



كلية المأمون الجامعة

قسم هندسة الحاسوب

[MICROPROCESSORS ARCITECTURE]

[Chapter1: Introduction to the Microprocessor]

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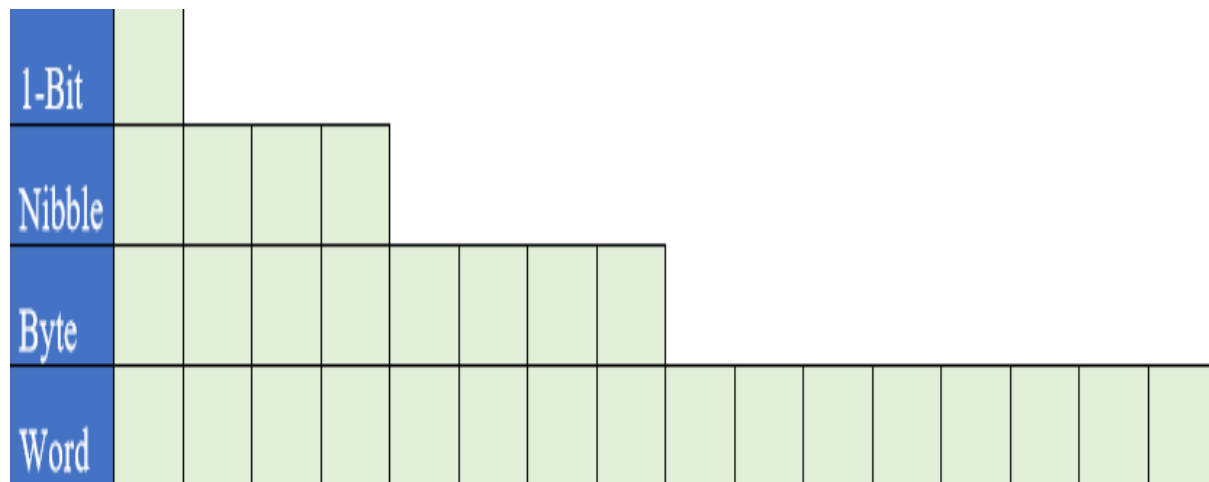
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Some Important Terminology

memory	Size
Bit	1 bit
Nibble	4 bit
Byte	8 bit (1 byte)
Word	16-bit (2 bytes)
kilobyte (KB)	2^{10} bytes (1024 byte)
megabyte (MB)	2^{20} bytes (1024 KB)
gigabyte (GB)	2^{30} bytes (1024 MB)
terabyte (TB)	2^{40} bytes (1024 GB)



Types of Number Systems

There are various types of number systems in mathematics. The four most common number system types are:

1. Decimal number system (Base- 10)
2. Binary number system (Base- 2)
3. Octal number system (Base-8)
4. Hexadecimal number system (Base- 16)

Decimal Number System (Base 10 Number System)

The decimal number system has a base of 10 because it uses ten digits from 0 to 9. In the decimal number system, the positions successive to the left of the decimal point represent units, tens, hundreds, thousands and so on. This system is expressed in decimal numbers. Every position shows a particular power of the base (10).

Example of Decimal Number System: The decimal number 1457 consists of the digit 7 in the units position, 5 in the tens place, 4 in the hundreds position, and 1 in the thousands place whose value can be written as:

$$(1 \times 10^3) + (4 \times 10^2) + (5 \times 10^1) + (7 \times 10^0)$$

$$(1 \times 1000) + (4 \times 100) + (5 \times 10) + (7 \times 1)$$

$$1000 + 400 + 50 + 7$$

$$1457$$

Binary Number System (Base 2 Number System)

The base 2 number system is also known as the Binary number system wherein, only two binary digits exist, i.e., 0 and 1. Specifically, the usual base-2 is a radix of 2. The figures described under this system are known as binary numbers which are the combination of 0 and 1. For example, 110101 is a binary number.

We can convert any system into binary and vice versa.

Example

Write $(14)_{10}$ as a binary number.

Solution:

2	14	
2	7	0
2	3	1
	1	1

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$$(14)_{10} = (1110)_2$$

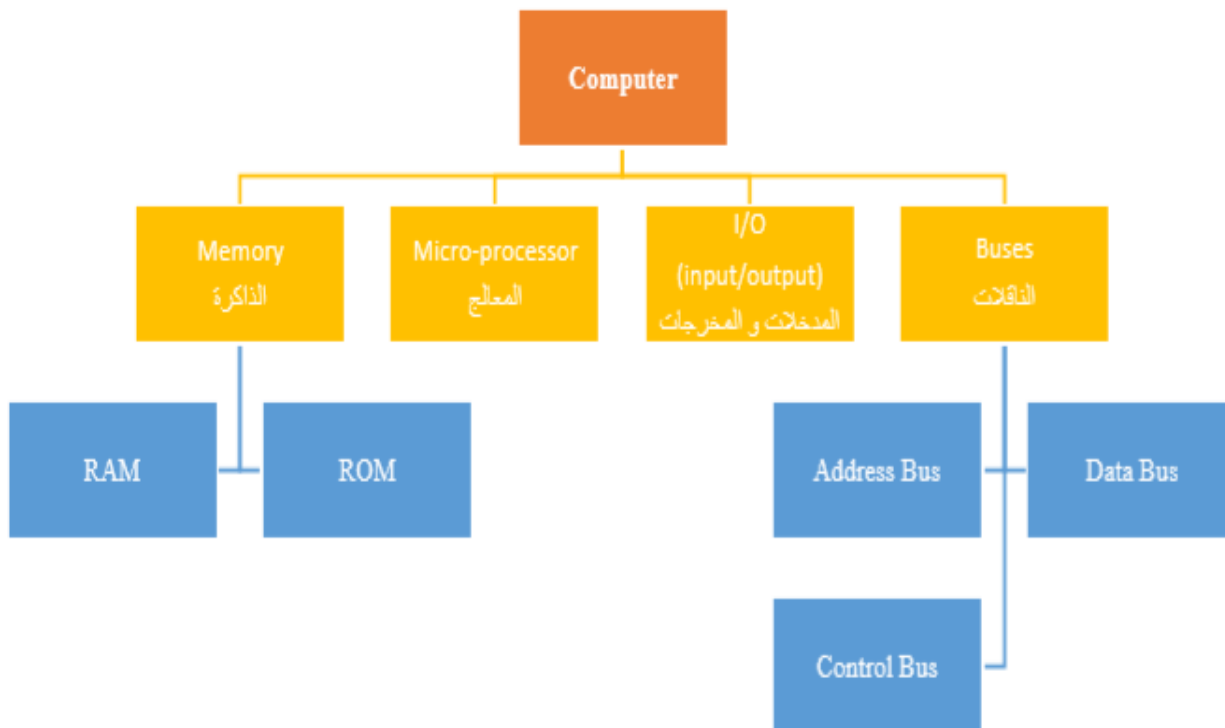
Hexadecimal Number System (Base 16 Number System)

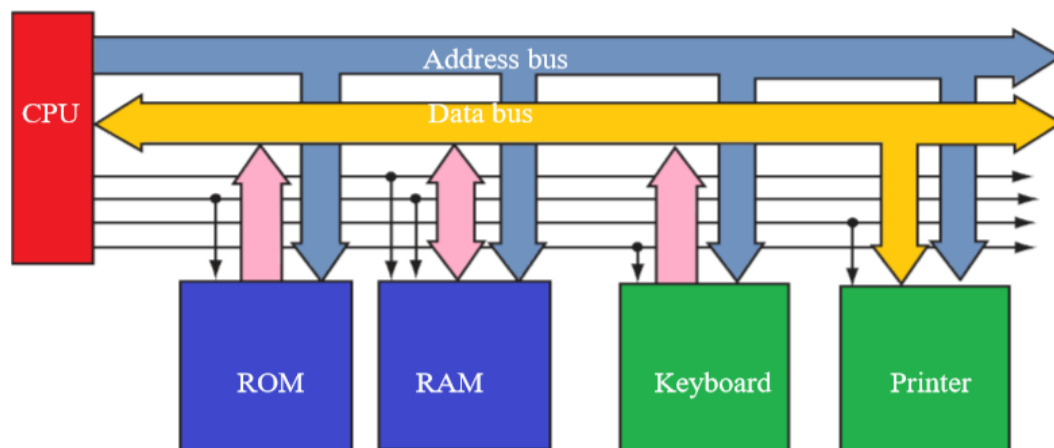
In the hexadecimal system, numbers are written or represented with base 16. In the hexadecimal system, the numbers are first represented just like in the

decimal system, i.e. from 0 to 9. Then, the numbers are represented using the alphabet from A to F. The below-given table shows the representation of numbers in the hexadecimal number system.

Hexadecimal	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
Decimal	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Binary	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111

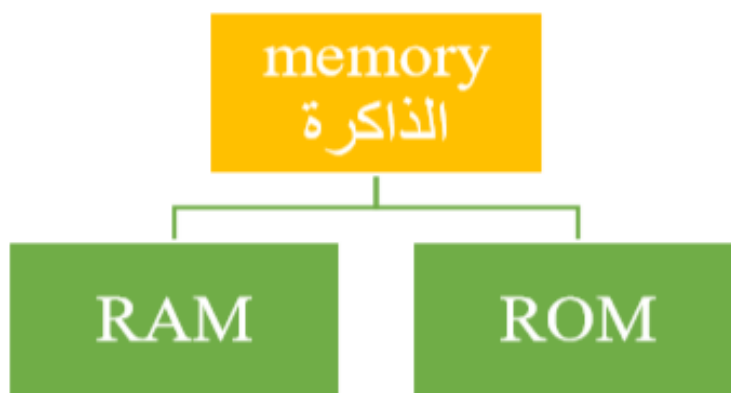
Internal Organization of Computers





There are Two types of memory used in microcomputers:

RAM and ROM



RAM (ذاكرة مؤقتة)	ROM (ذاكرة دائمة)
RAM stands to Random Access Memory (called Read / Write Memory)	ROM stands for read-only memory
RAM is used by the computer for temporary storage of programs that it is running	It contains programs and information essential to operation of the computer
RAM is sometimes called Volatile memory	It is called nonvolatile memory

Internal Organization of Computers

Component	Function
RAM (Random Access Memory)	• RAM is used by the computer for temporary storage of programs that it is running • RAM is sometimes called Volatile memory
ROM (Read only memory)	• ROM contains programs and information essential to operation of the computer • It is called nonvolatile memory
CPU (Central Processing Unit)	• CPU Execute information stored in memory
I/O (input/output) Devices	• I/O provide a mean of communication with CPU
Bus	• Bus is a group of wires that interconnect components in a computer system • The buses that interconnect the sections of a computer system transfer address, data, and control information between the microprocessor and its memory and I/O systems The address bus requests a memory location from the memory or an I/O location from the CPU. If I/O is addressed, the address bus contains a 16-bit I/O address from 0000H through FFFFH. The data bus Transfers information between the microprocessor and its memory and I/O address space. The control bus Contains lines that select the memory or I/O and cause them to perform a read or write.

Memory width Vs Memory size

