



Chapter 1: Introduction to the Personal Computer



IT Essentials: PC Hardware and Software v4.1

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Chapter 1 Section Objectives

- 1.1 Explain IT industry certifications
- 1.2 Describe a computer system
- 1.3 Identify the names, purposes, and characteristics of cases and power supplies
- 1.4 Identify the names, purposes, and characteristics of internal components
- 1.5 Identify the names, purposes, and characteristics of ports and cables
- 1.6 Identify the names, purposes, and characteristics of input devices
- 1.7 Identify the names, purposes, and characteristics of output devices
- 1.8 Explain system resources and their purposes

CompTIA A+ Certification

An A+ Certification candidate must pass two exams:

1. CompTIA A+ Essentials (220-701)

tests for the fundamentals of computer technology, networking and security, as well as the communication skills and professionalism now required of all entry-level IT professionals

2. CompTIA A+ Practical Application (220-702):

an extension of the knowledge and skills identified in CompTIA A+ Essentials, with more of a hands-on orientation focused on scenarios in which troubleshooting and tools must be applied to resolve problems

EUCIP IT Administrator Certification

Modules 1 and 2 covered in this course:

- **Module 1: PC Hardware**

- Includes the functions of the components of a personal computer, diagnosis and repair of hardware problems, and selection and recommendation of appropriate hardware

- **Module 2: Operating Systems**

- Includes installing and updating most common operating systems and applications and using system tools for troubleshooting and repairing operating systems

Basic Personal Computer System

- A computer system consists of hardware and software components.
- Hardware is the physical equipment such as the case, storage drives, keyboards, monitors, cables, speakers, and printers.
- Software is the operating system and programs.
 - The operating system instructs the computer how to operate.
 - Programs or applications perform different functions.



Computer Cases and Power Supplies

Computer case

- Provides protection and support for internal components
- Should be durable, easy to service, and have enough room for expansion
- The size and layout of a case is called a **form factor**

Power supply

- Converts AC power from the wall socket into DC
- Must provide enough power for the installed components and future additions

Four Basic Units of Electricity

- **Voltage (V)** is a measure of the force required to push electrons through a circuit. Voltage is measured in **volts**. A computer power supply usually produces several different voltages.
- **Current (I)** is a measure of the amount of electrons going through a circuit. Current is measured in amperes, or **amps (A)**. Computer power supplies deliver different amperages for each output voltage.
- **Power (P)** is voltage multiplied by current. The measurement is called **watts (W)**. Computer power supplies are rated in watts.
- **Resistance (R)** is the opposition to the flow of current in a circuit. Resistance is measured in **ohms**. Lower resistance allows more current to flow through a circuit.

Ohm's Law

- There is a basic equation that expresses how three of the terms relate to each other. It states that voltage is equal to the current multiplied by the resistance. This is known as Ohm's Law. **$V = IR$**
- In an electrical system, power (P) is equal to the voltage multiplied by the current. **$P = VI$**

Internal Components

- Identify the names characteristics of:
 - Motherboards
 - CPUs
 - Cooling systems
 - ROM and RAM
 - Adapter cards
 - Storage drives
 - Internal cables

Motherboards

- The motherboard is the main printed circuit board.
- Contains the buses, or electrical pathways found in a computer. Buses allow data to travel among the various components.
- Accommodates CPU, RAM, expansion slots, heat sink/fan assembly, BIOS chip, chip set, sockets, internal and external connectors, various ports, and the embedded wires that interconnect the motherboard components.



Motherboard Form Factors

- The form factor of motherboards pertains to the size and shape of the board.
- It also describes the physical layout of the different components and devices on the motherboard.
- Various form factors exist for motherboards.

AT – Advanced Technology

ATX – Advanced Technology Extended

Mini-ATX – Smaller footprint of ATX

Micro-ATX – Smaller footprint of ATX

LPX – Low-profile Extended

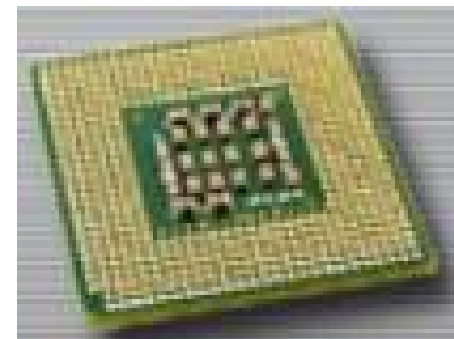
NLX – New Low-profile Extended

BTX – Balanced Technology Extended



Central Processing Unit (CPU)

- The CPU is known as the brain of the computer. It is also referred to as the processor.
- The CPU executes a program, which is a sequence of stored instructions.
- Two major CPU architectures related to instruction sets:
 - **Reduced Instruction Set Computer (RISC)**
 - **Complex Instruction Set Computer (CISC)**

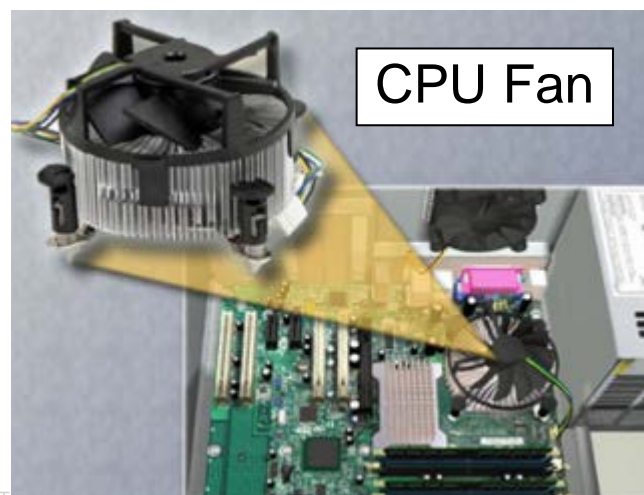


Central Processing Unit (Continued)

- Some CPUs incorporate **hyperthreading** to enhance the performance of the CPU.
- The amount of data that a CPU can process at the one time depends on the size of the processor data bus.
- **Overclocking** is a technique used to make a processor work at a faster speed than its original specification.
- **MMX** is a set of multimedia instructions built into Intel processors.
- The latest processor technology has resulted in CPU manufacturers finding ways to incorporate more than one CPU core onto a single chip.

Dual core CPU, Triple Core CPU and Quad Core CPU

Cooling Systems



- Electronic components generate heat. Too much heat can damage components.
- A **case fan** makes the cooling process more efficient.
- A **heat sink** draws heat away from the core of the CPU. A fan on top of the heat sink moves the heat away from the CPU.
- Fans can be dedicated to cool the **Graphics-processing unit (GPU)**.

ROM and RAM

- Read-only memory (ROM)
- ROM contains the basic instructions for booting the computer and loading the operating system are stored in ROM.
- Random-access memory (RAM)
- RAM is temporary storage for data and programs that are being accessed by the CPU
- RAM is volatile memory, which means that the contents are erased when the computer is powered off
- More RAM means more capacity to hold and process large programs and files, as well as enhance system performance.

Memory Modules

- Memory modules are memory chips that have been soldered on to a special circuit board for easy installation and removal.
- Dual Inline Package (**DIP**) is an individual memory chip.
- Single Inline Memory Module (**SIMM**) is a small circuit board that holds several memory chips.
- Dual Inline Memory Module (**DIMM**) is a circuit board that holds SDRAM, DDR SDRAM, and DDR2 SDRAM chips.
- RAM Bus Inline Memory Module (**RIMM**) is a circuit board that holds RDRAM chips.
- Small Outline DIMM (**SODIMM**) is a smaller, more condensed version of DIMM which provides random access data storage that is ideal for use in laptops, printers, and other devices where conserving space is desirable.
- The speed of memory has a direct impact on how much data a processor can process because faster memory improves the performance of the processor. As processor speed increases, memory speed must also increase.

Cache and Error Checking

■ Cache

- SRAM is used as cache memory to store the most frequently used data.
- SRAM provides the processor with faster access to the data than retrieving it from the slower DRAM, or main memory.

■ Error Checking

- Memory errors occur when the data is not stored correctly in the RAM chips.
- The computer uses different methods to detect and correct data errors in memory.

Adapter Cards

- Adapter cards increase the functionality of a computer by adding controllers for specific devices or by replacing malfunctioning ports.
- Examples of adapter cards:
 - Sound adapter and video adapter
 - USB, parallel, and serial ports
 - Network Interface Card (NIC), wireless NIC, and modem adapter
- Types of expansion slots:
 - Peripheral Component Interconnect (PCI)
 - Advanced Graphics Port (AGP)
 - PCI-Express



Hard Drives and Floppy Drives

- Hard drives and floppy drives read or write information to magnetic storage media.
- They may be fixed or removable.
- The **hard disk drive (HDD)** is a magnetic storage device. The storage capacity is measured in gigabytes (GB).
- Magnetic hard drives have drive motors designed to spin magnetic platters and move the drive heads.
- **Solid state drives (SSDs)** do not have moving parts, which results in faster access to data, higher reliability, reduced power usage.



Hard Drive

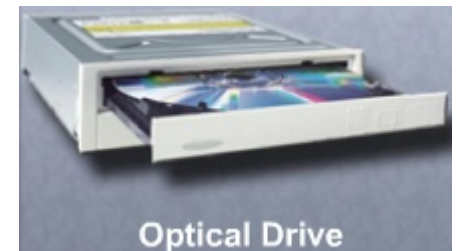


Floppy Drive

- A **floppy disk drive (FDD)** is storage device that uses removable 3.5 inch floppy disks that can store up to 1.44 MB of data.

Optical Drives, Flash Drives and Drive Interfaces

- An **optical drive** is a storage device that uses lasers to read data on the optical media. The three types are CD, DVD and BD.
- A **flash drive** is a removable storage device that connects to a USB port. A flash drive uses a type of memory that requires no power to maintain the data.
- Some common drive interfaces are:
 - Integrated Drive Electronics (IDE)
 - Enhanced Integrated Drive Electronics (EIDE)
 - Parallel ATA (PATA)
 - Serial ATA (SATA) and External SATA (eSATA)
 - Small Computer System Interface (SCSI)



RAID Levels

- RAID provides a way to store data across multiple hard disks for redundancy.

RAID Level	Min # of Drives	Description
0	2	Data striping without redundancy
1	2	Disk mirroring
2	2	Error-Correcting Coding
3	3	Byte-level data striping with dedicated parity
4	3	Block-level data striping with dedicated parity
5	3	Block-level data striping with distributed parity
6	4	Independent Data Disks with Double Parity
0/1	4	Combination of data striping and mirroring

Internal Cables

- Internal power cables (Molex and Berg) connect drives and fans to the motherboard.
- Front panel cables connect the case buttons and lights to the motherboard.
- Data cables connect drives to the drive controller.
 - Floppy disk drive (FDD) data cable
 - PATA (IDE) data cable
 - PATA (EIDE) data cable
 - SATA data cable
 - eSATA data cable
 - SCSI data cable



Ports and Cables

- Serial ports transmit one bit of data at a time.
- A telephone cable (RJ11) is used to connect a modem to a telephone outlet.
- USB is a standard interface for connecting hot-swappable peripheral devices to a computer. Some devices can also be powered through the USB port.
- FireWire is a high-speed, hot-swappable interface that can support up to 63 devices. Some devices can also be powered through the FireWire port.
- A parallel cable is used to connect parallel devices, such as a printer or scanner, and can transmit 8 bits of data at one time.
- A SCSI port can transmit data at rates in excess of 320 Mbps and can support up to 15 devices. SCSI devices must be terminated at the endpoints of the SCSI chain.

Ports and Cables (Continued)

- A network port, also known as an RJ-45 port, connects a computer to a network. The maximum length of network cable is 328 feet (100 m).
- A PS/2 port connects a keyboard or a mouse to a computer. The PS/2 port is a 6-pin mini-DIN female connector.
- An audio port connects audio devices to the computer.
- A video port connects a monitor cable to a computer.

Input Devices

- Input devices are used to enter data or instructions into a computer:
 - Mouse and Keyboard
 - KVM switch
 - Digital camera and digital video camera
 - Biometric authentication device
 - Touch screen
 - Scanner

Output Devices

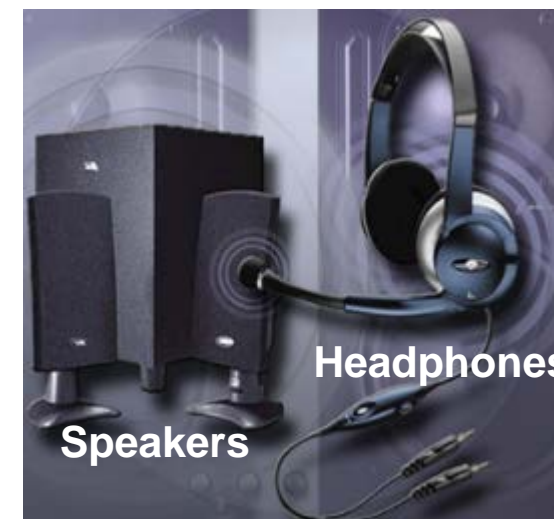


■ Monitors and Projectors:

- **Cathode-ray tube (CRT)** monitor is the most common monitor type. Most televisions also use this technology.
- **Liquid crystal display (LCD)** is commonly used in laptops and some projectors. LCD comes in two forms, active matrix and passive matrix.
- **Digital light processing (DLP)** is another technology used in projectors.
- Monitor resolution refers to the level of image detail that can be reproduced. Higher resolution settings produce better image quality.

Output Devices (Continued)

- **Printers and Fax Machines** are output devices that create hard copies of computer files.
- **Scanners** create electronic file version of paper documents.
- **Speakers and headphones** are output devices for reproducing audio signals.



System Resources

- System resources are used for communication purposes between the CPU and other components in a computer.
- There are three common system resources:
 - Interrupt Requests (IRQs)
 - Input/Output (I/O) Port Addresses
 - Direct Memory Access (DMA)

Chapter 1 Summary

- Information Technology encompasses the use of computers, network hardware, and software to process, store, transmit, and retrieve information.
- A personal computer system consists of hardware components and software applications.
- The computer case and power supply must be chosen carefully to support the hardware inside the case and allow for the addition of components.
- The internal components of a computer are selected for specific features and functions. All internal components must be compatible with the motherboard.
- You should use the correct type of ports and cables when connecting devices.

Chapter 1 Summary (Continued)

- Typical input devices include the keyboard, mouse, touch screen, and digital cameras.
- Typical output devices include monitors, printers, and speakers.
- System resources must be assigned to computer components. System resources include IRQs, I/O port addresses, and DMAs.

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