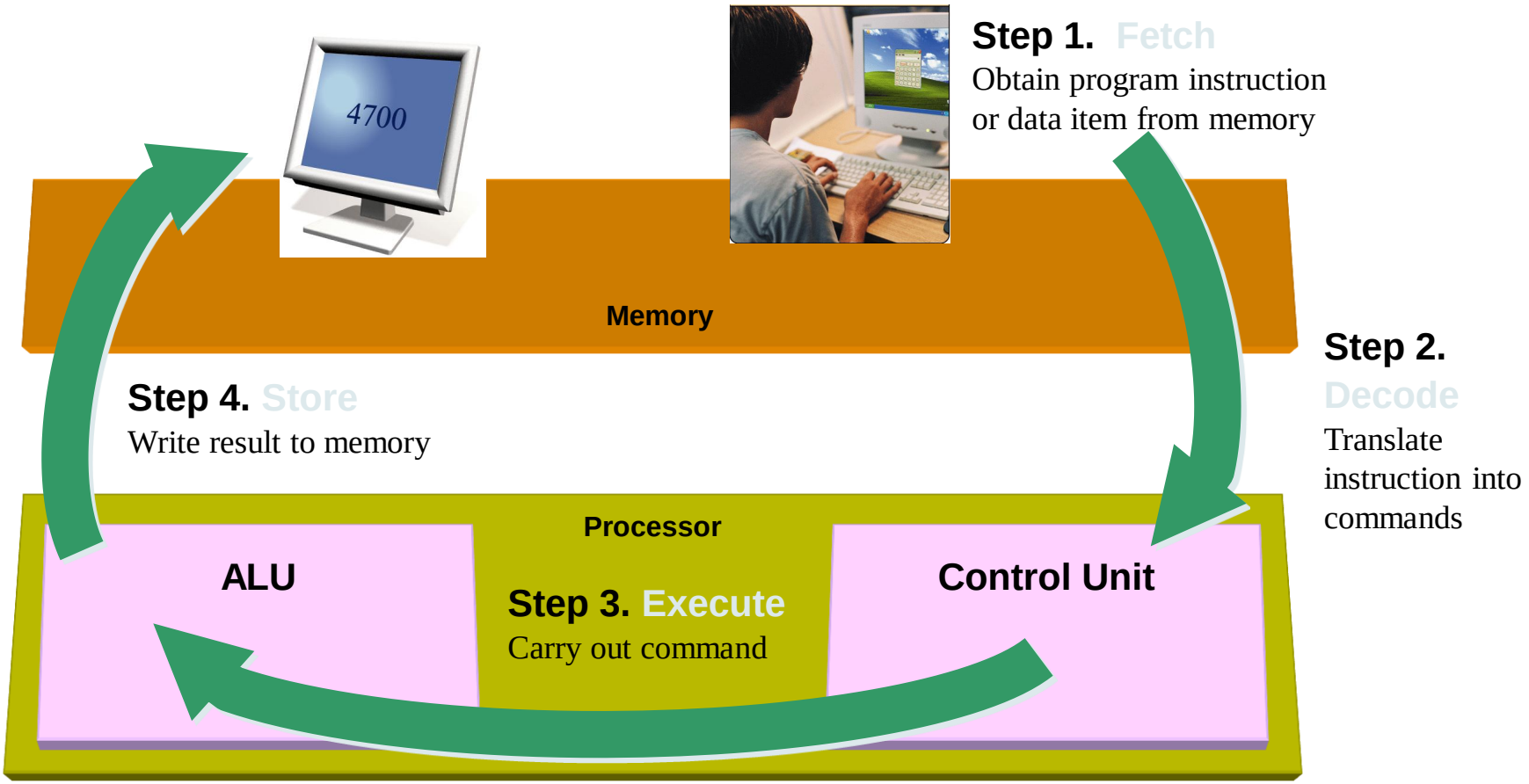
Processor

- What is the central processing unit (CPU)?
  - **Interprets and carries out basic instructions that operate a computer**
    - **Control unit** directs and coordinates operations in computer
    - **Arithmetic logic unit** (ALU) performs arithmetic, comparison, and logical operations
  - **Also called the processor**



Processor

- What is a machine cycle?
  - **Four operations of the CPU comprise a machine cycle**



Next

Processor

- What is the system clock?
  - **Controls timing of all computer operations**
  - **Generates regular electronic pulses, or ticks, that set operating pace of components of system unit**

Pace of system clock is clock speed
Most clock speeds are in the gigahertz (GHz) range (1 GHz = one billion ticks of system clock per second)

Next

Processor

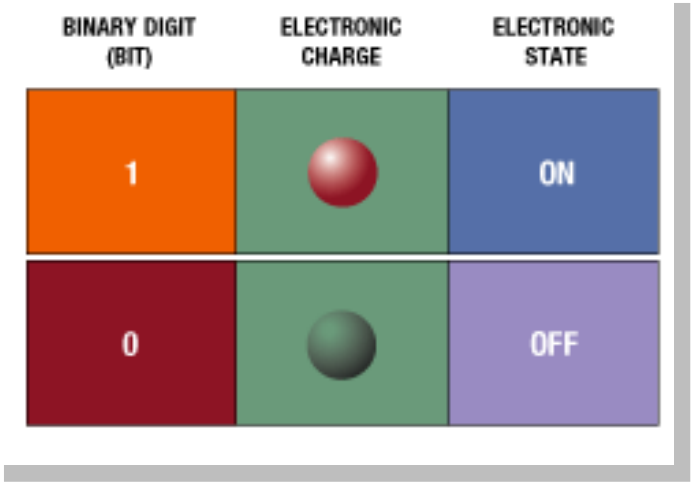
- Which processor should you select?
  - **The faster the processor, the more expensive the computer**

Intel Processor	Desired Clock Speed
Itanium or Xeon 	1.3 GHz and up
Pentium family 	3.0 GHz and up 2.4 GHz to 3.0 GHz Up to 2.4 GHz
Celeron 	2.2 GHz and up

Next

Data Representation

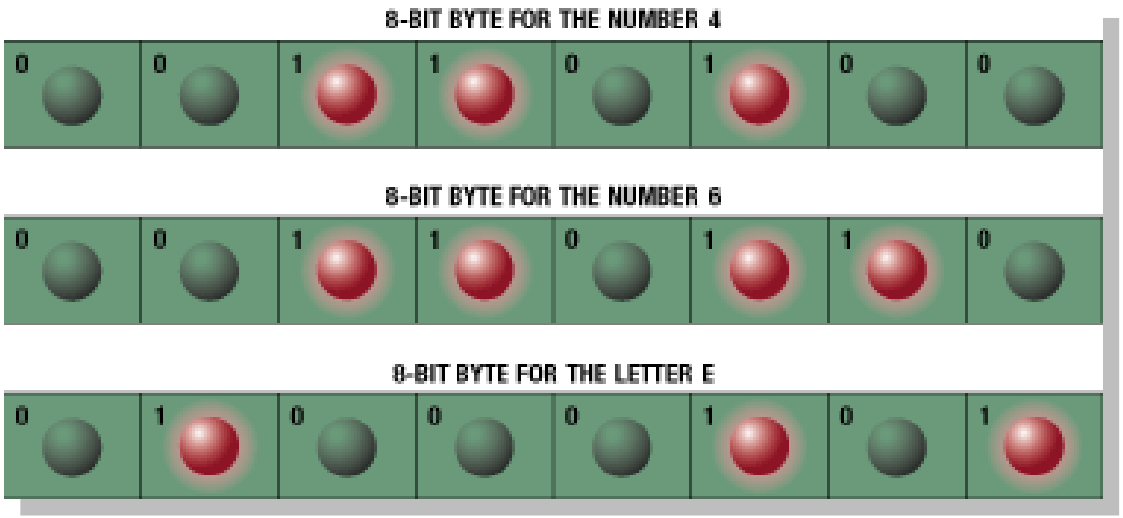
- How do computers represent data?
  - **Most computers are digital**



- Recognize only two discrete states: on or off
- Use a **binary system** to recognize two states
- Use Number system with two unique digits: 0 and 1, called **bits** (short for binary digits)

Data Representation

- What is a byte?
  - **Eight bits grouped together as a unit**
  - **Provides enough different combinations of 0s and 1s to represent 256 individual characters**
    - Numbers
    - Uppercase and lowercase letters
    - Punctuation marks



Data Representation

- What are two popular coding systems to represent data?
  - **ASCII—American Standard Code for Information Interchange**
  - **EBCDIC—Extended Binary Coded Decimal Interchange Code**

ASCII	Symbol	EBCDIC
00110000	0	11110000
00110001	1	11110001
00110010	2	11110010
00110011	3	11110011

p. 140 - 141 Fig. 4-8

Data Representation

- How is a letter converted to binary form and back?

Step 1.
The user presses the capital letter T (shift+T key) on the keyboard.

Step 2.
An electronic signal for the capital letter T is sent to the system unit.

Step 3.
The signal for the capital letter T is converted to its ASCII binary code (01010100) and is stored in memory for processing.

Step 4.
After processing, the binary code for the capital letter T is converted to an image, and displayed on the output device.

p. 141 Fig. 4-9

Next

Memory

- What is memory?
  - **Electronic components that store instructions, data, and results**
  - **Consists of one or more chips on motherboard or other circuit board**
  - **Each byte stored in unique location called an address, similar to seats in a concert hall**

p. 142 Fig. 4-10

Next

Memory

- How is memory measured?
  - **By number of bytes available for storage**

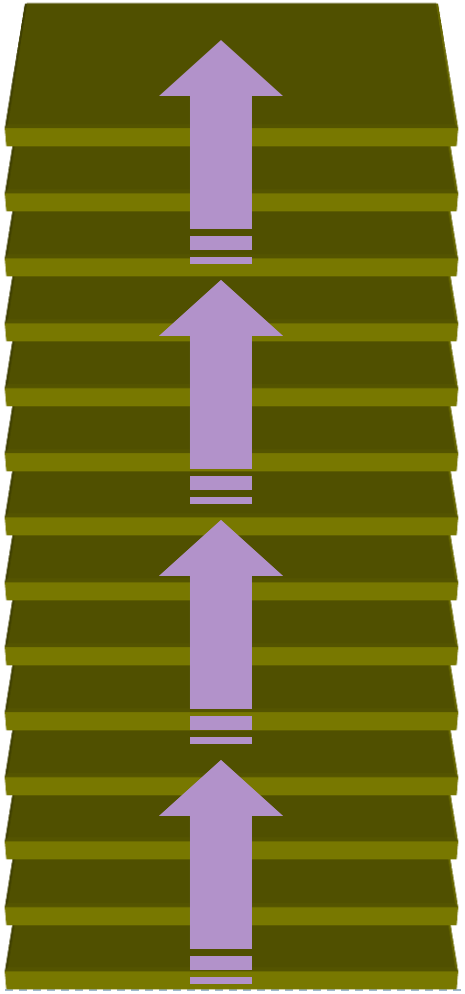
Term	Abbreviation	Approximate Size
Kilobyte	KB or K	1 thousand bytes
Megabyte	MB	1 million bytes
Gigabyte	GB	1 billion bytes
Terabyte	TB	1 trillion bytes

p. 142 Fig. 4-11

Next

Memory

- What is random access memory (RAM)?



Memory chips that can be read from and written to by processor

Also called main memory or primary storage

Most RAM is volatile, it is lost when computer's power is turned off

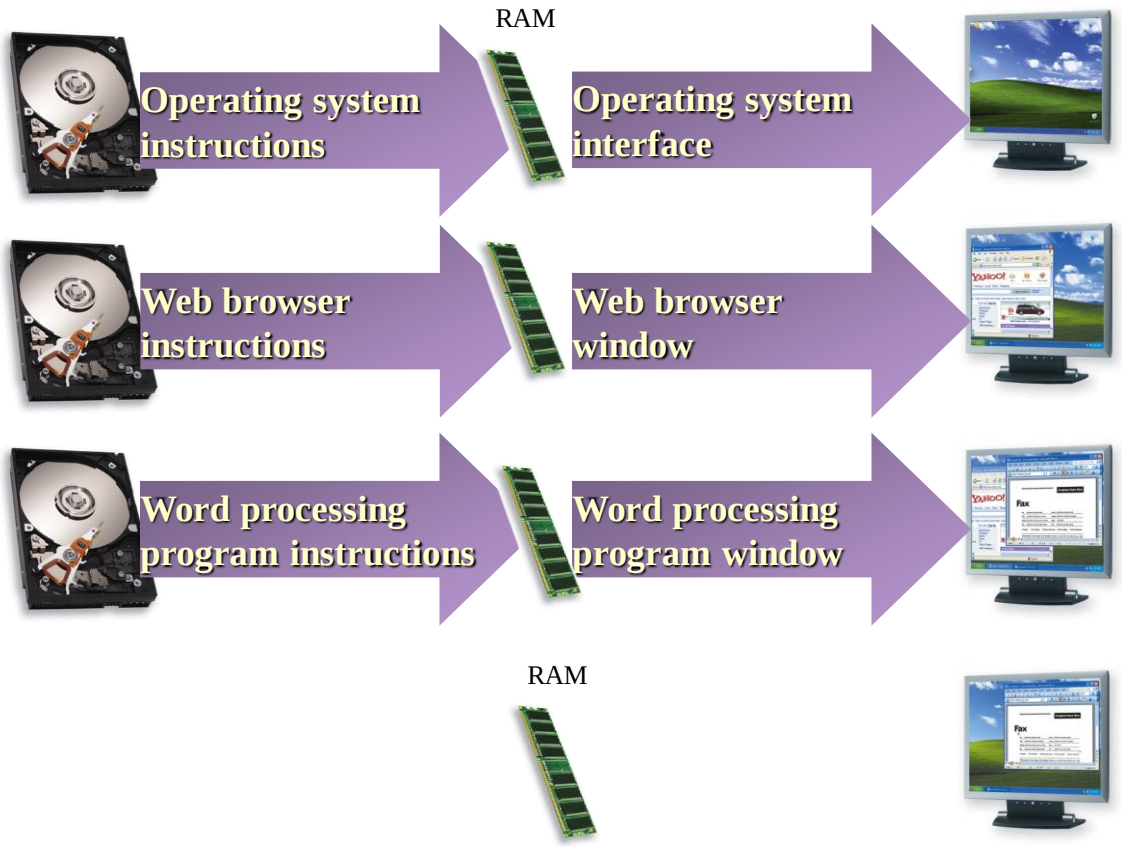
The more RAM a computer has, the faster it responds

Click to view Web Link, click Chapter 4, Click Web Link from left navigation, then click RAM below Chapter 4

Next

Memory

- How do program instructions transfer in and out of RAM?



Step 1. When you start the computer, certain operating system files are loaded into RAM from the hard disk. The operating system displays the user interface on the screen.

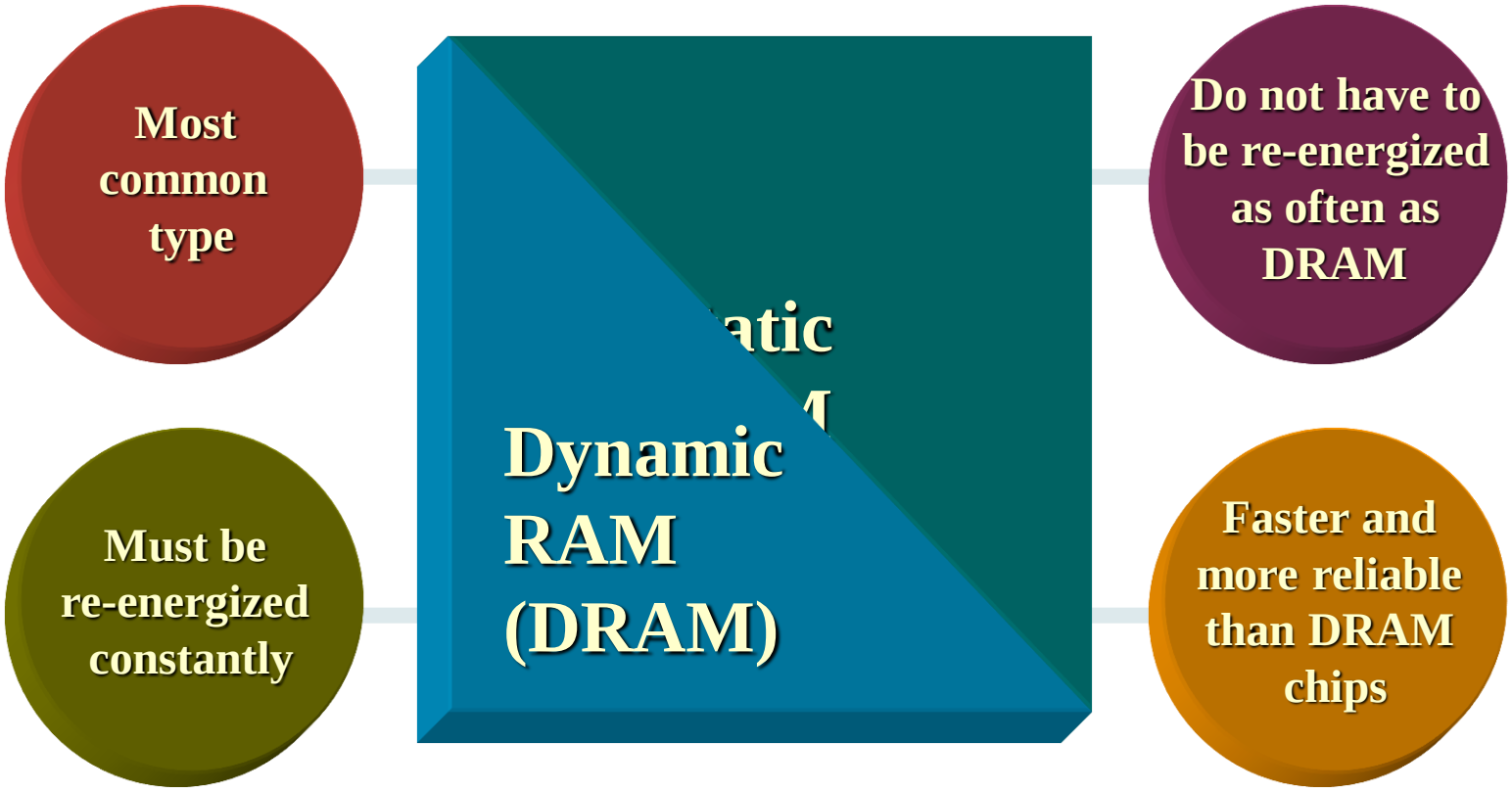
Step 2. When you start a Web browser, the program's instructions are loaded into RAM from the hard disk. The Web browser window is displayed on the screen.

Step 3. When you start a word processing program, the program's instructions are loaded into RAM from the hard disk. The word processing program, along with the Web Browser and certain operating system instructions are in RAM. The word processing program window is displayed on the screen.

Step 4. When you quit a program, such as the Web browser, its program instructions are removed from RAM. The Web browser is no longer displayed on the screen.

Memory

- What are two basic types of RAM chips?

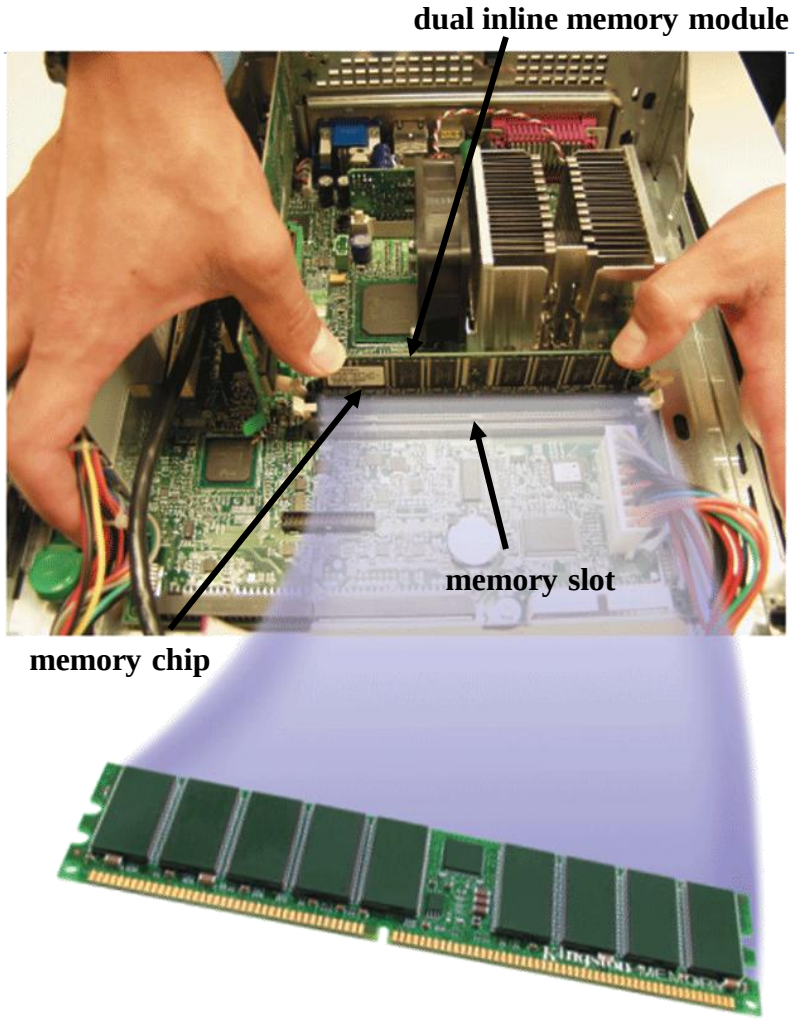


Newer Type: Magnetoresistive RAM (MRAM)

Next

Memory

- Where does memory reside?
  - **Resides on small circuit board called memory module**
  - **Memory slots on motherboard hold memory modules**



p. 144 Fig. 4-13

Next

Memory

- How much RAM does a computer require?
  - **Depends on the types of software you plan to use**
  - **For optimal performance, you need more than minimum specifications**

Next

Memory

- What is cache?
  - **Helps speed computer processes by storing frequently used instructions and data**
  - **Also called memory cache**
    - **L1 cache** built into processor
    - **L2 cache** slower but has larger capacity
    - L2 **advanced transfer cache** is faster, built directly on processor chip

Click to view Web Link, click Chapter 4, Click Web Link from left navigation, then click Cache below Chapter 4

Memory

- What is read-only memory (ROM)?

Memory chips that store permanent data and instructions

The data on most ROM chips cannot be modified

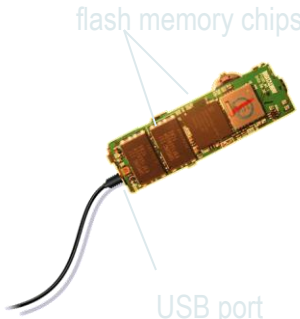
Firmware—Manufactured with permanently written data, instructions, or information

Next

Memory

- What is flash memory?
  - **Nonvolatile memory that can be erased electronically and rewritten**
  - **Used with PDAs, smart phones, printers, digital cameras, automotive devices, audio players, digital vocie recorders, and pagers**

Step 1.
Purchase and download MP3 music tracks from a Web site. With one end of a special cable connected to the system unit, connect the other end into the MP3 player.



Step 2.
Instruct the computer to copy the MP3 music track to the flash memory chip in the MP3 player.

Step 3.
Plug the headphones into the MP3 player, push a button on the MP3 player, and listen to the music through the headphones.

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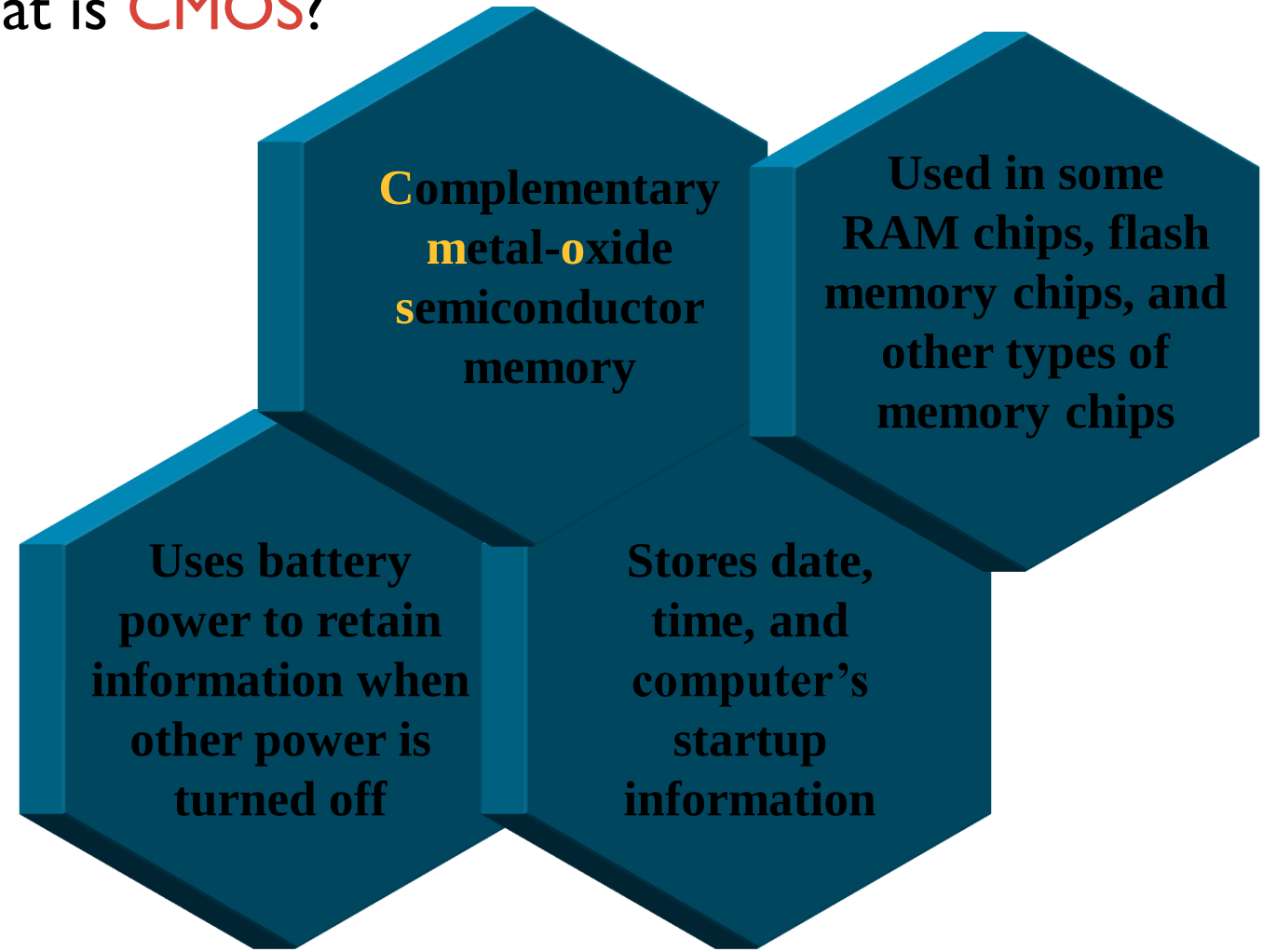
Memory

- What is CMOS?



Next

Memory

- What is access time?
  - **Amount of time it takes processor to read data from memory**
  - **Measured in nanoseconds (ns), one billionth of a second**
  - **It takes 1/10 of a second to blink your eye; a computer can perform up to 10 million operations in same amount of time**

Term	Speed
Millisecond	One-thousandth of a second
Microsecond	One-millionth of a second
Nanosecond	One-billionth of a second
Picosecond	One-trillionth of a second

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Next

Expansion Slots and Adapter Cards

- What is an adapter card?
  - **Enhances system unit or provides connections to external devices called peripherals**
  - **Also called an expansion card**

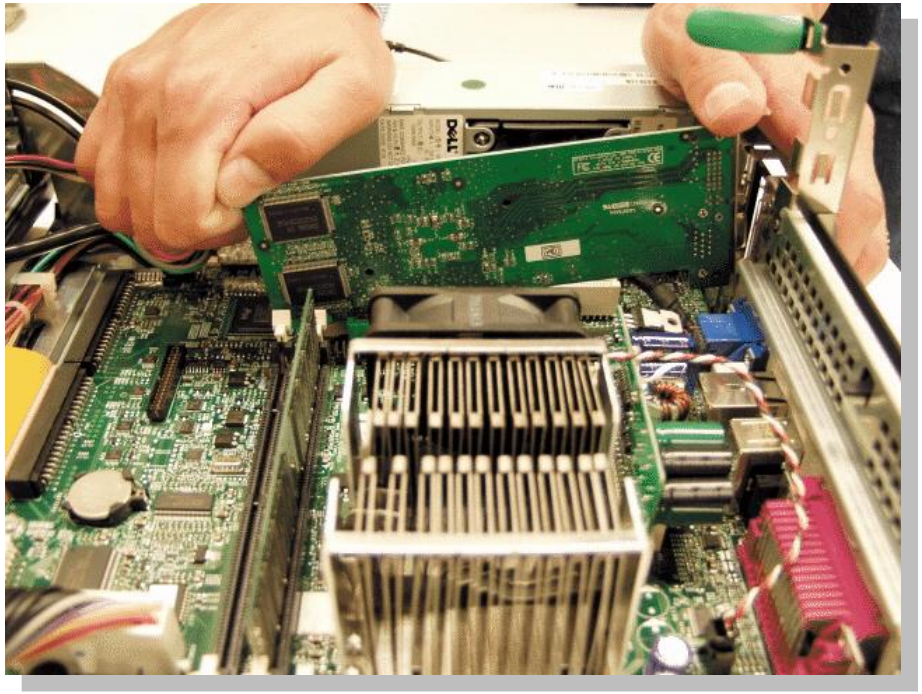
TYPES OF ADAPTER CARDS

Adapter Card	Purpose
Disk controller	Connects disk drives
FireWire	Connects to FireWire devices
Graphics accelerator	Increases the speed at which graphics are displayed
MIDI	Connects musical instruments
Modem	Connects other computers through telephone or cable television lines
Network	Connects other computers and peripherals
PC-to-TV converter	Connects a television
Sound	Connects speakers or a microphone
TV tuner	Allows viewing of television channels on the monitor
USB 2.0	Connects to USB 2.0 devices
Video	Connects a monitor
Video capture	Connects a camcorder

Click to view Web Link, click Chapter 4, Click Web Link from left navigation, then click Sound Cards below Chapter 4

Expansion Slots and Adapter Cards

- What is an expansion slot?
  - **An opening, or socket, on the motherboard that can hold an adapter card**



Expansion Slots and Adapter Cards

- What are PC cards, flash memory cards, and USB Flash Drives?
  - **A PC card adds memory, storage, sound, fax/modem, communications, and other capabilities to notebook computers**
  - **A flash memory card allows users to transfer data from mobile devices to desktop computers**
  - **A USB flash drive is a flash memory storage device that plugs into a USB port on a computer**

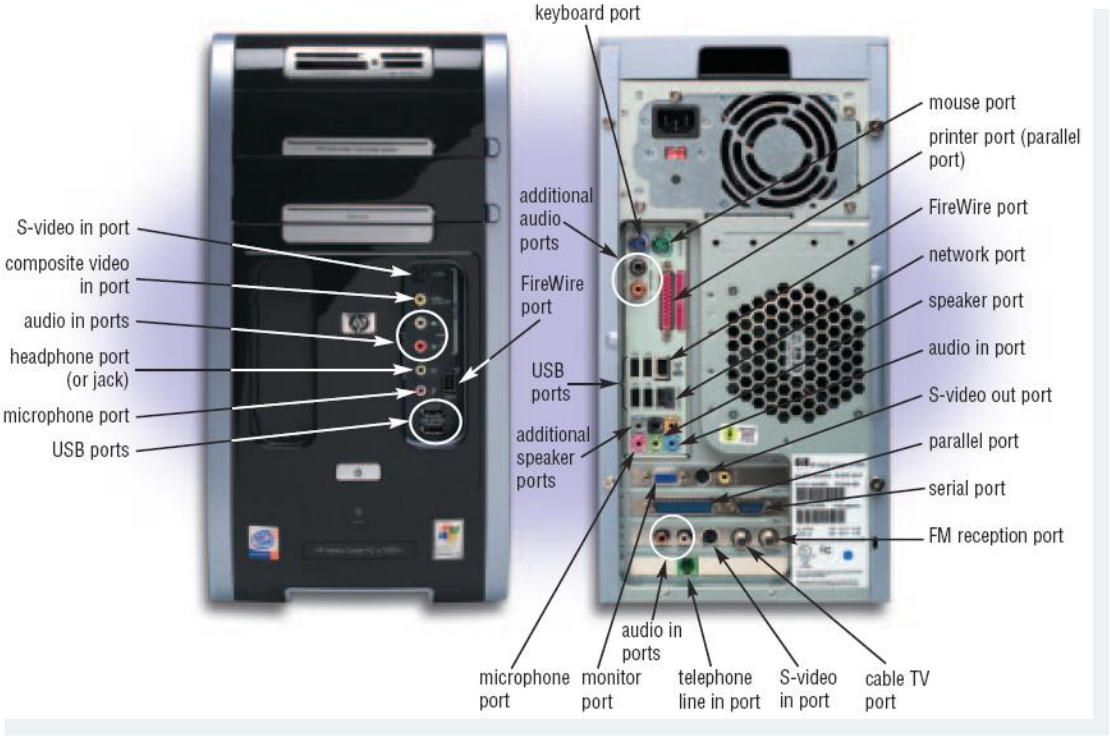
Click to view Web Link, click Chapter 4, Click Web Link from left navigation, then click Removable Flash Memory Devices below Chapter 4

p. 147 Figs. 4-19 – 4-20

Next

Ports and Connectors

- What are ports and connectors?
  - **Port connects external devices to system unit**
  - **Connector joins cable to peripheral**



p. 148 Fig. 4-21

Next

Ports and Connectors

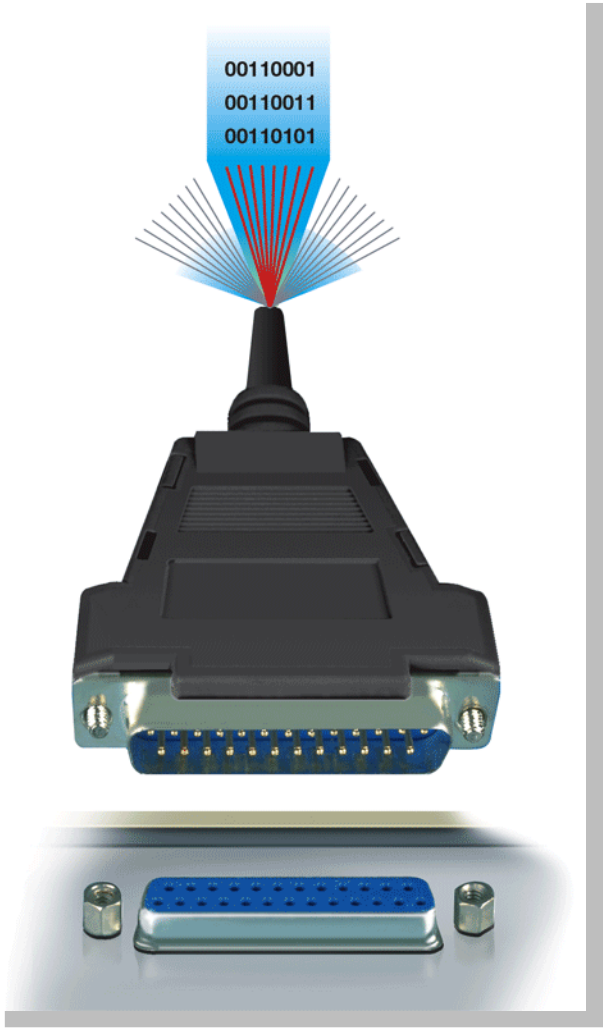
- What is a serial port?
  - **Transmits one bit of data at a time**
  - **Connects slow-speed devices, such as a mouse, keyboard, or modem**

p. 149 Fig. 4-22

Next

Ports and Connectors

- What is a parallel port?
  - **Connects devices that can transfer more than one bit at a time, such as a printer**



p. 149 Fig. 4-23—slide 32 or 45

Next

Ports and Connectors

- What are USB ports?

USB (universal serial bus) port can connect up to 127 different peripherals together with a single connector type

PCs typically have six to eight USB ports on front or back of the system unit

Single USB port can be used to attach multiple peripherals using a USB hub

The latest version of USB is called USB 3.0

Next

Ports and Connectors

- What are FireWire ports?
  - **Connects multiple types of devices that require faster data transmission speeds**
  - **Allows you to connect up to 63 devices together**

Next

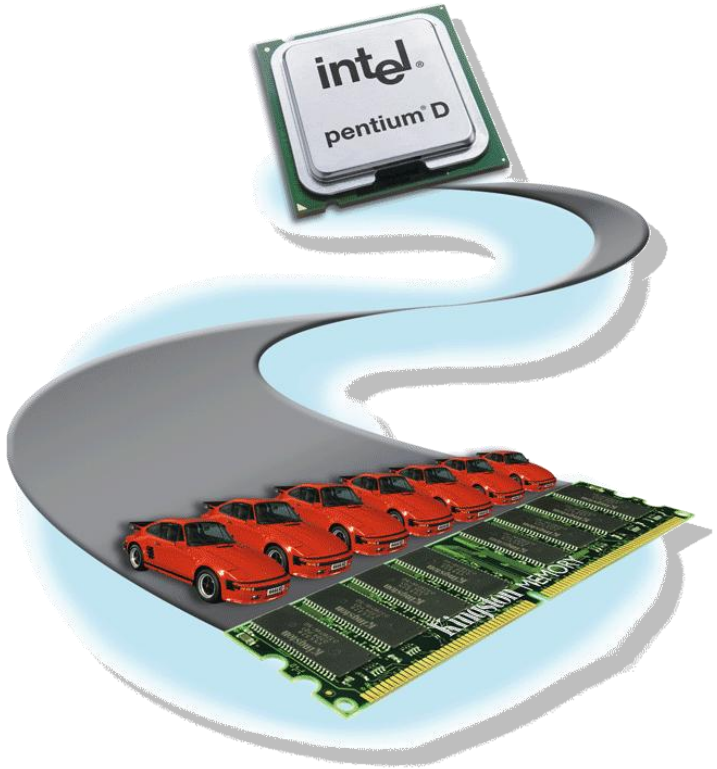
Ports and Connectors

- What are special-purpose ports?
  - **Allow users to attach specialized peripherals or transmit data to wireless devices**
    - **MIDI (Musical Instrument Digital Interface) port**
    - **SCSI (small computer system interface) port**
    - **IrDA (Infrared Data Association) port**
    - **Bluetooth port**

Next

Buses

- What is a bus?
  - **Channel that allows devices inside and attached to the computer to communicate with each other**
    - System bus connects processor and main memory
    - Bus width determines number of bits transmitted at one time



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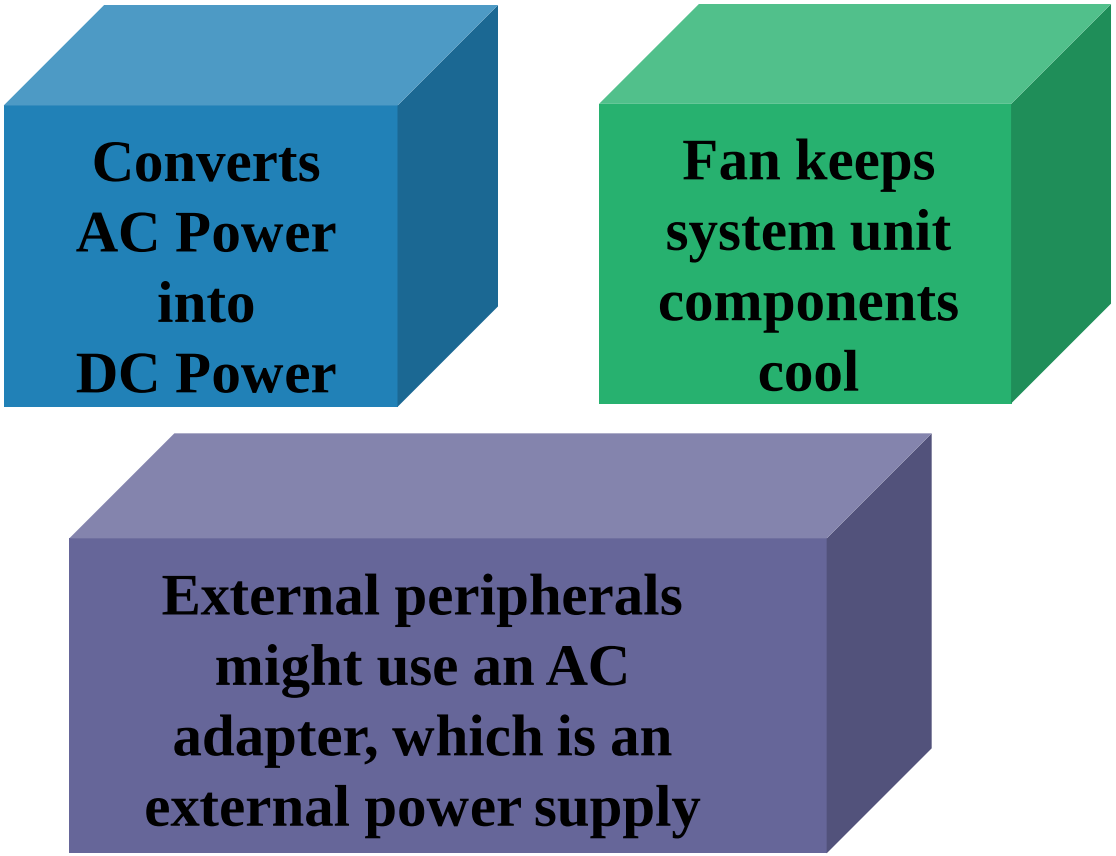
Bays

- What is a bay?
  - **Open area inside system unit used to install additional equipment**
  - **Drive bays typically hold disk drives**

Power Supply

- What is a power supply?



Next

Mobile Computers and Devices

- What is a mobile computer?
  - **Notebook, weighing between 2.5 and 9 pounds, or mobile device such as a PDA**

p. 152 Fig. 4-26

Next

Mobile Computers and Devices

- What ports are on a notebook computer?

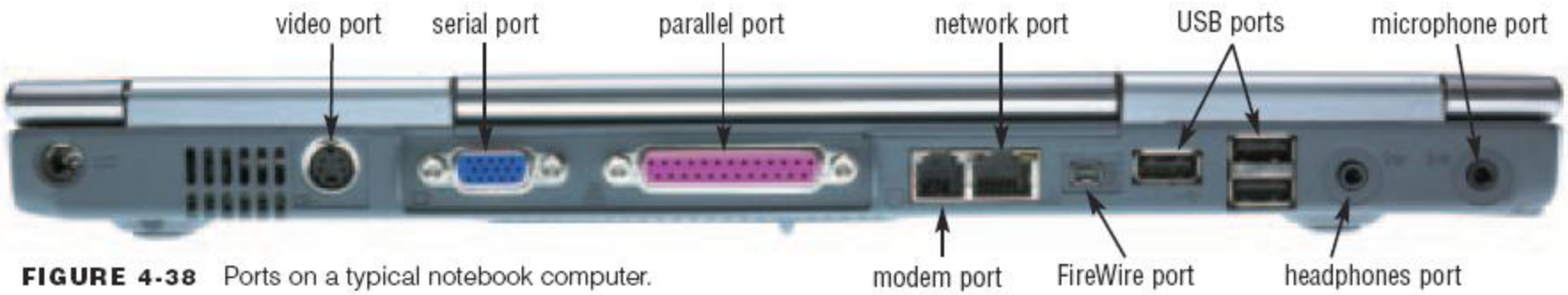
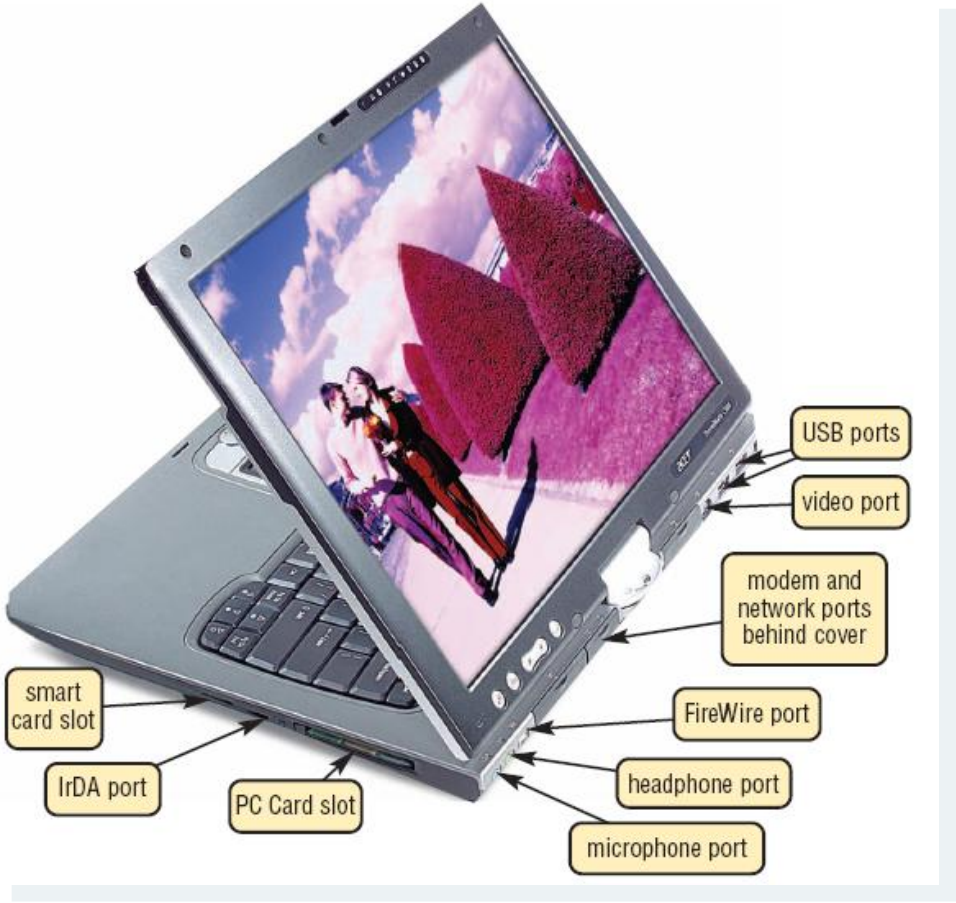


FIGURE 4-38 Ports on a typical notebook computer.

Mobile Computers and Devices

- What ports and slots are on a tablet PC?



p. 153 Fig. 4-28

Next

Putting It All Together

- What are suggested processor, clock speed, and RAM requirements based on the needs of various types of users?

SUGGESTED MINIMUM CONFIGURATIONS BY USER

User	Processor and RAM
HOME 	Intel Celeron D or AMD Sempron or Intel Pentium 4 or AMD Athlon 64 Minimum RAM: 256 MB
SMALL OFFICE/ HOME OFFICE 	Intel Pentium D or AMD Athlon 64 FX Minimum RAM: 512 MB
MOBILE 	Intel Celeron M or Intel Pentium M or AMD Turion 64 Minimum RAM: 512 MB
POWER 	Intel Itanium 2 or AMD Opteron or Intel Pentium Extreme Edition or Intel Xeon MP or AMD Athlon MP or AMD Athlon 64 X2 Minimum RAM: 2 GB
LARGE BUSINESS 	Intel Pentium D or AMD Athlon 64 FX Minimum RAM: 1 GB

Next

Keeping Your Computer Clean

- Over time, the system unit collects dust – even in a clean environment
  - **Preventative maintenance requires a few basic products:**

Next

Summary of the Components of the System Unit

- **Components of the system unit**
- **How memory stores data, instructions, and information**
- **Sequence of operations that occur when a computer executes an instruction**
- **Comparison of various personal computer processors on the market today**
- **How to clean a system unit**

Chapter 4 Complete