

clock rate – тактова частота

cycle per second – репц

storage location – компрка пам'ятц

to cause – змущувати

## DIGITAL COMPUTERS

### I

**Data representation in a digital computer.** The digital com-

puter is one of the types of electronic computers. It is called so as it is designed to process data in numerical (digitized) form; its circuits perform directly the mathematical operations of addition, subtraction, multiplication, and division. The numbers operated on by a digital computer are expressed in the binary system; binary digits, or bits, are 0 and 1, so that 0, 1, 10, 11, 100, 101, etc., correspond to 0, 1, 2, 3, 4, 5, etc. Binary digits are easily expressed in the computer circuitry by the presence (1) or absence (0) of a current or voltage.

A series of eight consecutive bits is called a "byte"; the eight-bit byte permits 256 different "on-off" combinations. Each byte can thus represent one of up to 256 alphanumeric characters, and such an arrangement is called a "single-byte character set" (SBCS); the de facto standard for this representation is the extended ASCII character set. Some languages, such as Japanese, Chinese, and Korean, require more than 256 unique symbols. The use of two bytes, or 16 bits, for each symbol, however, permits the representation of up to 65,536 characters or ideographs. Such an arrangement is called a "double-byte character set" (DBCS). Unicode is the international standard for such a character set.

One or more bytes, depending on the computer's architecture, is sometimes called a digital word. It may specify not only the magnitude of the number in question, but also its sign (positive or negative), and may also contain redundant bits that allow automatic detection, and in some cases correction, of certain errors.

A digital computer can store the results of its calculations for later use, can compare results with other data, and on the basis of such comparisons can change the series of operations it performs. Digital

computers are used for reservations systems, scientific investigation, data-processing and word-processing applications, desktop publishing, electronic games, and many other purposes.

**The main components of a digital computer.** A digital computer typically consists of a control unit, an arithmetic-logic unit, a memory unit, input/output units, and a communications network. The arithmetic-logic unit (ALU) performs simple addition, subtraction, multiplication, division, and logic operations – such as OR and AND. The main computer memory, usually high-speed random-access memory (RAM), stores instructions and data. The control unit fetches data and instructions from memory and effects the operations of the ALU.

The control unit and ALU usually are referred to as a processor, or central processing unit (CPU). The operational speed of the CPU primarily determines the speed of the computer as a whole. The basic operation of the CPU is analogous to a computation carried out by a person using an arithmetic calculator. The control unit corresponds to the human brain and the memory to a notebook that stores the program, initial data, and intermediate and final computational results. In the case of an electronic computer, the CPU and fast memories are realized with transistor circuits.

I/O units, or devices, are commonly referred to as computer peripherals and consist of input units (such as keyboards and optical scanners) for feeding instructions and data into the computer and output units (such as printers and monitors) for displaying results.

In addition to RAM, a computer usually contains some slower, but larger and permanent, secondary memory storage. Almost all computers contain a magnetic storage device known as a hard disk, as well as a disk drive to read from or write to removable magnetic media known as floppy disks. Various optical and magnetic-optical hybrid removable storage media are also quite common, such as CD-ROMs (compact disk read-only memory) and DVD-ROMs (digital video [or versatile] disk read-only memory).

Computers also often contain a cache – a small, extremely fast (compared to RAM) memory unit that can be used to store information that will be urgently or frequently needed. Current research includes cache design and algorithms that can predict what data is likely to be needed next and preload it into the cache for improved performance.