

Chapter 6

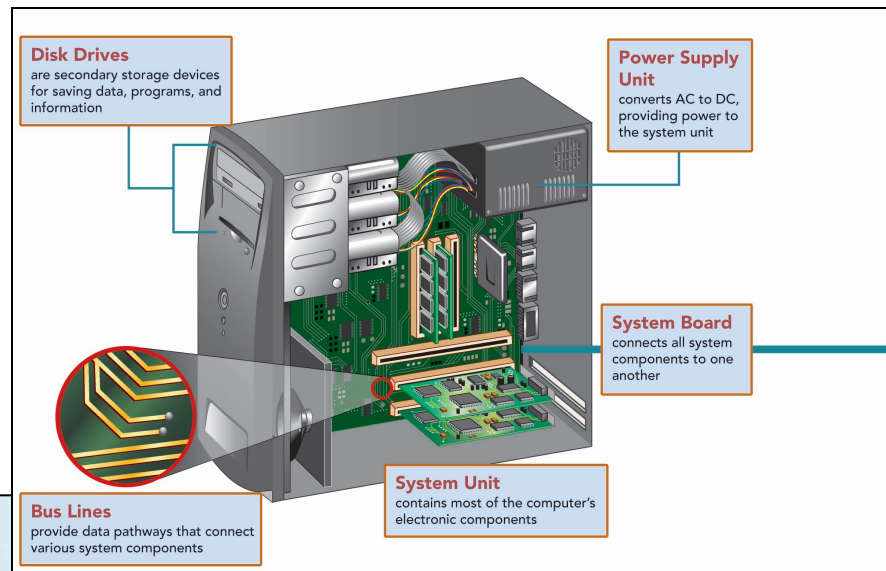
The System Unit

Competencies (1 of 2)

- Describe the four basic types of **system units**
- Discuss how a computer uses binary codes to represent data in electronic form
- Describe each of the major system unit components
- Discuss **microprocessors**, including specialty processors
- Describe the different types of **memory**

Competencies (2 of 2)

- Discuss **expansion slots** and boards
- Describe the five principal types of **expansion buses**
- Discuss the four standard **ports**



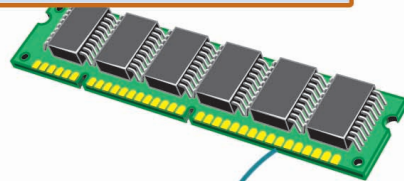
Introduction

Speed, capacity, and flexibility determine the power of microcomputers. 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 basic principles of how microcomputers are put together. These principles will be covered in this chapter.

System Unit

Memory

holds data, instructions, and information; memory circuit boards plug into slots on the system board



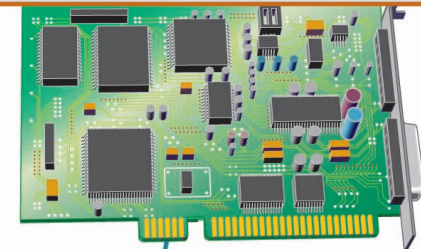
Microprocessor

controls operations and performs arithmetic and logical operations; microprocessor cartridges plug into a special slot on the system board



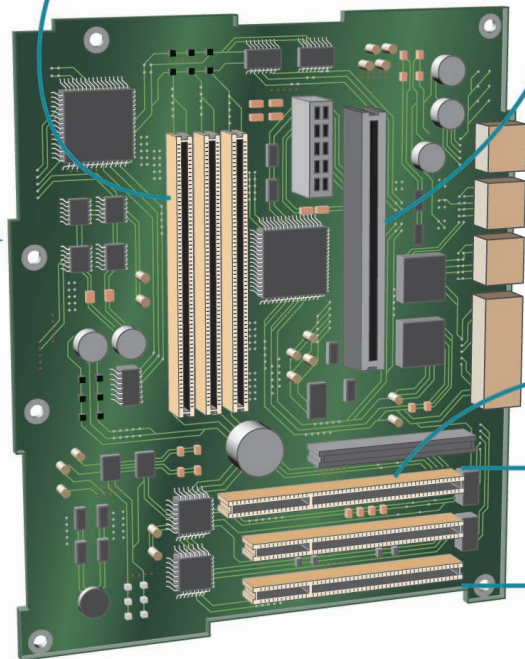
Expansion Cards

allow external devices to connect to and expand a computer's capabilities; expansion cards plug into slots on the system board



Expansion Slots

provide connections for expansion cards to the system board



System Unit Types

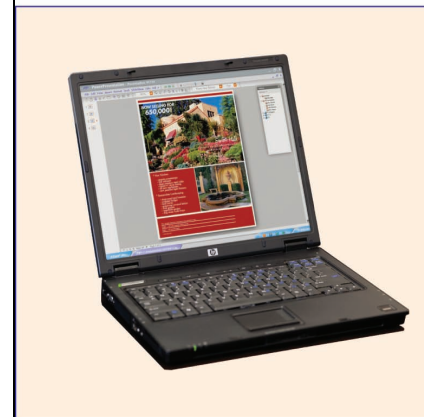
- **Desktop System Units**
- **Notebook System Units**
- **Tablet PC System Units**
- **Handheld Computer System Units**



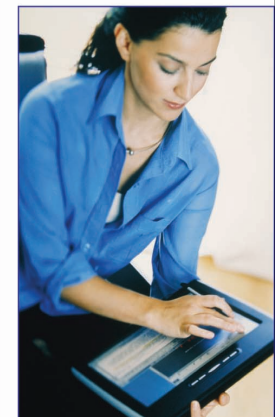
Desktop (tower model)



PDA



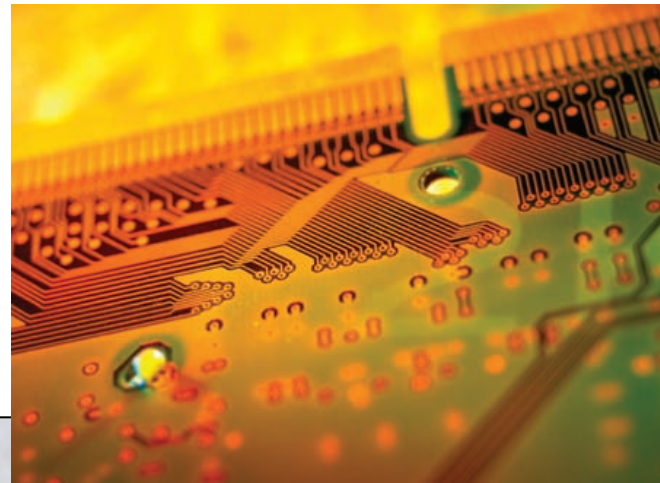
Notebook



Tablet PC

Electronic Data and Instructions

- **Data and instructions are represented electronically**
- **Two-state system or Binary System**
 - Off/on electrical states
 - Characters represented by 0s (off) and 1s (on)
 - **Bits**
 - **Bytes**



Binary Coding Schemes

- Three types of **binary coding schemes**
 - **ASCII** - American Standard Code for Information Exchange
 - **EBCDIC** - Extended Binary Coded Decimal Interchange Code (*for ancient IBM punch cards*)
 - **Unicode** – handles languages with large numbers of characters

Code	Uses
ASCII	Microcomputers
EBCDIC	Large computers
Unicode	International languages

ASCII - detail

```
!"#$%&'()*+,-./
0123456789:;<=>?
@ABCDEFGHIJKLMNO
PQRSTUVWXYZ[\]^_
`abcdefghijklmno
pqrstuvwxyz{|}~
```

Each character is stored in one byte
1 byte = 1 char
The basis of "plaintext"

0	}	<i>control codes</i>
...		
31		
32		<i>space</i>
33		!
34		"
35		#
...		
65		A
66		B
67		C
...		
90		Z
...		
125		}
126		~
127		<i>delete</i>

Unicode

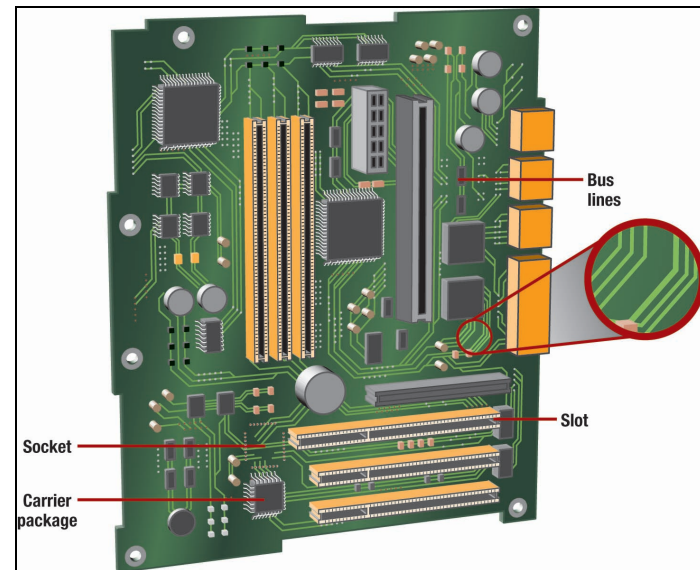
- **More than 100,000 characters, such as...**

π Я 音 æ∞

- **Rules to deal with things like directionality**
 - Left-to-Right, Right-to-Left (Arabic, etc.)
- **Still evolving, but in widespread use**
- **UTF-8 is the common version of Unicode**
 - Backward compatible with ASCII

System Board

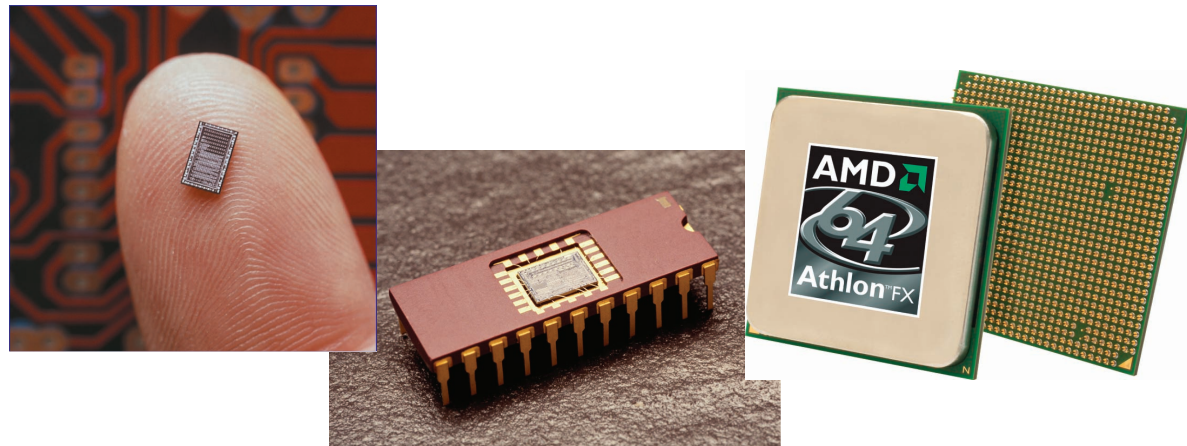
- Connects all components
- Allows communication between devices
- Main board or **motherboard**
- Circuit board electronic components
 - **Sockets**
 - **Slots**
 - **Bus lines**



Microprocessor

- **Central Processing Unit (CPU)**
- **Two Basic Components**
 - **Control unit**
 - **Arithmetic-logic unit (ALU)**

Unit	Speed
Microsecond	Millionth of a second
Nanosecond	Prepare written documents
Picosecond	Trillionth of a second



Word Size of Processors

- Chip capacities are expressed in **word sizes**
 - **8-bit** and **16-bit** (embedded or older)
 - **32-bit** (most PC's today)
 - **64-bit** (larger computers, some PCs)

Microprocessor Chips

- **Two Recent Significant Developments**
 - **64-bit processors**
 - Becoming more commonplace
 - Windows XP Professional X64 Edition
 - **Dual-Core Chips**
 - Can provide two separate and independent CPUs
 - **Parallel processing**

Processor	Manufacturer	Description
Pentium 4	Intel	32-bit
Core 2	Intel	64-bit, dual-core
Xeon	Intel	64-bit, dual-core
Athlon 64	AMD	64-bit, dual-core
Opteron	AMD	64-bit, dual-core
PowerPC	IBM	64-bit, dual-core

Processor Clock Speeds

Hertz – a measure of frequency (**Hz**)

Megahertz (MHz)

A million times a second (fast)

Gigahertz (GHz)

A billion times a second (faster!)

My laptop:

2.0 GHz

Clock Speed

- **Kilohertz (thousand) millisecond**
– Camera Flash Bulb
- **Megahertz (million) microsecond**
– Radio Waves, slow electronics
- **Gigahertz (billion) nanosecond**
– Microwaves, modern electronics
- **Terahertz (trillion) picosecond**
– Research, fastest transistors

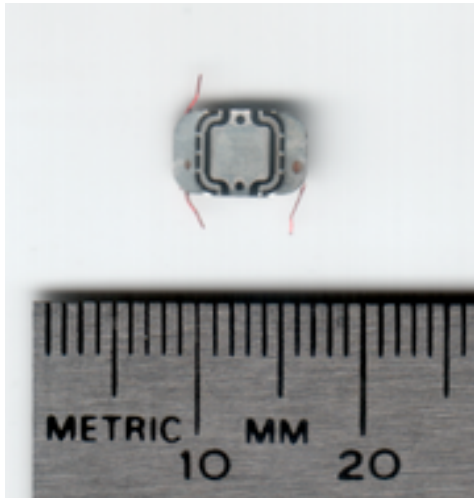
Specialty Processors

- **Coprocessors**
 - Designed to improve specific computing operations
 - **Graphics coprocessors**
- **Smart cards**
 - Credit card sized with an embedded chip
 - Used by many universities
- **RFID tags**
 - Information chips
 - Used for tracking purposes



RFID Tags

- **Reader sends a pulse**
- **RFID tag responds**
 - **Sends back an ID number**



Passports / ID cards
Implantable Microchips
Timing Racing Events
Traffic Monitoring / Tollbooths
Product Tracking
Promotional Items
Library Books
Museum Guides
Medical / Patient IDs

"How would you like it if, for instance, one day you realized your underwear was reporting on your whereabouts?"

—[California State Senator Debra Bowen](#)

Memory

- Holding area for data, instructions, and information
- Memory is contained on chips connected to the **system board**
- Types of memory chips

- RAM
- ROM
- CMOS

Type	Use
RAM	Programs and data
ROM	Fixed start-up instructions
CMOS	Flexible start-up instructions

Memory Sizes

Measured in **bytes**

1 byte = 1 character

Kilobyte (KB or Kbyte)

1,024 bytes (= 2^{10})

Megabyte (MB or Mbyte)

1,048,576 bytes (= 1K x 1K)

Gigabyte (GB or Gbyte)

1,073,741,824 bytes (= 1K x 1M)

Terabyte (TB or Tbyte)

1,099,511,627,776 bytes (= 1K x 1G)

Memory Sizes

Measured in **bytes**

1 byte = 1 character

Kilobyte

About 1/2 page

Megabyte (MB or Mbyte)

Novel (500 pages)

Gigabyte (GB or Gbyte)

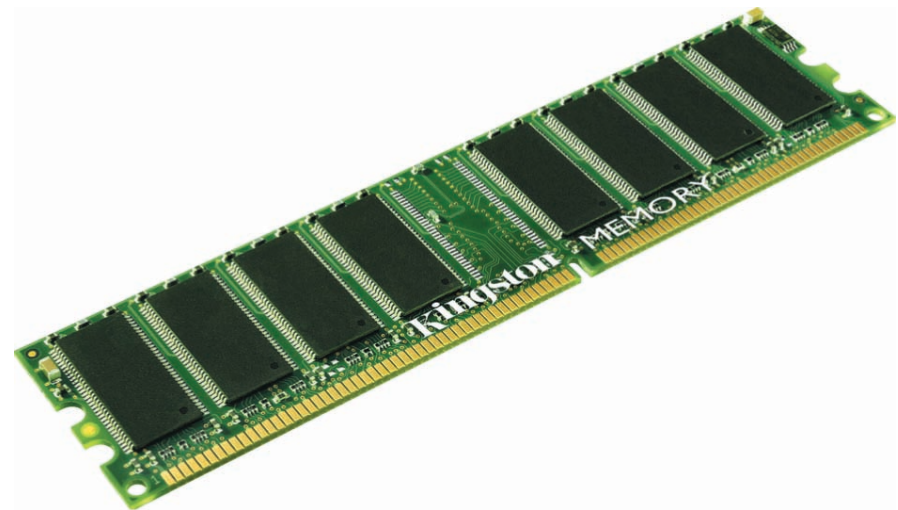
50 feet of shelf space

Terabyte (TB or Tbyte)

All of Powell's Bookstore (est.)

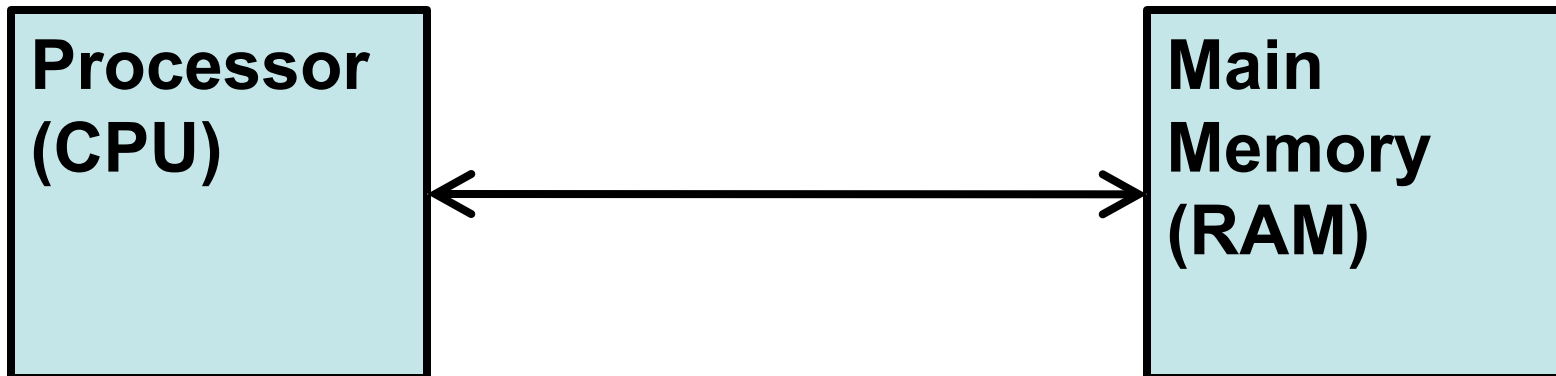
RAM

- **Random Access Memory (RAM) chips hold the program and data**
 - **Cache memory** or RAM cache
 - Flash RAM or **flash memory**
- **Other types of RAM**
 - DRAM
 - SDRAM
 - DDR
 - Direct RDRAM



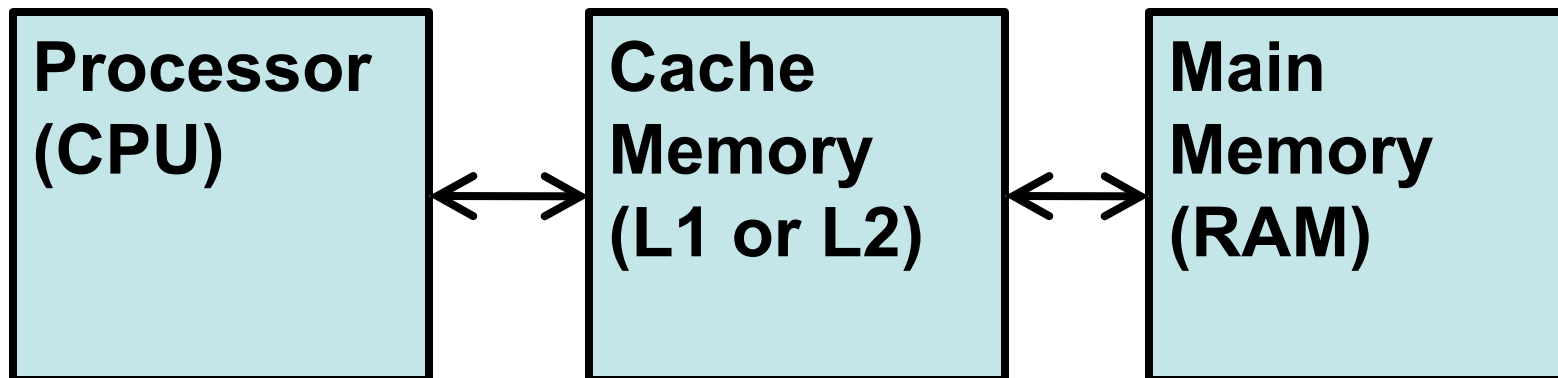
Cache Memory

- **Inserted between processor and RAM**



Cache Memory

- **Inserted between processor and RAM**



ROM

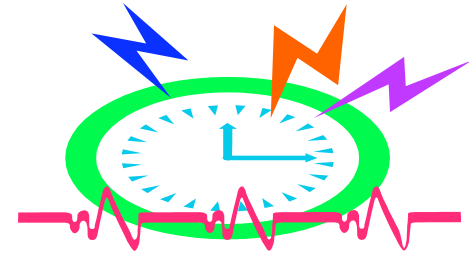
- **Read-only memory (ROM) chips are not volatile and cannot be changed by the user**
- **CPU can read, or retrieve data and programs but the computer cannot write**
- **Contain special instructions**
 - **Needed to start a computer**
 - **Give keyboard keys their special capabilities**
 - **Put characters on screen**

CMOS

- **Complementary metal-oxides semiconductor (CMOS) chips provide flexibility for a computer system**
- **Contains essential information every time the computer is turned on**
 - **Date and time**
 - **Amount of RAM**
 - **Type of keyboard**
- **Content can be changed to reflect changes in the computer system**

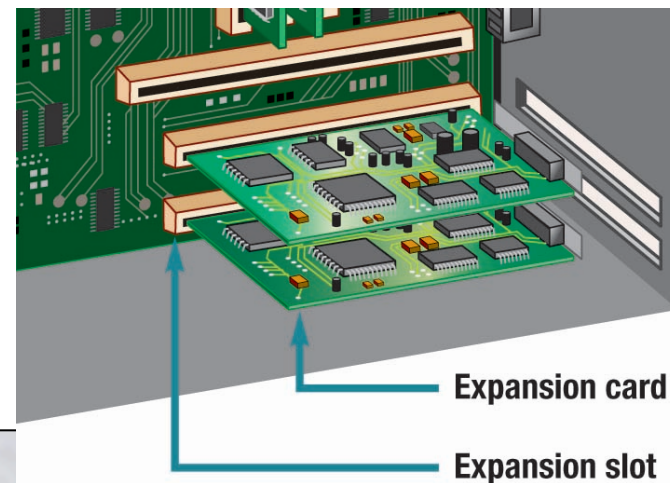
System Clock

- **Important measurement indicating speed**
 - Located on a small chip
 - Produces electrical beats
- **Synchronizes operations**
- **Expressed in gigahertz (GHz)**
(billions of beats per second)
- **Faster clock speed, faster computer**



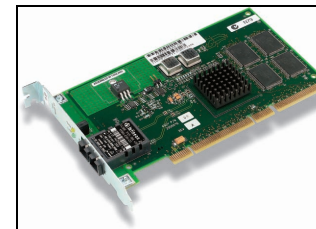
Expansion Slots and Cards

- **Allow for new devices to be added**
 - Open architecture
 - Slots provide for expansion
- **Expansion cards** are also called ...
 - Plug-in boards
 - Controller cards
 - Adapter cards
 - Interface cards



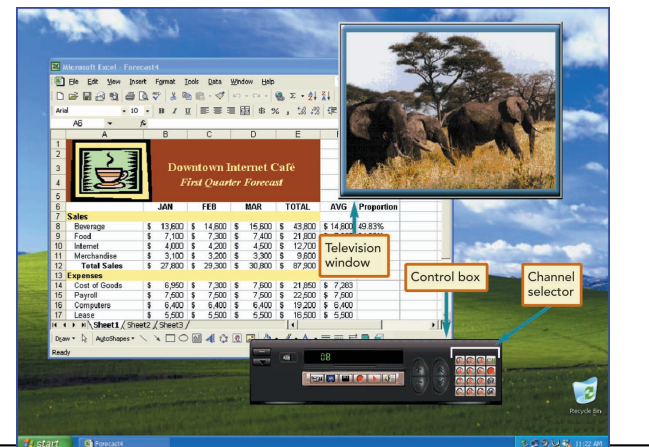
Commonly Used Expansion Cards

- Graphics cards
- Sound cards
- Modem cards
- Network interface cards (NIC)
- PC cards (PCMCIA cards)
- TV tuner cards



TV Tuner Cards And Video Clips

- **Allows you to view your favorite TV shows while running other applications such as Excel**
- **Video can be captured to a file, added to a Web page, attached to an email, or added to a class presentation**
- **Relatively inexpensive and easy to install**

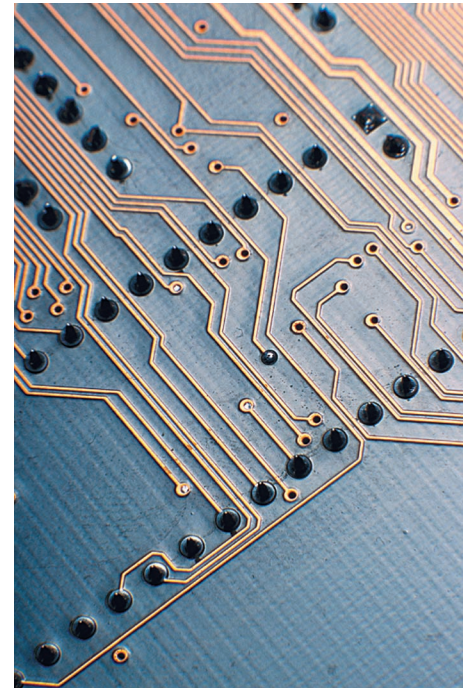


Plug and Play

- **Set of hardware and software standards developed by Intel, Microsoft, and others**
- **Creating devices that are able to configure themselves when installed**

Bus Lines

- **Connect parts of the CPU to each other**
- **Data roadway for traveling bits**
 - Measured as **bus width**
 - More lanes, faster traffic
- **Two basic categories**
 - **System buses**
 - **Expansion buses**

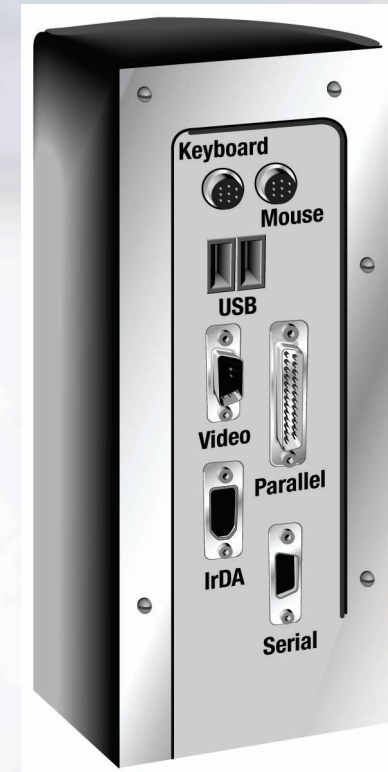


Expansion Buses

- **Connects the CPU to other components on the system board, including expansion slots**
- **Principal types**
 - **Industry Standard Architecture (ISA)**
 - **Peripheral Component Interconnect (PCI)**
 - **Accelerated Graphics Port (AGP)**
 - **Universal serial bus (USB)**
 - **FireWire buses (HPSB)**

Ports

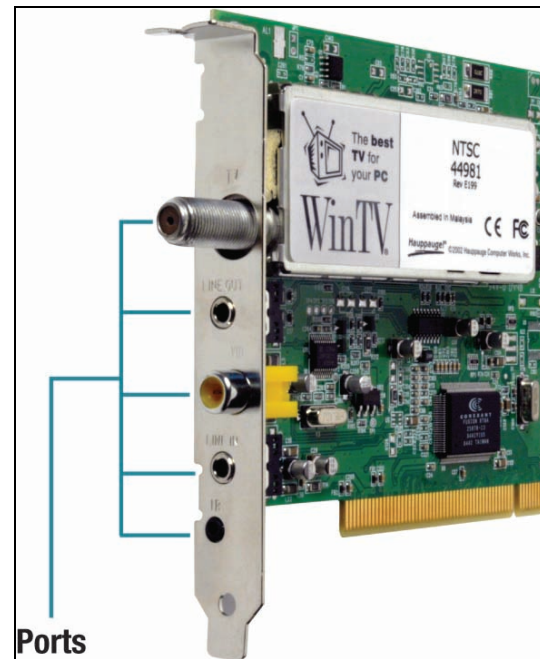
- **Socket for connecting external devices**
- **Ports can connect directly to the system board or they can connect to cards that are inserted into slots on the system board**
- **Two Types**
 - [Standard Ports](#)
 - [Specialized Ports](#)



Ports

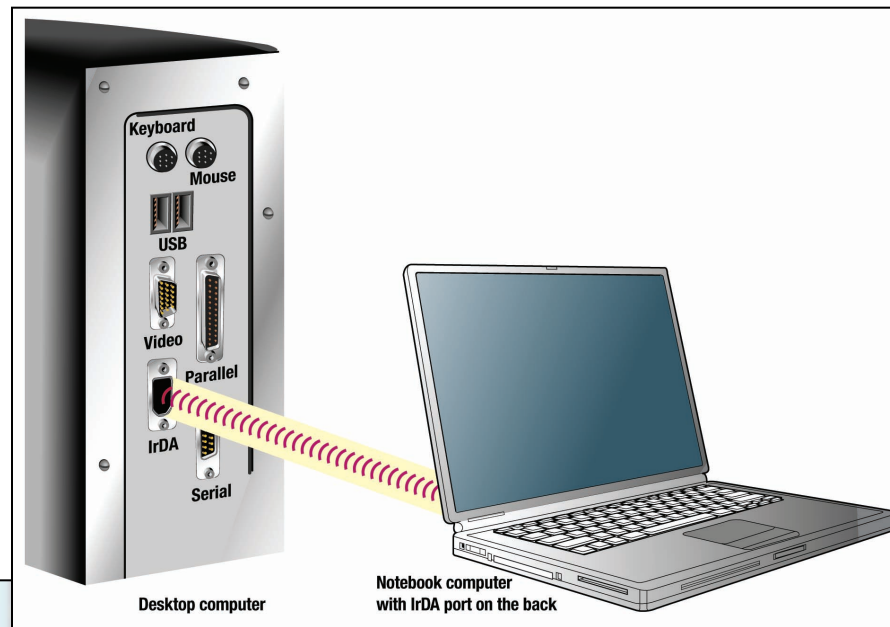
Standard Ports

- **Four common ports**
 - **Serial ports**
 - **Parallel ports**
 - **USB ports**
 - **FireWire ports**



Specialized Ports

- **Three specialized ports**
 - **Musical Instrument digital interface (MIDI)**
 - **Infrared data association (IrDA)**



Cables

- **Used to connect exterior 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**



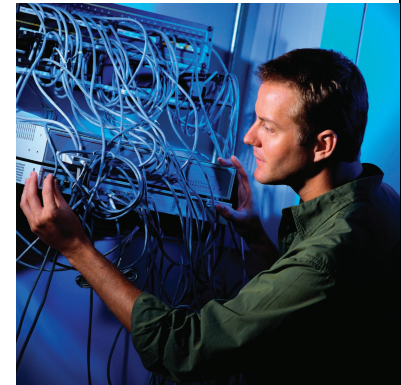
Power Supply

- **Computers require direct current (DC)**
- **DC power provided by converting alternating current (AC) from wall outlets or batteries**
- **Desktop computers use **power supply units****
- **Notebooks and handhelds use **AC adapters****



Careers In IT

- **Computer technicians** repair and install computer components and systems
- **Employers look for**
 - Certification in computer repair
 - Good communication skills
- **Continued education is required**
- **Computer technicians can expect to earn an hourly wage of \$13.00 to \$22.00**



A Look to the Future

Xybernaut Corporation



- **Wearable computers**
- **Send and receive email**
- **Maintain your personal schedule book**
- **Play interactive games and surf the Web from anywhere**

Discussion Questions

- **Describe the four basic types of system units.**
- **Describe the two basic components of the CPU.**
- **What are the differences and similarities between the three types of memory?**
- **Identify five expansion cards and describe the function of each.**
- **Identify and describe four standard ports and two specialized ports.**