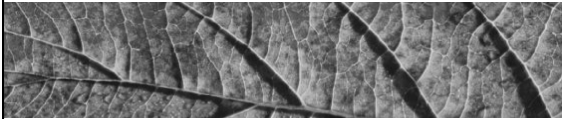


NEW PERSPECTIVES

Chapter 2

Computer Hardware

Computer Concepts 2013



2 Chapter Contents

- Section A: Personal Computer Basics
- Section B: Microprocessors and Memory
- Section C: Storage Devices
- Section D: Input and Output Devices
- Section E: Hardware Security

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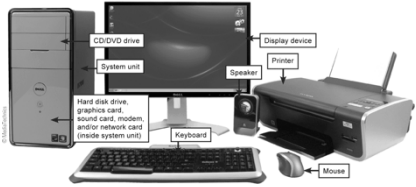
2 Section A: Personal Computer Basics

- Personal Computer Systems
- Desktop and Portable Computers
- Home, Game, and Small Business Systems
- Buying a Computer
- Handheld Computers

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2 Personal Computer Systems


FIGURE 2-1
A typical personal computer system includes the system unit and a variety of storage, input, and output devices. The components of a typical desktop system are shown here. To compare the components of desktops with portable computers, watch the video for this figure in your interactive eBook.




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2 Desktop and Portable Computers

- The term form factor refers to the size and dimensions of a component, such as a system board or system unit
- A desktop computer fits on a desk and runs on power from an electrical wall outlet



A tower unit can be placed on the desk or on the floor.



The circuitry for this desktop all-in-one model is integrated into the case that holds the screen.

FIGURE 2-3
A desktop computer fits on a desk and is tethered to a wall outlet.

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2 Desktop and Portable Computers

- A portable computer is a small, lightweight personal computer
- A notebook computer (also referred to as a laptop) is a small, lightweight portable computer that opens like a clamshell to reveal a screen and keyboard
- A netbook is a small version of a notebook computer

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2 Desktop and Portable Computers




FIGURE 2-4
A notebook computer is small and lightweight, giving it the advantage of portability. It can be plugged into an electrical outlet, or it can run on battery power.

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2 Home, Game, and Small Business Systems

- Today, the term home computer system encompasses a vast array of computer configurations designed to accommodate consumers who use computers for personal tasks
- Some of the most cutting-edge computers are designed for gaming
- Computers marketed for small business applications tend to be middle-of-the-line models pared down to essentials

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2 Buying a Computer

- Browse through computer magazines and online computer stores to get a general idea of features and prices
- Decide on a budget and stick to it
- Make a list of the ways you plan to use your computer
- Select a platform
- Decide on a form factor
- Select peripherals, software, and accessories

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2 Section B: Microprocessors and Memory


- Microprocessor Basics
- Today's Microprocessors
- Random Access Memory
- Read-only Memory
- EEPROM

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2 Microprocessor Basics

- A microprocessor is an integrated circuit designed to process instructions
 - Usually the most expensive component of a computer

FIGURE 2-15 Although a microprocessor is sometimes mistakenly referred to as a computer on a chip, it can be more accurately described as a CPU on a chip because it contains—on a single chip—circuitry that performs essentially the same tasks as the central processing unit of a classic mainframe computer.

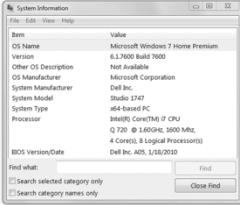


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2 Microprocessor Basics

- Microprocessor clock
 - Megahertz
 - Gigahertz
- Multicore processor
- Front side bus
- Cache
 - Level 1 cache (L1)
 - Level 2 cache (L2)
 - Level 3 cache (L3)
- Word size

FIGURE 2-16 You can discover your computer processor's specs using operating system utilities or third-party software, such as CPU-Z. If you are using a Mac, click the Apple icon and then select About This Mac. When using Windows, click the Control Panel button to access System Information.



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2 Microprocessor Basics

- CISC vs. RISC technology
- Serial processing
 - Pipelining
- Parallel processing
- Benchmarks

FIGURE 2-17 Microprocessor designers have developed techniques for serial processing, pipelining, and parallel processing.

Instruction 3
Instruction 2
Instruction 1

In serial processing, one instruction is processed at a time.

Instruction 3
Instruction 2
Instruction 1

In pipelining, an instruction can begin to be processed before the previous instruction's processing is complete.

Instruction 4
Instruction 3
Instruction 2
Instruction 1

In parallel processing, multiple instructions can be processed at the same time.

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2 Today's Microprocessors

FIGURE 2-19 Today's Popular Server, Desktop, and Mobile Microprocessor Families

Processor		Application	
INTEL			
Core i7 and i5	Desktops and Notebooks	Phenom	Desktops
Pentium	Desktops	Athlon	Desktops and Notebooks
Celeron	Desktops and Notebooks	Sempron	Desktops and Notebooks
Xeon	Servers and Workstations	Turion	Notebooks
Itanium	Servers	Opteron	Servers and Workstations
Atom	Notebooks and Handhelds		
ARM			
ARM7	Analog phones		
ARM9	Digital phones		
Cortex-A	Handhelds		

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2 Random Access Memory

- RAM (random access memory) is a temporary holding area for data, application program instructions, and the operating system

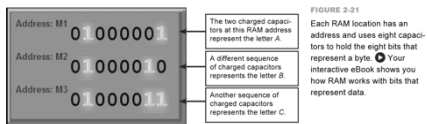
FIGURE 2-20 A computer ad typically specifies the amount and type of RAM.

- Intel Core i7 2820QM processor 2.3 GHz 1600 MHz FSB
- 6 MB L3 cache
- 4 GB DDR2-800 MHz dual channel SDRAM
- 1 TB SATA HD (7200 rpm)
- 16X max. DVD+/-R/RW SuperMulti drive

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2 Random Access Memory

- Microscopic capacitors hold the bits that represent data
- Most RAM is volatile
 - Requires electrical power to hold data



2 Random Access Memory

- RAM capacity is expressed in megabytes or gigabytes
- Personal computers typically feature between 2 GB and 8 GB of RAM
- If a program exceeds its allocated space, the operating system uses an area of the hard disk, called virtual memory, to store parts of programs or data files until they are needed

2 Random Access Memory

- SDRAM is fast and relatively inexpensive
 - DDR, DDR2, or DDR3
- RAM speed is often expressed in nanoseconds or megahertz
 - Lower nanosecond ratings are better



FIGURE 2-23 SDRAM is the most popular type of RAM in today's computers. It is typically available on a small circuit board. When adding memory to a computer, follow the manufacturer's instructions carefully.

2 Read-Only Memory

- ROM is a type of memory circuitry that holds the computer's startup routine
 - Permanent and non-volatile
- The ROM BIOS tells the computer how to access the hard disk, find the operating system, and load it into RAM

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2 EEPROM

- Electrically Erasable Programmable Read-Only Memory
- Replaces CMOS technology
- Requires no power to hold data

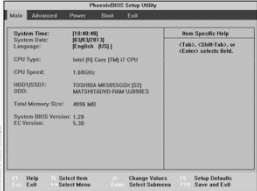


FIGURE 2-24
EEPROM holds computer configuration settings, such as the date and time, hard disk capacity, number of floppy disk drives, and RAM capacity. To access the EEPROM setup program, hold down the F1 key as your computer boots. But be careful! If you make a mistake with these settings, your computer might not be able to start.

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2 Section C: Storage Devices

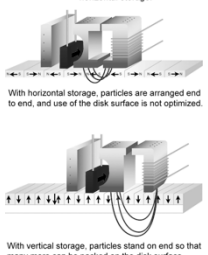
- Storage Basics
- Magnetic Disk and Tape Technology
- Optical Technology
- Solid State Storage Technology
- Storage Wrap-up

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2 Storage Basics

- A storage medium contains data
- A storage device records and retrieves data from a storage medium
 - Data gets copied from a storage device into RAM, where it waits to be processed
 - Processed data is held temporarily in RAM before it is copied to a storage medium
- Vertical vs. horizontal storage

FIGURE 2-25
Vertical storage produces higher storage capacities than horizontal storage.



With horizontal storage, particles are arranged end to end, and use of the disk surface is not optimized.

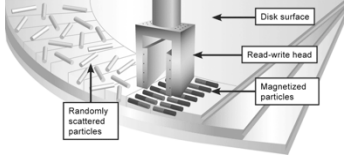
With vertical storage, particles stand on end so that many more can be packed on the disk surface.

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2 Magnetic Disk and Tape Technology

- Magnetic storage stores data by magnetizing microscopic particles on the disk or tape surface

FIGURE 2-26
Before data is stored, particles on the surface of the disk are scattered in random patterns. The disk drive's read-write head magnetizes the particles, and orients them in a positive (north) or negative (south) direction to represent 0 and 1 bits.



Randomly scattered particles

Disk surface

Read-write head

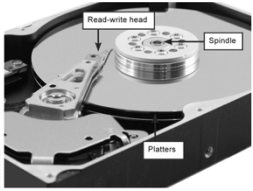
Magnetized particles

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2 Magnetic Disk and Tape Technology

- Hard disk technology is the preferred type of main storage for most personal computers
- Not as durable as many other storage technologies
 - Head crash

FIGURE 2-27
Hard disk platters and read-write heads are sealed inside the drive case or cartridge to screen out dust and other contaminants. The video for this figure in your interactive eBook shows how a hard drive works and what happens when a hard disk crashes.



Read-write head

Spindle

Platters

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2 Optical Storage Technology

- Optical storage stores data as microscopic light and dark spots on the disk surface
 - CD, DVD, and Blu-ray storage technologies

FIGURE 2-30

As seen through an electron microscope, the pits on an optical storage disc look like small craters. Each pit is less than 1 micron (one-millionth of a meter) in diameter—1,500 pits lined up side by side are about as wide as the head of a pin.

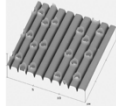
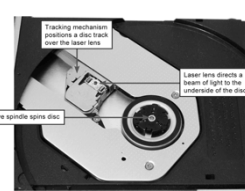


FIGURE 2-31

CD, DVD, and Blu-ray drives use a laser to read data from the underside of a disc.



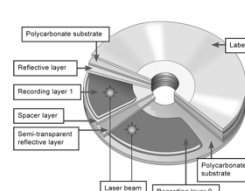
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2 Optical Storage Technology

- Today's DVD drives typically have 24X speeds for a data transfer rate of 3,600 KBps
- Three categories of optical technologies
 - Read-only (ROM)
 - Recordable (R)
 - Rewritable (RW)

FIGURE 2-32

CDs, DVDs, and Blu-ray discs are constructed with one or more layers of recording surface sandwiched between protective plastic.



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2 Optical Storage Technology


- CDDA
- DVD-Video
- CD-ROM
- DVD-ROM
- CD-R
- DVD+R or DVD-R
- CD-RW
- DVD+RW or DVD-RW
- BD-ROM, BD-R, and BD-RE

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2 Solid State Storage Technology

- Solid state storage technology stores data in an erasable, rewritable circuitry
- Non-volatile
- Card reader may be required to read data on solid state storage

FIGURE 2-35
Most personal computers are equipped with a card reader for transferring data to and from solid state memory cards.



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2 Solid State Storage Technology

- A solid state drive (SSD) is a package of flash memory that can be used as a substitute for a hard disk drive
- A USB flash drive is a portable storage device that plugs directly into a computer's system unit using a built-in connector

FIGURE 2-36
Like hard disk drives, SSDs offer fast data transfer rates and are fixed in place. Although they use the same technology as USB flash drives, SSDs cannot be easily removed from a computer.





FIGURE 2-37
To view the files and programs stored on a USB flash drive, insert it into the computer. Windows displays the AutoPlay window that you can use to quickly view the files stored on the USB device.



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2 Storage Wrap-up

FIGURE 2-38
Some notebook computers provide bays for one hard disk drive and one CD or DVD drive.

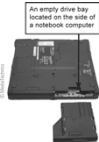



FIGURE 2-39
Most desktop computers have several drive bays, some accessible from outside the case, and others—designed for hard disk drives—without any external access. Empty drive bays are typically hidden from view with a face plate.

Watch the video for this figure to find out how to install internal and external drives.



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2 Storage Wrap-up

FIGURE 2-39
 Storage Technology
 Comparison

Storage Type	Cost of Device	Capacity	Data Transfer Rate	Technology	Removable
USB Flash Drive	\$\$	2–256 GB	Medium	Solid state	Yes
CD-RW	\$	700 MB	Slow	Optical	Yes
DVD+RW	\$	8.5 GB	Slow	Optical	Yes
Blu-ray	\$\$\$\$	50 GB	Slow	Optical	Yes
Floppy Disk	\$	1.44 MB	Glacial	Magnetic	Yes
Hard Drive (Internal)	\$\$\$	80 GB–2 TB	Fast	Magnetic	No
Hard Drive (External)	\$\$\$	80 GB–2 TB	Fast	Magnetic	Yes
Solid State Drive (Internal)	\$\$\$	32 GB–256 GB	Fast	Solid state	No

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2 Section D: Input and Output Devices


- Basic Input Devices
- Display Devices
- Printers
- Installing Peripheral Devices

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2 Basic Input Devices

- Keyboard
- Pointing device
 - Mice
 - Game controller
 - Trackpad
- Touch screen

FIGURE 2-40
An optical mouse uses an onboard chip to track a light beam as it bounces off a surface, such as a desk, clipboard, or mouse pad.



Game controllers can include several sticks and buttons for arcade-like control when playing computer games.


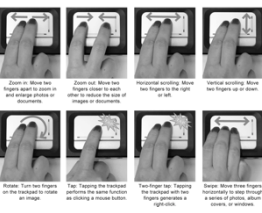


FIGURE 2-41
Touchpad Gestures




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2 Display Devices

- An LCD display produces an image by filtering light through a layer of liquid crystal cells
- Gradually, CCFL backlighting technology is being replaced by low-power light-emitting diodes (LEDs)
 - LED display

FIGURE 2-43
LCD screens are used with most desktop and portable computers.



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2 Display Devices

- Screen size
- Dot pitch
- Viewing angle width
- Response rate
- Color depth
- Screen resolution

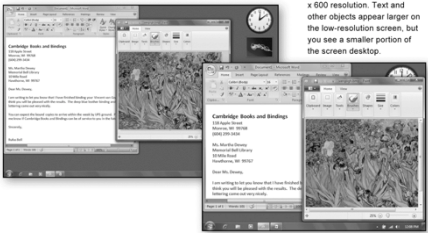
FIGURE 2-44
Common Screen Resolutions

VGA	640 x 480
SVGA	800 x 600
XGA	1024 x 768
SXGA	1280 x 1024
UXGA	1600 x 1200
WUXGA	1920 x 1200
WQXGA	2560 x 1600

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2 Display Devices

FIGURE 2-45
The screen on the left shows 1280 x 800 resolution. Notice the size of text and other screen-based objects. The screen on the right shows 800 x 600 resolution. Text and other objects appear larger on the low-resolution screen, but you see a smaller portion of the screen desktop.




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2 Display Devices

- Graphics circuitry generates the signals for displaying an image on the screen
 - Integrated graphics
 - Dedicated graphics
 - Graphics card
 - Graphics processing unit (GPU)

FIGURE 2-46
A graphics card is a small circuit board that plugs into the system board.

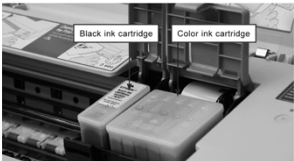


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2 Printers

- An ink-jet printer has a nozzle-like print head that sprays ink onto paper
- A laser printer uses the same technology as a photocopier

FIGURE 2-47
Ink jet printers spray ink from a series of ink cartridges.



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2 Printers




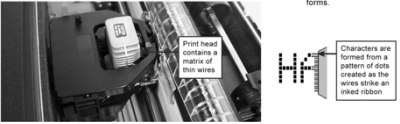
FIGURE 2-48
Laser printers electrostatically collect toner on a drum, then the toner is transferred onto paper. ▶ Find out more about laser printers by watching the video for this figure in your interactive eBook.

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2 Printers

- Dot matrix printers produce characters and graphics by using a grid of fine wires
 - The wires strike a ribbon and the paper

FIGURE 2-43
Unlike laser and ink-jet technologies, a dot matrix printer actually strikes the paper and, therefore, can print multipart carbon forms.



Print head contains a matrix of thin wires.

Characters are formed from a pattern of dots created as the wires strike an inked ribbon.

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2 Printers

- Printer features
 - Resolution
 - Print speed
 - Duty cycle
 - Operating costs
 - Duplex capability
 - Memory
 - Networkability

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2 Installing Peripheral Devices

- The data bus moves data between RAM and the microprocessor
- The segment of the data bus to which peripheral devices connect is called the expansion bus
- An expansion slot is a long, narrow socket on the system board into which you can plug an expansion card
- Expansion cards are small circuit boards that give the computer additional capabilities
 - Expansion slot
 - Expansion port

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2 Installing Peripheral Devices

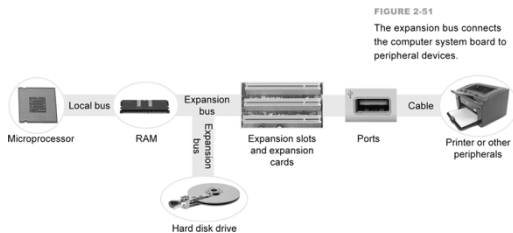


FIGURE 2-51
The expansion bus connects the computer system board to peripheral devices.

2 Installing Peripheral Devices

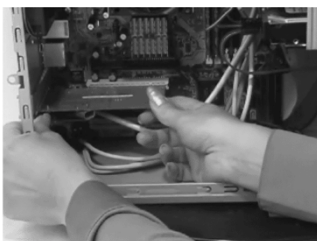


FIGURE 2-52
An expansion card simply slides into an expansion slot. Before you install an expansion card, be sure to unplug the computer and ground yourself—that's technical jargon for releasing static electricity by using a special grounding wristband or by touching both hands to a metal object. Your interactive eBook explains how to install expansion cards in a desktop computer.

2 Installing Peripheral Devices

➤ An expansion port passes data in and out of a computer or peripheral device

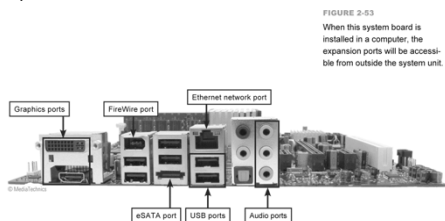


FIGURE 2-53
When this system board is installed in a computer, the expansion ports will be accessible from outside the system unit.

2 Installing Peripheral Devices

- Most peripherals connect to an external USB port
- You can easily add USB ports to your computer by using a USB hub

FIGURE 2-54

A USB connector is shaped like a fat rectangle. Make sure you know which side of the plug is up; the top is usually labeled with the USB logo.

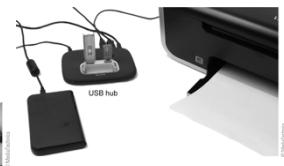


FIGURE 2-55

This self-powered USB hub connects two USB flash drives, an external hard drive, and a printer to a single USB port that is connected to a computer.

2 Installing Peripheral Devices

- Other kinds of ports



VGA



DVI



HDMI

FIGURE 2-56

A variety of ports are available for connecting an external monitor to a desktop or notebook computer.

- Plug and Play automatically configures your computer to accommodate new peripheral devices you add

2 Section E: Hardware Security

- Anti-theft Devices
- Surge Protection and Battery Backup
- Basic Maintenance
- Troubleshooting and Repair

2 Anti-Theft Devices

- ▶ Never leave your portable computer unattended, especially when you are at a coffee shop, the library, or the airport.
- ▶ If you have to leave your portable computer in your car, never leave it in plain view. Lock it up in the trunk or cover it up.
- ▶ Carry your portable computer in an inconspicuous carrying case.
- ▶ Record your portable computer's make, model, and serial number and store them away from the computer. Many recovered computers cannot be returned to their owners because this tracking information is not supplied to police.
- ▶ Consider securing your portable computer with an anti-theft device.

FIGURE 2-58
Tips for Preventing Computer Theft

2 Anti-Theft Devices

FIGURE 2-59
The Kensington Security Slot is an industry standard way to secure a computer to a desk.



FIGURE 2-60
Find My iPhone can locate a missing phone and remotely lock it or delete its contents.



2 Surge Protection and Battery Backup

- ▶ A power surge is a sudden increase in electrical energy, affecting the current that flows to electrical outlets
- ▶ A surge strip is a device that contains electrical outlets protected by circuitry that blocks surges
- ▶ A UPS is a device that not only provides surge protection, but also furnishes your computer with battery backup power during a power outage

2 Surge Protection and Battery Backup



FIGURE 2-61 Surge strips should be connected directly to a wall outlet. Plugging one surge strip into another surge strip reduces their effectiveness.



FIGURE 2-62 An uninterruptible power supply (UPS) not only protects electronic equipment from power surges, it also provides battery power during power outages.

2 Basic Maintenance

- Computer component failures can be caused by manufacturing defects and other circumstances beyond your control
- Keep the keyboard clean
- Clean your computer screen on a regular basis
- Keep the area clean around your computer
- Make sure fans are free of dust

2 Basic Maintenance



FIGURE 2-63 Carefully use a cotton swab and a can of compressed air or a vacuum cleaner to remove dust and debris from your keyboard. Sticky liquids are difficult to remove. That can of pop? Keep it away from your keyboard. Watch the video in your interactive eBook to see how to safely clean your computer keyboard.

2	2 Troubleshooting and Repair
	<ul style="list-style-type: none">➤ There are several telltale signs that your computer is in trouble<ul style="list-style-type: none">➤ Failure to power up➤ Loud beep➤ Blank screens and/or error messages➤ Blue screen of death➤ Troubleshooting and diagnostic tools➤ Safe Mode
<small>Chapter 2: Computer Hardware 58</small>	

2	2 Troubleshooting and Repair
	<p style="text-align: right; font-size: small; margin: 0;">FIGURE 2-57 Troubleshooting Tips</p> <ul style="list-style-type: none">➤ Stay calm and don't jump to any conclusions until you've thought everything through.➤ Write down all error messages and any other information that goes with them.➤ Make sure all components are plugged in and that there are no loose cables. For example, if your display device's cable is loose, the indicator light will be off and your screen will be blank.➤ If you can, try to duplicate the problem by going through the same steps that led you to it.➤ Look for troubleshooting and repair tips in your user's manual, on your vendor's Web site, or even through a search engine. If you search the Internet by typing in the error message number or keywords in the error message, you might discover that at least one person has already found a solution to your problem.➤ Run your antispyware and antivirus software. Lurking viruses, worms, Trojan horses, and spyware (discussed in the next chapter) can cause strange and unexplainable occurrences in your computer system. For example, spyware can cause your computer to keep displaying a pop-up ad no matter how you try to close it.➤ A simple reboot of your computer might clear up the problem. Windows always requires a reboot when it displays the blue screen of death. However, a more serious problem underlying the BSoD will not be resolved with a reboot. To reboot a PC, hold down the Ctrl, Alt, and Del keys at the same time. When the next screen appears, click the red Shut Down button in the lower-right corner.
<small>Chapter 2: Computer Hardware 59</small>	
