

Discovering Computers

Technology in a World of Computers,
Mobile Devices, and the Internet

Chapter 6

Inside Computers and Mobile Devices



Objectives Overview

Describe the various computer and mobile device cases and the contents they protect

Describe multi-core processors the components of a processor, and the four steps in a machine cycle

Identify characteristics of various personal computer processors on the market today, and describe the ways processors are cooled

Explain the advantages and services of cloud computing

Define a bit, and describe how a series of bits represents data

Explain how program and application instructions transfer in and out of memory

See Page 248
for Detailed Objectives

Copyright © Cengage Learning. All rights reserved.

THOMSON

Objectives Overview

Differentiate among the various types of memory

Describe the purpose of adapter cards, USB adapters, and ExpressCard modules

Explain the function of a bus

Explain the purpose of a power supply and batteries

Understand how to care for computers and mobile devices

See Page 248
for Detailed Objectives

Copyright © Cengage Learning. All rights reserved.

Inside the Case

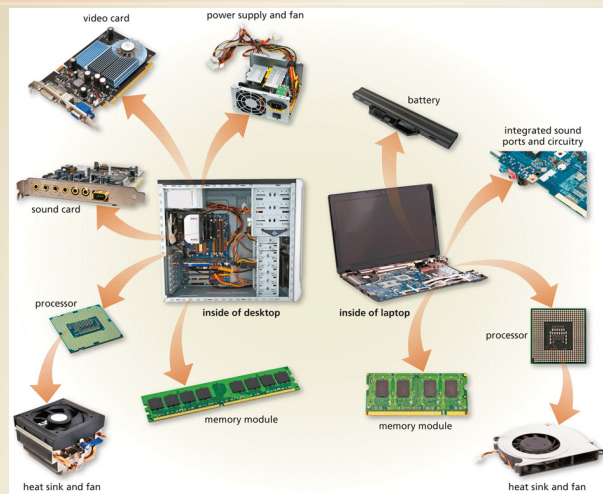
- The case contains and protects the electronics of the computer or mobile device from damage



Page 248
Figure 6-1

Copyright © Cengage Learning. All rights reserved.

Inside the Case

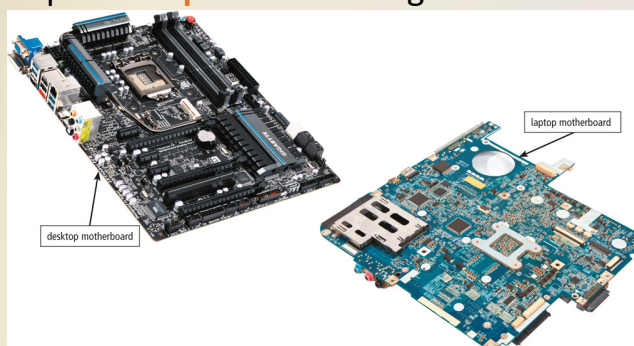


Page 250
Figure 6-2

Copyright © Cengage Learning. All rights reserved.

Inside the Case

- The **motherboard** is the main circuit board of the computer
 - A computer **chip** contains integrated circuits



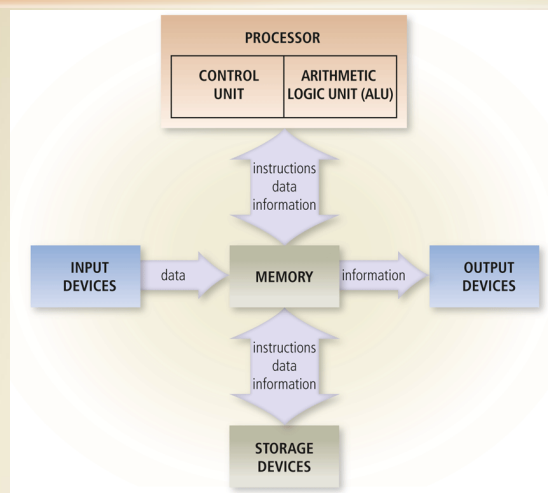
Pages 250 - 251
Figure 6-3

Copyright © Cengage Learning. All rights reserved.

Processors

- The **processor**, also called the **central processing unit (CPU)**, interprets and carries out the basic instructions that operate a computer
 - Contain a control unit and an arithmetic logic unit (ALU)
- A **multi-core processor** is a single chip with two or more separate processor cores

Processors

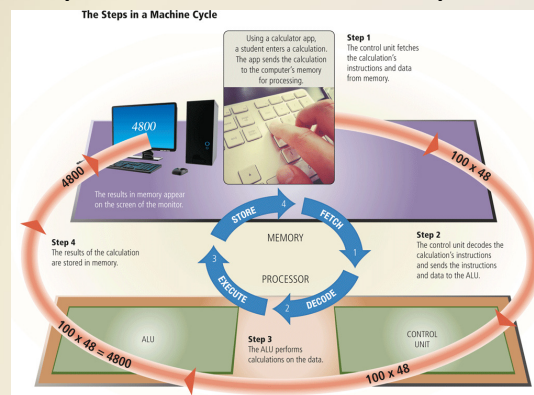


Processors

- The **control unit** is the component of the processor that directs and coordinates most of the operations in the computer
- The **arithmetic logic unit (ALU)** performs arithmetic, comparison, and other operations

Processors

- For every instruction, a processor repeats a set of four basic operations, which comprise a machine cycle



Processors

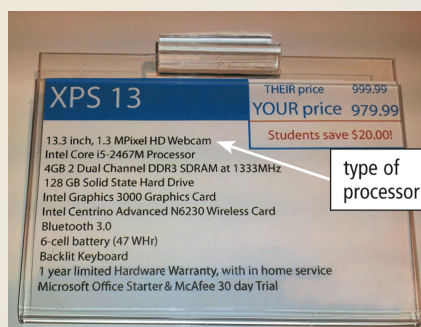
The processor contains registers, that temporarily hold data and instructions

The **system clock** controls the timing of all computer operations

- The pace of the system clock is called the **clock speed**, and is measured in **gigahertz (GHz)**

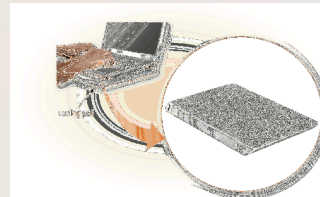
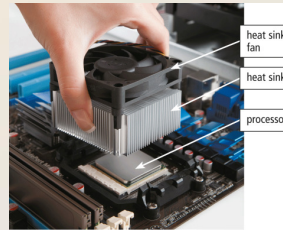
Processors

- The leading manufacturers of personal computer processor chips are Intel and AMD



Processors

- A processor chip generates heat that could cause the chip to malfunction or fail
- Require additional cooling
 - Heat sinks
 - Liquid cooling technology
 - Cooling mats



Pages 256 - 257
Figures 6-6 – 6-7

Copyright © Cengage Learning. All rights reserved.

Cloud Computing

- Home and business users choose cloud computing for a variety of reasons

Accessibility

Cost savings

Space
savings

Scalability

Page 257

Copyright © Cengage Learning. All rights reserved.

Data Representation

Analog signals are continuous and vary in strength and quality

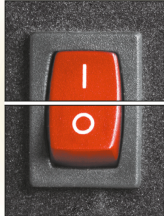



Digital signals are in one of two states: on or off

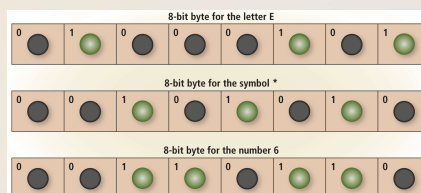
- Most computers are digital
- The **binary system** uses two unique digits (0 and 1)
 - **Bits** and **bytes**

Data Representation

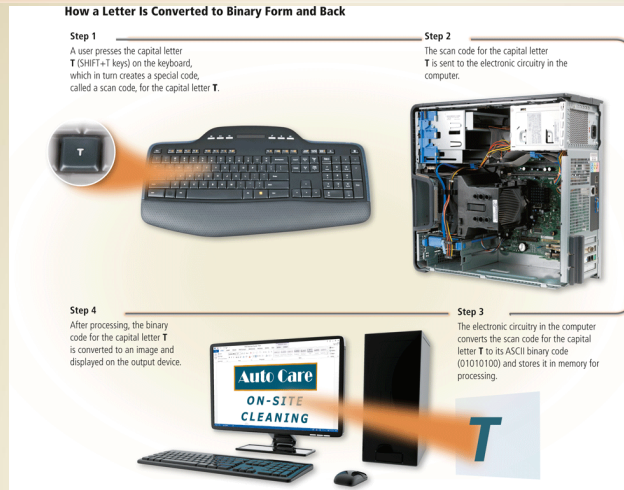
The circuitry in a computer or mobile device represents the on or the off states electronically by the presence or absence of an electronic charge

Eight bits grouped together as a unit are called a **byte**. A byte represents a single character in the computer or mobile device

Binary Digit (BIT)	Electronic Charge	Electronic State
		ON
		OFF



Data Representation



Page 260
Figure 6-10

Copyright © Cengage Learning. All rights reserved.

Memory

- **Memory** consists of electronic components that store instructions waiting to be executed by the processor, data needed by those instructions, and the results of processing the data
- Stores three basic categories of items:

The operating system and other programs

Applications

Data being processed and the resulting information

Page 261

Copyright © Cengage Learning. All rights reserved.

Memory

- Each location in memory has an address
- Memory size commonly is measured in gigabytes (GB) or terabytes (TB)



Page 261
Figure 6-11

Copyright © Cengage Learning. All rights reserved.

Memory

- The system unit contains two types of memory:

Volatile memory

Loses its contents when power is turned off

Example includes **RAM**

Nonvolatile memory

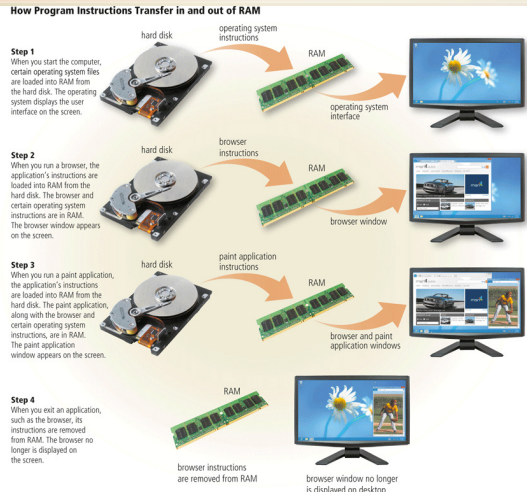
Does not lose contents when power is removed

Examples include ROM, flash memory, and CMOS

Page 262

Copyright © Cengage Learning. All rights reserved.

Memory



Page 262
Figure 6-12

Copyright © Cengage Learning. All rights reserved.

Memory

- Two common types of RAM chips exist:

Dynamic RAM
(DRAM)

Static RAM (SRAM)

Table 6-1 Common DRAM Variations

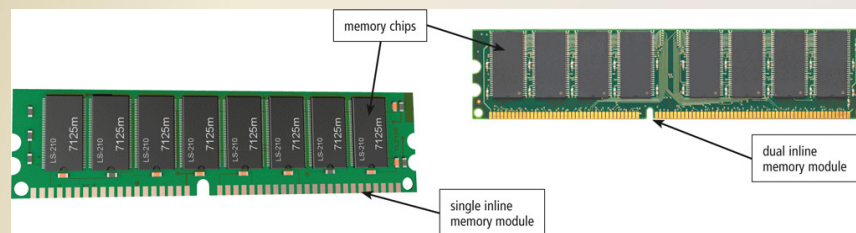
Name	Comments
SDRAM (Synchronous DRAM)	<ul style="list-style-type: none"> Synchronized to the system clock Much faster than DRAM
DDR SDRAM (Double Data Rate SDRAM)	<ul style="list-style-type: none"> Transfers data twice, instead of once, for each clock cycle Faster than SDRAM
DDR2	<ul style="list-style-type: none"> Second generation of DDR Faster than DDR
DDR3	<ul style="list-style-type: none"> Third generation of DDR Designed for computers with multi-core processors Faster than DDR2
DDR4	<ul style="list-style-type: none"> Fourth generation of DDR Faster than DDR3
RDRAM (Rambus DRAM)	<ul style="list-style-type: none"> Much faster than SDRAM

Page 263
Table 6-1

Copyright © Cengage Learning. All rights reserved.

Memory

- RAM chips usually reside on a **memory module** and are inserted into **memory slots**

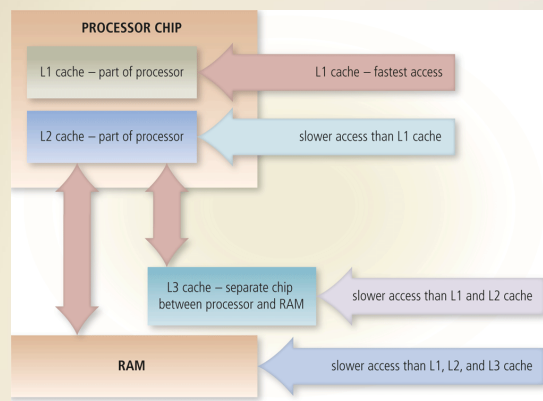


Page 263
Figure 6-13

Copyright © Cengage Learning. All rights reserved.

Memory

- Memory cache** speeds the processes of the computer because it stores frequently used instructions and data



Page 265
Figure 6-14

Copyright © Cengage Learning. All rights reserved.

Memory

Read-only memory (ROM)
refers to memory chips
storing permanent data and
instructions

- **Firmware**

Memory

- **Flash memory** can be erased electronically and rewritten
 - CMOS technology provides high speeds and consumes little power

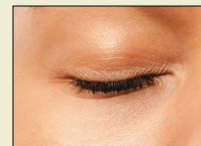
Memory

- **Access time** is the amount of time it takes the processor to read from memory
 - Measured in nanoseconds

Table 6-2 Access Time Terminology

Term	Abbreviation	Speed
Millisecond	ms	One-thousandth of a second
Microsecond	μs	One-millionth of a second
Nanosecond	ns	One-billionth of a second
Picosecond	ps	One-trillionth of a second

10 million
operations = 1 blink



Adapters

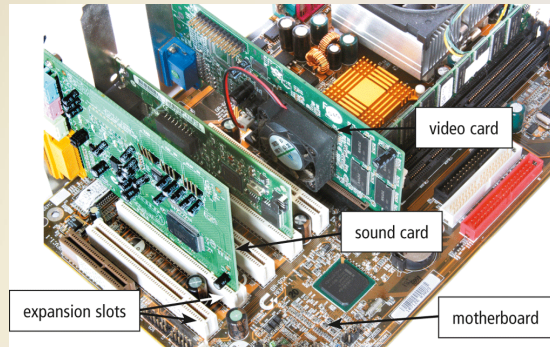
- An **adapter card** enhances functions of a component of a desktop or server system unit and/or provides connections to peripherals
 - Sound card and graphics card
- An **expansion slot** is a socket on a desktop or server motherboard that can hold an adapter card

Table 6-3 Adapter Cards

Type	Purpose
Bluetooth	Enables Bluetooth connectivity
MIDI	Connects to musical instruments
Modem	Connects to transmission media, such as cable television lines or phone lines
Network	Provides network connections, such as to an Ethernet port
Sound	Connects to speakers or a microphone
TV tuner	Allows viewing of digital television broadcasts on a monitor
USB	Connects to high-speed USB ports
Video	Provides enhanced graphics capabilities, such as accelerated processing or the ability to connect a second monitor
Video capture	Connects to a video camera

Adapters

- With **Plug and Play**, the computer automatically can recognize peripheral devices as you install them

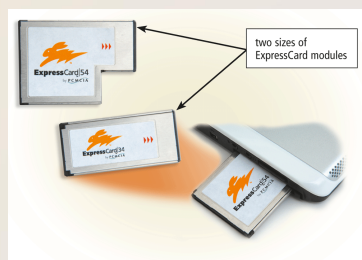


Page 269
Figure 6-16

Copyright © Cengage Learning. All rights reserved.

Adapters

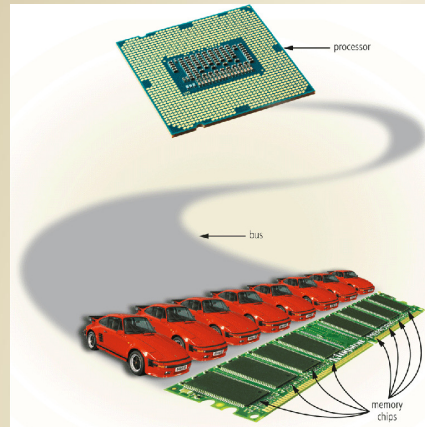
- Adapters for mobile computers are in the form of a removable flash memory device
 - **USB adapter**
 - ExpressCard module



Page 269
Figures 6-17 – 6-18

Copyright © Cengage Learning. All rights reserved.

Buses



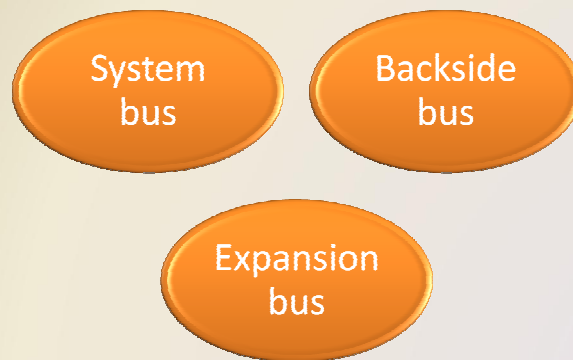
- A **bus** allows the various devices both inside and attached to the system unit to communicate with each other
 - Data bus
 - Address bus
- **Word size** is the number of bits the processor can interpret and execute at a given time

Pages 270 - 271
Figure 6-19

Copyright © Cengage Learning. All rights reserved.

Buses

- A computer might have these three types of buses:

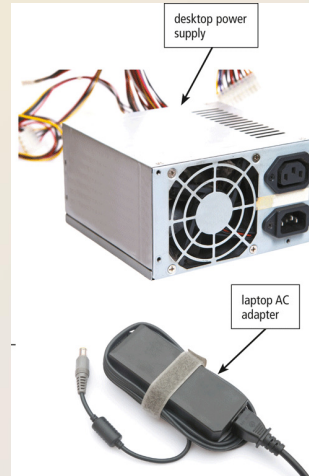


Page 271

Copyright © Cengage Learning. All rights reserved.

Power Supply and Battery

- The **power supply** or laptop AC adapter converts the wall outlet AC power into DC power



Page 271
Figure 6-20

Copyright © Cengage Learning. All rights reserved.

Power Supply and Battery

- Mobile computers and devices can run using either a power supply or batteries
- Batteries typically are rechargeable lithium-ion batteries



Page 272
Figure 6-21

Copyright © Cengage Learning. All rights reserved.

Summary

Various components inside computers and mobile devices

Types of processors, steps in a machine cycle, and processor cooling methods

Advantages and services of cloud computing

How memory stores data and described various types of memory

Adapters, buses, power supplies and batteries

Ways to care for computers and mobile devices

Discovering Computers

Technology in a World of Computers,
Mobile Devices, and the Internet

Chapter 6

Inside Computers and Mobile Devices

Chapter 6 Complete

