Chapter 4  The Components of the System Unit

The System Unit
- Box-like case that contains computer’s electronic components
- Sometimes called the chassis

What are common components inside the system unit?
- Processor
- Memory module
- Expansion cards
  - Sound card
  - Modem card
  - Video card
  - Network interface card
- Ports and Connectors

What is the motherboard?
- Main circuit board in system unit
- Contains chips, integrated circuits, and transistors
- Also called system board

What chip packages are available?
- single edge contact (SEC) cartridge
- dual inline package (DIP)
- flip chip-PGA (FC-PGA) package
- pin grid array (PGA)

Central Processing Unit
What is the central processing unit (CPU)?
- Interprets and carries out basic instructions that operate a computer
- Also called the processor

What are the components of the CPU?
- Control Unit
- Arithmetic/Logic Unit (ALU)

What is the control unit?
- Directs and coordinates operations in computer
- Control unit repeats four basic operations:
• Fetch - obtain program instruction or data item from memory
• Decode - translate instruction into commands
• Execute - carry out command
• Store - write result to memory

What is a machine cycle?
• Four operations of the CPU comprise a machine cycle
• Also called instruction cycle
  • Instruction time (i-time) - time taken to fetch and decode
  • Execution time (e-time) - time taken to execute and store

An example of a machine cycle
• Student enters math problem (100 x 52) into computer’s memory
• Result in memory displays on monitor’s screen

How is the CPU’s speed measured?
• According to how many millions of instructions per second (MIPS) it can process

What are two designs used for the CPU?
• CISC (complex instruction set computing)
  • Supports large number of instructions
  • CPU executes complex instructions more quickly
• RISC (reduced instruction set computing)
  • Supports smaller number of instructions
  • CPU executes simple instructions more quickly

What is the arithmetic/logic unit (ALU)?
• CPU component that performs execution part of the machine cycle
  • Arithmetic (addition, subtraction, multiplication, and division)
  • Comparison (greater than, equal to, or less than)
  • Logical (AND, OR, NOT)

What is pipelining?
• CPU begins executing second instruction before completing first instruction
• Results in faster processing

What is a register?
• Temporary storage area that holds data and instructions
  • Stores location from where instruction was fetched
  • Stores instruction while it is being decoded
  • Stores data while ALU processes it
Stores results of calculation

What is the system clock?
- Synchronizes all computer operations
- Each tick is clock cycle
- MHz megahertz (millions)
- GHz gigahertz (billions)

What is a microprocessor?
- Single processor chip found in personal computers

How do personal computer processors compare?
- Intel - PC
- AMD - PC
- Motorola - Mac

What is a coprocessor?
- Chip that assists processor in performing specific tasks
- One type is a floating-point coprocessor, also known as a math or numeric coprocessor

What is parallel processing?
- Using multiple processors simultaneously to execute program faster
- Requires special software to divide problem and bring results together

Data Representation

How do computers represent data?
- Most computers are digital
- Recognize only two discrete states: on or off

What is the binary system?
- Number system with two unique digits: 0 and 1

What is a byte?
- Eight bits grouped together
- 256 characters

What are three popular coding systems to represent data?
- ASCII - American Standard Code for Information Interchange
- EBCDIC - Extended Binary Coded Decimal Interchange Code
- Unicode - coding scheme capable of representing all world’s languages

How is a character sent from keyboard to computer?
- Step 1: Press letter T
- Step 2: Electronic signal for letter T sent to system unit
• Step 3: Signal changed to its ASCII code (01010100) and stored in memory
• Step 4: After processing, binary code for letter T is converted to image on output device

**Memory**

**What is memory?**
- Temporary storage area for operating system, application programs, and data
- Consists of one or more chips on motherboard
- Each byte stored in unique address

**How is memory measured?**
- By number of bytes available
  - KB
  - MB
  - GB
  - TB

**What are two types of system unit memory?**
- Volatile memory
  - Loses its contents when computer's power is turned off
- Nonvolatile memory
  - Does NOT lose its contents when computer’s power is turned off

**What is random access memory (RAM)?**
- Memory chips that can be read from and written to by processor
- Most RAM is volatile
- The more RAM a computer has, the faster it operates

**What are two basic types of RAM chips?**
- Dynamic RAM (DRAM)
  - Most common type
  - Also called main memory
- Static RAM (SRAM)
  - Used for special applications such as cache
  - Faster and more reliable than DRAM chips

**How much RAM is needed?**
- Software package usually indicates RAM requirements

**How much RAM is needed?**
- Depends on type of applications you intend to run on your computer
What is cache
- Helps speed computer processes by storing frequently used instructions and data
- Also called memory cache, cache store, or RAM cache
- L1 cache built in processor
- L2 and L3 cache not built in processor
- L2 advanced transfer cache most common

What is read-only memory (ROM)?
- Memory chips that contain data, instructions, or information that is recorded permanently
- Data can only be read; cannot be modified in ROM
- ROM is nonvolatile — Contents not lost when computer is turned off
  - BIOS (basic input/output system)
  - Stored on ROM
- Sequence of instructions computer follows to load operating system and other files when you turn on the computer

Types of ROM
- Firmware
- ROM chips manufactured with permanently written data, instructions, or information
- PROM (programmable read-only memory)
  - Blank ROM on which you can place items permanently
- EEPROM (electrically erasable programmable read-only memory)
  - Type of PROM containing microcode programmer can erase

What is flash memory?
- Nonvolatile memory that can be erased electronically and reprogrammed
- Used with handheld computers and digital cameras, cellular phones, and automobile

What is CMOS?
- Complementary metal-oxide semiconductor memory
- Stores information about the computer
  - type of disk drives
  - keyboard
  - monitor
  - current time and date
- Uses battery to retain information when computer is turned off

What is memory access time?
- Speed at which processor can access data from memory directly
• Measured in nanoseconds (ns), which is 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

**Expansion Slots and Expansion Cards**

**What is an expansion slot?**
• An opening, or socket, where circuit board is inserted into motherboard
• Expansion card inserted in expansion slot

**How are expansion cards used?**

**What is Plug and Play?**
• Computer automatically can configure cards and other devices as you install them

**What is a PC card?**
• Credit card-sized device used to add capabilities to notebook computers
• PCMCIA - Personal Computer Memory Card International Association
• Uses include modem, additional memory, and storage
  • Memory – Type I
  • Modem – Type II
  • Hard Drive – Type III

**What is a flash memory card?**
• Adds memory to handheld computers, digital music players, cellular telephones, and similar devices

**Ports**

**What is a port?**
• Connects external devices to system unit
  • keyboard port
  • USB port
  • serial port
  • monitor port
  • game port
  • network port
  • mouse port
  • parallel port
  • speaker port
  • microphone port

**What are different types of connectors?**
What is a serial port?
• Transmits one bit of data at a time
• Used to connect slow-speed devices, such as mouse, keyboard, modem

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

What is a universal serial bus port (USB)?
• Connector that supports newer peripherals and plug and play
• Can connect 127 devices
• Other popular ports include 1394, MIDI, SCSI, and IrDA

**Buses**

What is a bus?
• Channel that allows devices inside computer to communicate with each other
• On the motherboard
• System bus connects processor and RAM
• Bus width determines number of bits transmitted at one time
• Word size determines number of bits processor can interpret and execute at a given time
  • Usually same as bus width

What is an expansion bus?
• Allows processor to communicate with peripherals
  • ISA – most common, slowest
  • Local Bus – high-speed, connects higher speed devices
  • AGP – designed by Intel to improve 3-D graphics

**Bays**

What is a bay?
• Open area inside system unit used to install additional equipment

**Power Supply**

What is a power supply?
• Converts alternating current (AC) to direct current (DC)
• Some peripheral devices have AC adapter

**Mobile Computers**

What is a mobile computer?
• Notebook, which weighs between 2.5 and 8 pounds, or handheld

What ports are on a notebook computer?
- Keyboard/mouse port
- IrDA port
- Serial port
- Parallel Port
- Video port
- USB port

How is data transferred from a handheld computer?
- An IrDA port allows the handheld computer to communicate wirelessly with other computers or devices
- Handheld computers also can rest in a cradle, so you can transfer data to your desktop computer

**Putting It All Together**

What are suggested processor, clock speed, and RAM requirements based on the needs of various types of users?
- Pentium® 4 or Itanium™ or Athlon™ 1 GHz or higher
- 256 MB RAM

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