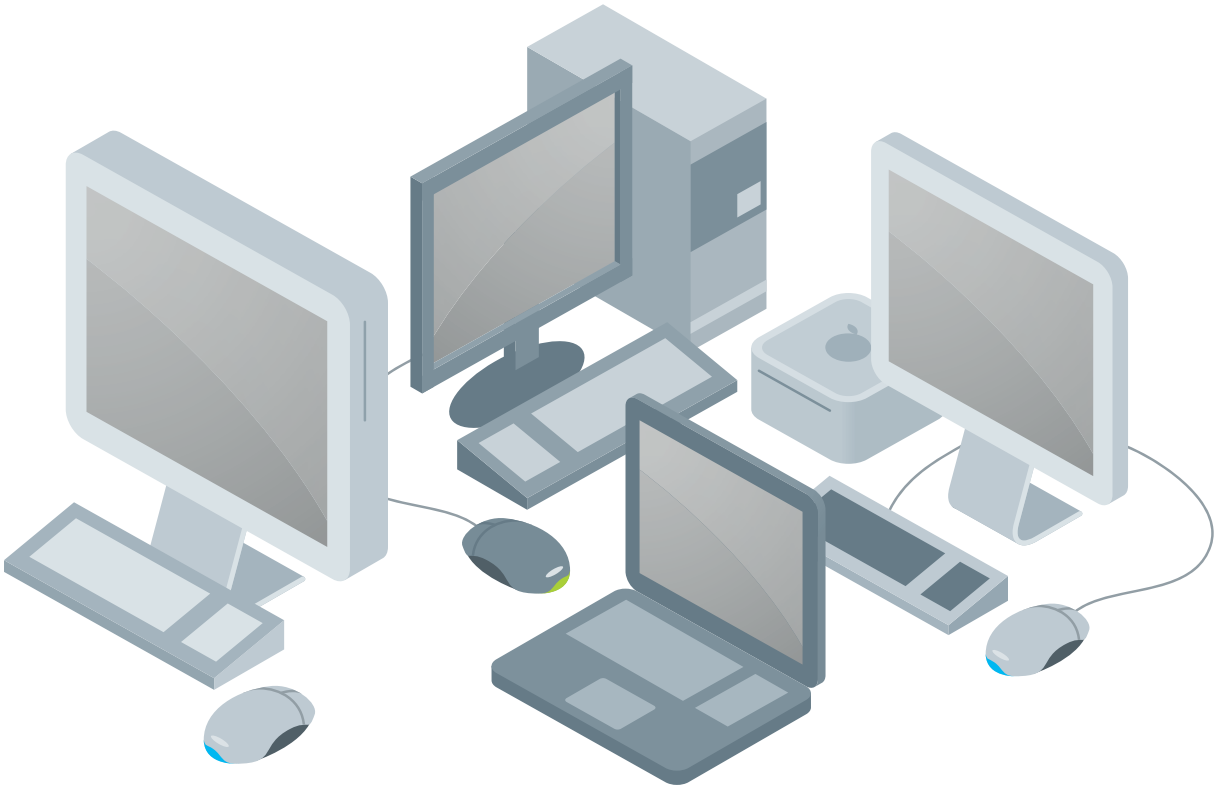
The System Unit

Personal computer is the term used to describe a collection of computer hardware devices combined to form a single computer system, called *the system unit*, designed for the home and small business user. Other types of system unit include hand-held computers, notebooks, servers, mainframes and supercomputers. These system units vary in size, shape, price and performance.

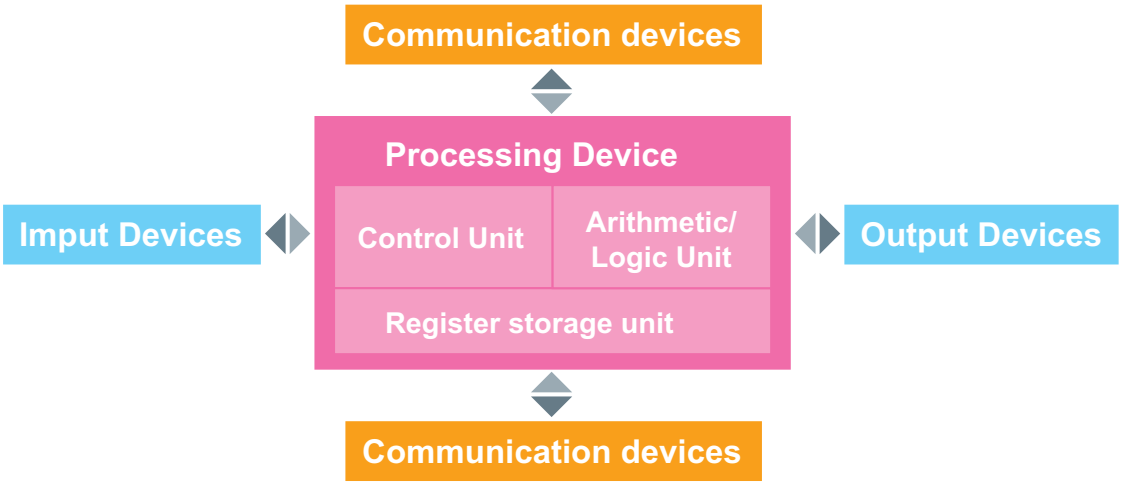


All system units share some common functions. They are all electronic devices that:

- take inputs in the form of raw data-for example, the user typing names and addresses on a keyboard
- process and manipulate data to produce useful information
- store data and information in digital form
- make data available for output as information.

Components of the system unit

A computer's system unit comprises the main unit of a computer system into which peripherals are connected. The system unit is sometimes incorrectly called the CPU.

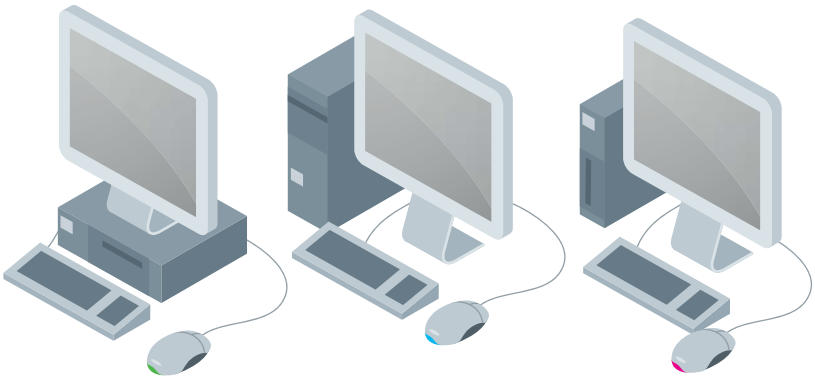


The system case

The system unit case is a plastic-and-metal box that houses components such as the motherboard, disk drives and power supply unit. There are two main types of system case, desktop and tower. Both of these are available in a range of sizes. The size and shape of the system case should be matched to the main functions of the computer; for example, if the computer is to be used on a small office desk, it would need to be small and compact. If the computer is to be used for editing video, a larger case that provides plenty of cooling vents and space between high performance hardware devices, would be needed.

Desktop case

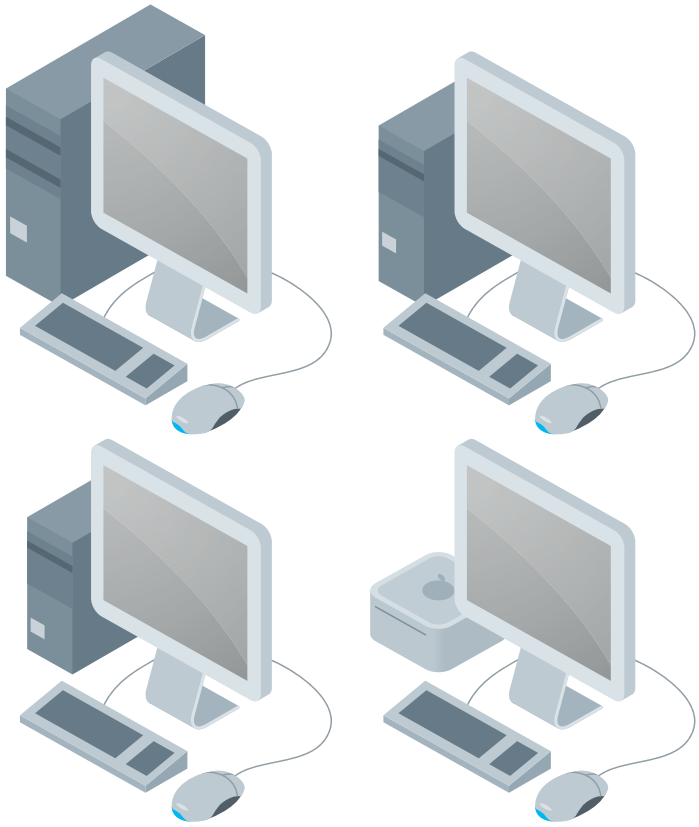
A desktop case is designed to sit horizontally on a surface, so it is wider than it is long. These are used for office or home personal computers. Desktop cases come in two basic sizes, standard and 'slim-line'.



Tower case

A tower case is designed to sit vertically on a surface, so it is higher than it is wide. Tower cases come in three basic sizes:

- ***Full*** - Full-tower cases are used for servers because these computer system units require extra internal space for multiple hard drives, interface cards and back-up power supply units.
- ***Midi*** - Midi-tower cases are used for high-end user personal computers systems. These do require room for extra devices and interface cards but do not require the same hardware devices as servers.
- ***Mini*** - Mini-tower cases are usually used for office or home (SOHO – small office/home office) system units where the requirement for additional internal devices and desk space is limited.



Parts of the case

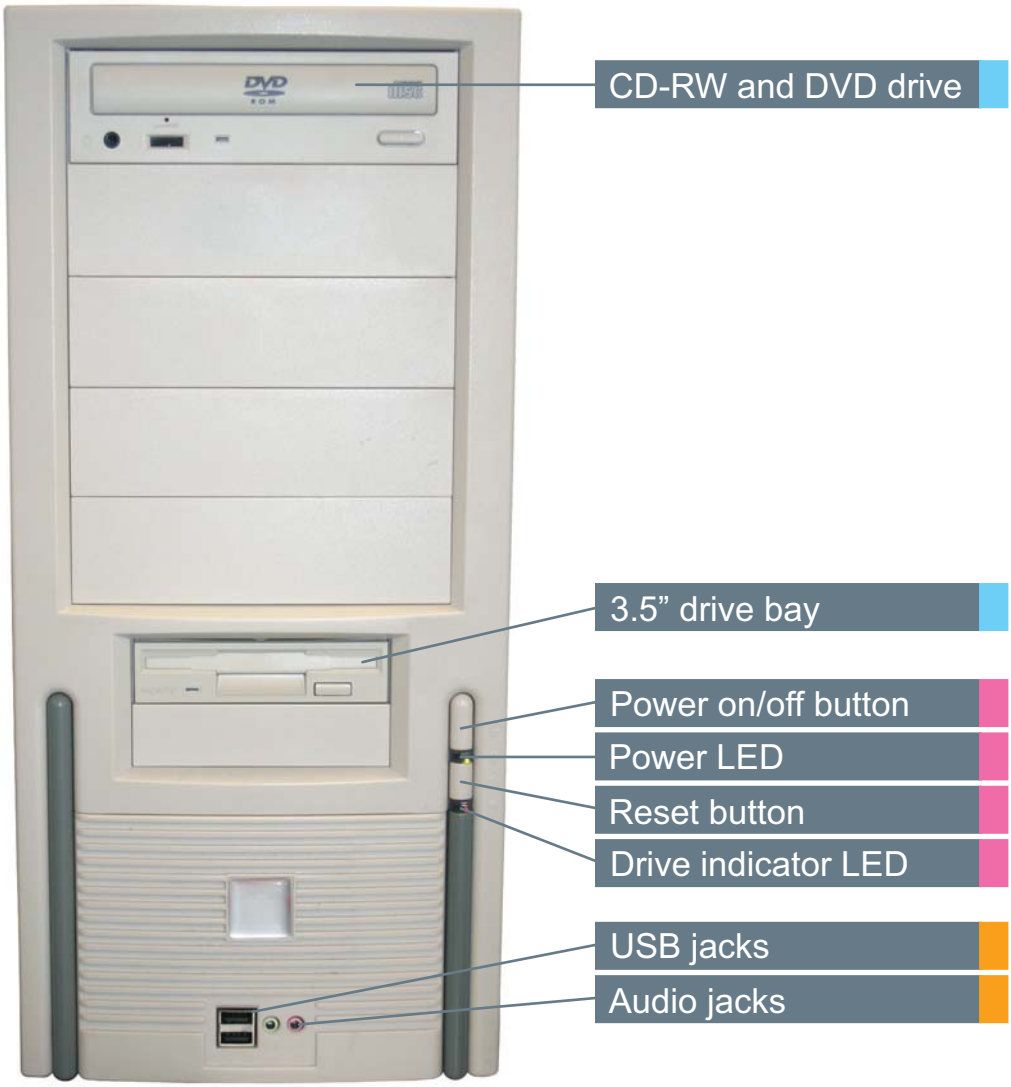
There are three parts to a case: the cover, front panel and rear panel.

A midi-tower case (cover removed)

Cover - The case has a cover which is removed by either undoing the screws at the back or pressing together clips.

Front panel - The front panel provides the user with access to the computer's portable media drives (floppy, CD-ROM and DVD), a power on/off switch, a reset switch, universal serial bus jacks, audio jacks and LEDs (light-emitting diodes) which, when lit, indicate drive operation.

The illustration below shows the front panel of a personal computer system unit and a list of the components.



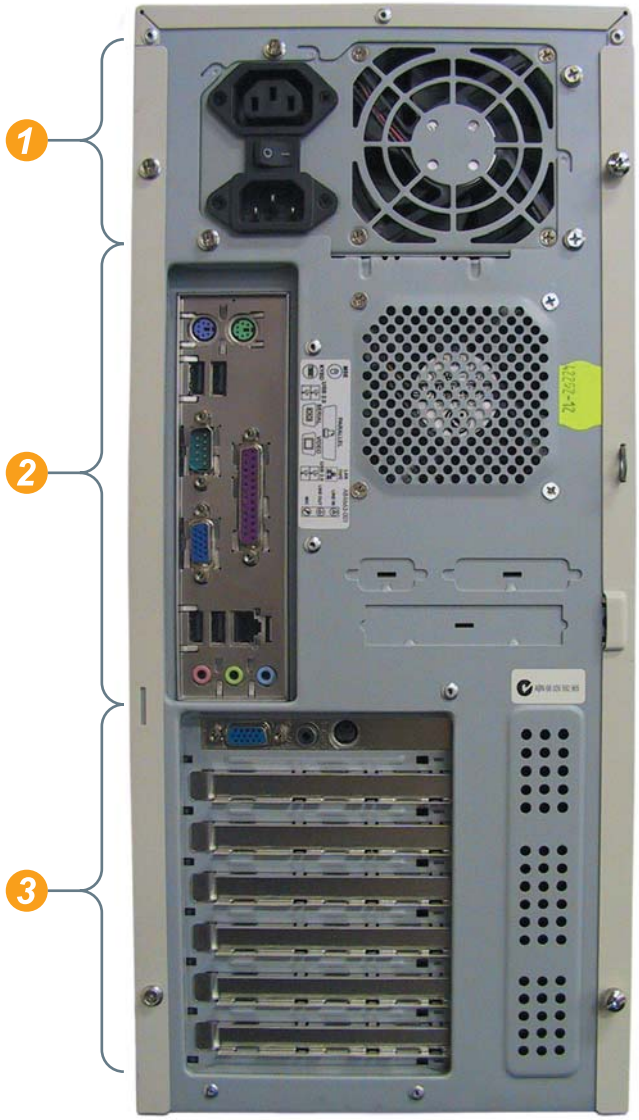
Rear panel - The rear panel has slots through which interface card connections appear. These slots should be covered by either an interface card or a metal strip known as a blanking plate. There are also slots through which the motherboard connectors appear, for example parallel and serial port connectors.

This image shows the rear panel of a PC:

1. power supply unit

2. Motherboard bays including
   - monitor connector
   - mouse port
   - keyboard port
   - audio jacks
   - USB jacks
   - parallel port
   - serial port

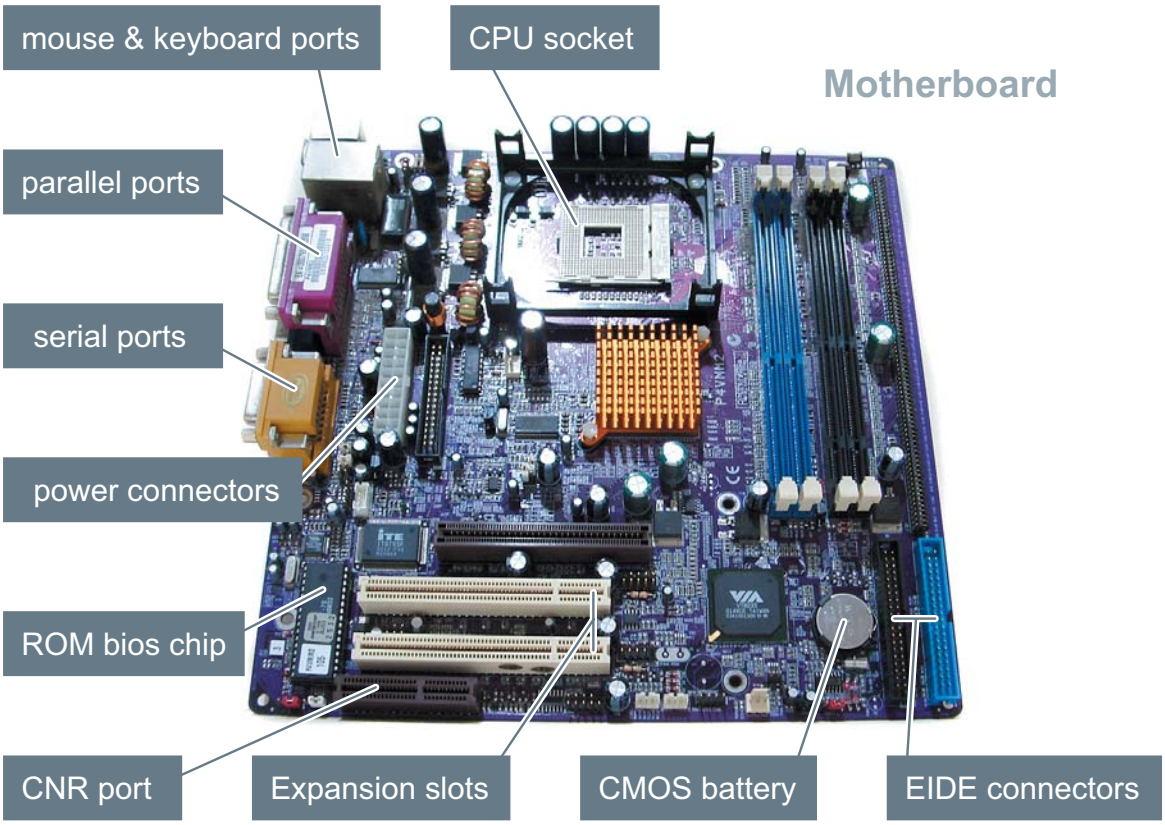
3. Expansion card bays including
   - network card
   - Fire wire® card
   - modem.



The motherboard

The motherboard is the major printed circuit board inside a system unit. The motherboard is also called the system board or main board. The motherboard has sockets for the processor and memory and expansion slots for cards. The type, design and make of a motherboard affects the potential to upgrade a computer system.

A typical motherboard consists of the following components.



The central processing unit

At the centre of a computer's system is the central processing unit or CPU. Each central processing unit has three distinct, but interrelated elements: that are inter-related.

- control unit
- arithmetic logic unit or ALU
- register.

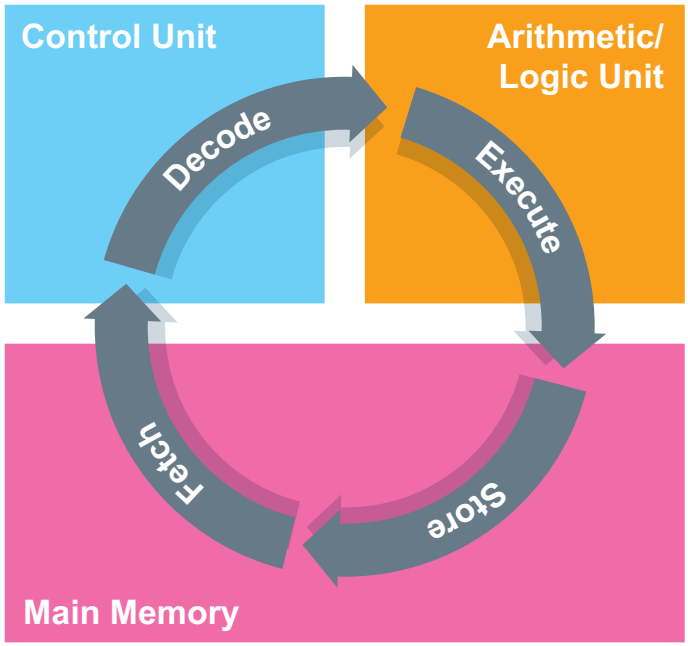
Control unit

This part of a CPU is responsible for:

1. accessing program instructions
2. decoding instructions
3. providing a flow of data to and from the ALU, registers, primary storage and, in some instances, secondary storage and output devices

The control unit operates by repeating the machine cycle. The machine cycle involves four steps.

1. fetching – returning the next instruction from main memory
2. decoding – translation of instructions into commands
3. executing – the actual processing of the commands
4. storing – storing the results of processing in main memory.



Machine cycle in detail

- The instruction to be performed is retrieved from memory by the control unit.
- The instruction is decoded so that the control unit and ALU can interpret the instruction. Data is then moved from memory to the register and the location of the next instruction is identified.

- The ALU performs the required operation, which is either arithmetic computation (add, subtract, multiply or divide) or logic comparison (greater than, less than, equal, etc).
- The results are stored in register or memory.

Each CPU is designed to produce a series of electronic pulses at a predetermined rate. This rate is the clock speed of a CPU and affects machine cycle time.

The control unit activates each stage of the machine cycle by following inbuilt instructions called microcode. Microcode is dependent on the clock speed for the rate at which instructions can be generated; these instructions determine when the transition from one stage of the machine cycle to the next occurs.

The faster the electronic pulses can be generated (clock speed) the greater is the number of microcode instructions executed in a given time. This in turn decreases the time taken to complete a machine cycle.

Clock speed is measured in megahertz (MHz) or Gigahertz (GHz), with one hertz being equivalent to one cycle or pulse per second. (One MHz is one million cycles per second). Generally speaking, when describing the speed of a computer's processor, the clock speed is quoted.

Arithmetic/logic unit

This unit contains the electrical circuitry needed to perform arithmetic and logic operations on data fed to it by the control unit. Depending on the result, different processing may occur. For example, two values/numbers in different addresses can be compared: If they are equal, the number in one address can be added to the other; if they are not equal, addition would not take place.

Registers

Both the control unit and the ALU contain registers. Registers are temporary storage locations for specific types of data. Current program instructions, the values of data being processed and the address of the next instruction are all stored in separate registers.

Word size or word length

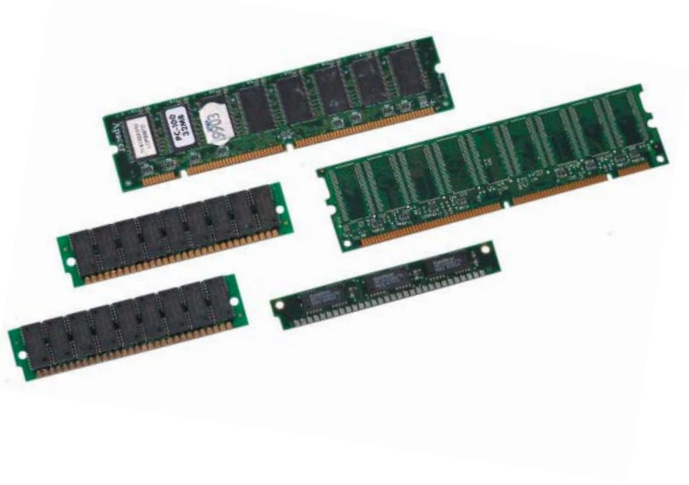
This is the number of bits the CPU can process at any one time. A CPU with a word length of 32 (a 32 bit CPU) will process 32 bits of data every machine cycle.

Memory

There are two types of computer memory, RAM and ROM. These perform different tasks within a system unit. RAM or random access memory, can be further divided into system RAM and cache RAM.

System RAM

System RAM is the working memory of the system unit. Program instructions are loaded into RAM so that they can be read and executed by the processor. RAM holds data temporarily while it is being processed. This type of RAM is called ‘volatile’ because it loses any stored data when the power to it is turned off.



Cache RAM

The main job of cache RAM in a computer system unit is to use a small area of very fast memory (SRAM) to store copies of recently-accessed information. Cache RAM is part of the motherboard.

ROM BIOS

The BIOS, or basic input output system, is a ROM chip that provides instructions to the CPU using an industry standard program code to operate components of the system unit and other devices, for example monitor, keyboard and ports.

BIOS code is manufacturer-specific and BIOS chips cannot be swapped between different motherboards. However, some motherboards use a form of flash ROM and can be upgraded.

The BIOS is also called firmware, as it is a memory chip and also has programs coded into it by the manufacturer.

CMOS RAM

The CMOS RAM stores the configuration of the computer, including things like disk drives, passwords and installation dates and times. This prevents the need for reconfiguration when booting up a computer.

CMOS stands for 'complementary metal-oxide semiconductor', which describes the manufacturing process used to make the RAM chip. CMOS devices require very little power to operate and use a small battery to keep their settings in RAM when the computer is turned off.

Expansion bus

A bus carries signals from component to component within the system unit. These signals include data, memory addresses and other control signals. Expansion bus or slots provide the motherboard with a way of connecting more devices to the system. PC expansion bus types include ISA, EISA, MCA, VL-Bus and PCI.

Acknowledgement:
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