

Chapter IV: Inside the system

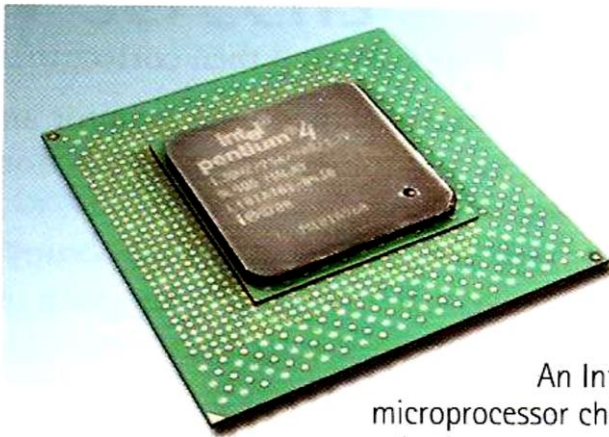
I/ Warm-up

Try to answer these questions.

- *What is the main function of a microprocessor?
- *What unit of frequency is used to measure processor speed?
- *What does RAM stand for?

II/ Reading

A/ Read the text below then answer the following questions.



An Intel microprocessor chip, the nerve centre of many PCs

- 1 What are the main parts of the CPU?
- 2 What does ALU stand for? What does it do?
- 3 What is the function of the system clock?
- 4 How much is one gigahertz?
- 5 What type of memory is temporary?
- 6 What type of memory is permanent and includes instructions needed by the CPU?
- 7 How can RAM be increased?
- 8 What term is used to refer to the main printed circuit board?
- 9 What is a bus?
- 10 What is the benefit of having expansion slots?

What is inside a PC system?

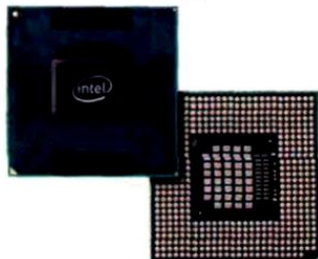
Processing

The nerve centre of a PC is the **processor**, also called the **CPU**, or **central processing unit**. This is built into a single **chip** which executes program instructions and coordinates the activities that take place within the computer system. The chip itself is a small piece of silicon with a complex electrical circuit called an **integrated circuit**.

The processor consists of three main parts:

- The **control unit** examines the instructions in the user's program, interprets each instruction and causes the circuits and the rest of the components – monitor, disk drives, etc. – to execute the functions specified.
- The **arithmetic logic unit (ALU)** performs mathematical calculations (+, -, etc.) and logical operations (AND, OR, NOT).
- The **registers** are high-speed units of memory used to store and control data. One of the registers (the program counter, or PC) keeps track of the next instruction to be performed in the main memory. The other (the instruction register, or IR) holds the instruction that is being executed (see Fig. 1 on page 13).

The power and performance of a computer is partly determined by the speed of its processor. A **system clock** sends out signals at fixed intervals to measure and synchronize the flow of data. **Clock speed** is measured in **gigahertz (GHz)**. For example, a CPU running at 4GHz (four thousand million hertz, or cycles, per second) will enable your PC to handle the most demanding applications.



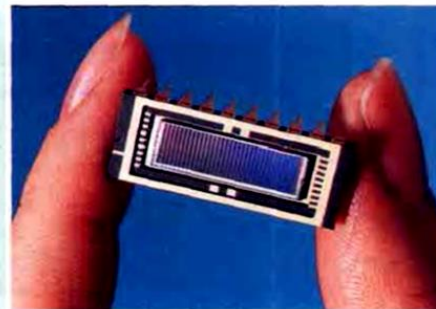
The Intel Core 2 Duo processor; other chip manufacturers are AMD and Motorola

RAM and ROM

The programs and data which pass through the processor must be loaded into the main memory in order to be processed. Therefore, when the user runs a program, the CPU looks for it on the hard disk and transfers a copy into the **RAM** chips. **RAM (random access memory)** is volatile – that is, its information is lost when the computer is turned off. However,

ROM (read only memory) is non-volatile, containing instructions and routines for the basic operations of the CPU. The **BIOS (basic input/output system)** uses ROM to control communication with peripherals.

RAM capacity can be expanded by adding extra chips, usually contained in small circuit boards called dual in-line memory modules (**DIMMs**).



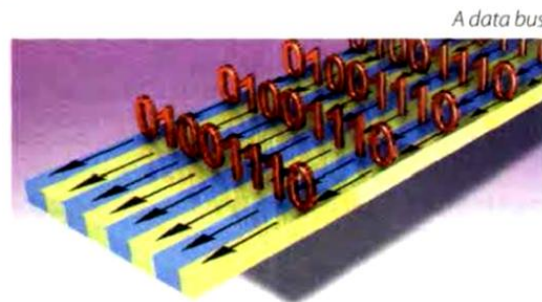
A RAM chip

Buses and cards

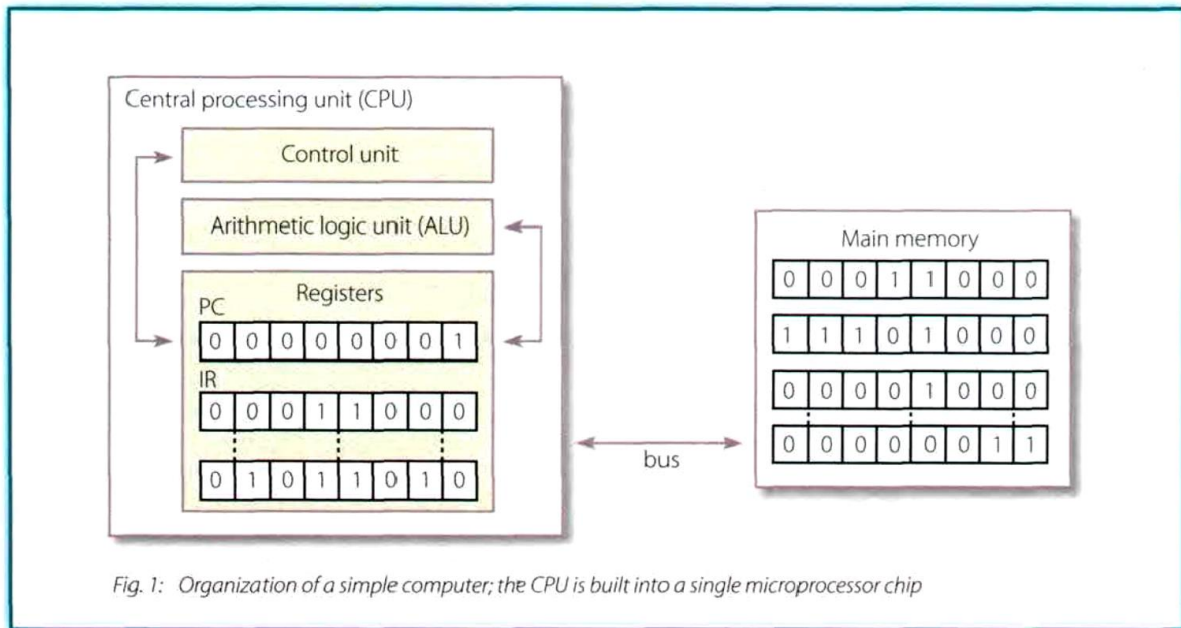
The main circuit board inside your system is called the **motherboard** and contains the processor, the memory chips, expansion slots, and controllers for peripherals, connected by **buses** – electrical channels which allow devices inside the computer to communicate with each other. For example, the front side bus carries all data that passes from the CPU to other devices.

The size of a bus, called **bus width**, determines how much data can be transmitted. It can be compared to the number of lanes on a motorway – the larger the width, the more data can travel along the bus. For example, a 64-bit bus can transmit 64 bits of data.

Expansion slots allow users to install **expansion cards**, adding features like sound, memory and network capabilities.



A data bus



B/ Look at these extracts from the text. What do the words in bold refer to?

- 1 **This** is built into a single chip. (line 2)
- 2 ... **which** executes program instructions and coordinates ... (line 3)
- 3 ... **that** is being executed. (line 22)
- 4 ... performance of a computer is partly determined by the speed of **its** processor. (line 25)
- 5 ... the CPU looks for **it** on the hard disk ... (line 35)
- 6 ... inside the computer to communicate with **each other**. (line 52) these advertising slogans and say which computer element each pair refers to

C/ Decide if the following sentences are True (T) or False (F)), then rewrite them to make them true.

- 1 The CPU directs and coordinates the activities taking place within the computer system.
- 2 The arithmetic logic unit performs calculations on the data.
- 3 32-bit processors can handle more information than 64-bit processors.
- 4 A chip is an electronic device composed of silicon elements containing a set of integrated circuits.

- 5 RAM, ROM and secondary storage are the components of the main memory.
- 6 Information cannot be processed by the microprocessor if it is not loaded into the main memory.
- 7 'Permanent' storage of information is provided by RAM (random access memory).
- 8 The speed of the microprocessor is measured in gigahertz or megahertz. One GHz is equivalent to one thousand MHz. One MHz is equivalent to one million cycles per second.

III/ How memory is measured

A/ Read the text and then answer these questions.

- 1 How many digits does a binary system use?
- 2 What is a bit?
- 3 What is a collection of eight bits called?
- 4 What does ASCII stand for?
- 5 What is the purpose of ASCII?

Bits and bytes

Computers do all calculations using a code made of just two numbers – 0 and 1. This system is called **binary code**. The electronic circuits in a digital computer detect the difference between two states: ON (the current passes through) or OFF (the current doesn't pass through) and represent these states as 1 or 0. Each 1 or 0 is called a **binary digit**, or **bit**.

Bits are grouped into eight-digit codes that typically represent characters (letters, numbers and symbols). Eight bits together are called a **byte**. Thus, each character on a keyboard has its own arrangement of eight bits. For example, 01000001 for the letter A, 01000010 for B, and 01000011 for C.

One bit

01000011

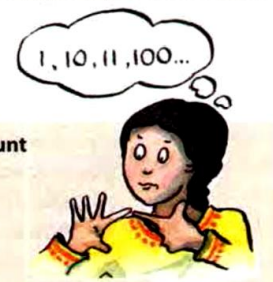
Example of a byte

Computers use a standard code for the binary representation of characters. This is the American Standard Code for Information Interchange, or **ASCII** – pronounced /'æski/. In order to avoid complex calculations of bytes, we use bigger units such as kilobytes, megabytes and gigabytes.

We use these units to describe the RAM memory, the storage capacity of disks and the size of a program or document.

Note: bit is pronounced /bit/; byte is pronounced /bait/

Unit of memory	Abbreviation	Exact memory amount
Binary digit	bit, b	1 or 0
Byte	B	8 bits
Kilobyte	KB or K	1,024 bytes (2^{10})
Megabyte	MB	1,024 KB, or 1,048,576 bytes (2^{20})
Gigabyte	GB	1,024 MB, or 1,073,741,824 bytes (2^{30})
Terabyte	TB	1,024 GB, or 1,099,511,627,776 bytes (2^{40})



B/ Complete these descriptions with the correct unit of memory.

1 A..... is about one trillion bytes - about as much text as the books and magazines in a huge library.

2 A..... is about one million bytes - about as much text as a 300-page novel.

3 A..... is about one thousand bytes - equivalent to one sheet of A4.

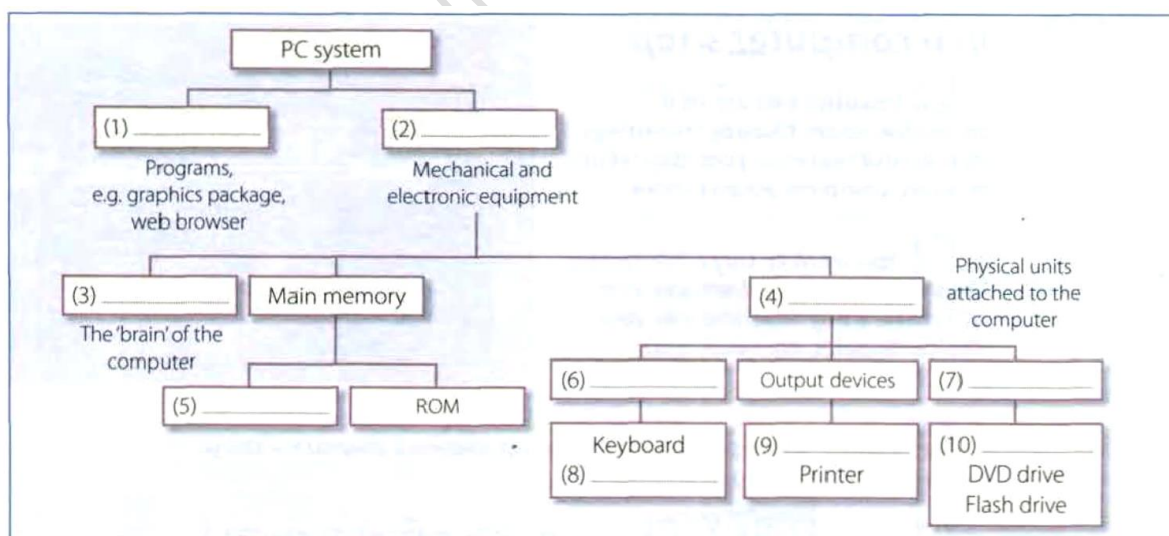
4 A..... is about one billion bytes - about as much text as 1,000 books.

5 A..... can store a single character, such as the letter h or number 7.

IV/ Speaking

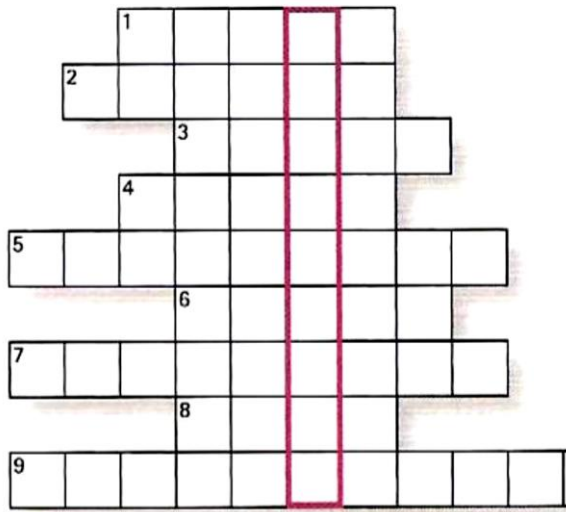
A PC system

A/ In pairs, complete this diagram of a PC system.



B/ Listen to a teacher explaining the diagram to her class and check your answers.

C/ Solve the clues and complete the puzzle with words from the text



- 1 Intel are used in many computers.
- 2 Each 0 or 1 is called a bit, short for digit.
- 3 Special cards can be inserted into expansion
- 4 A controls the timing within the PC by sending signals to synchronize its circuits and operations.
- 5 The processor speed is measured in
- 6 carry signals between different parts of a PC.
- 7 cards improve the computer's performance.
- 8 The uses ROM to control the input/output of data.
- 9 The main printed circuit board is called the

Down: The brain of a computer

English for Computing, S1