



# B

## BREAK

You can usually *break* a program when it is running by pressing a particular key — often STOP, BREAK or ESCAPE. A break stops a program running and returns control of the computer to the user. However, the computer will first save any temporary information used while running the program to a reserved area of memory. This will include information such as which line was being executed, any loop or subroutine counters, and so on. This is done so that you can restart the program at the point at which it was stopped without affecting its operation.

Breaks are most often used when debugging a program. You can break it at the relevant point, have a look at and perhaps alter the contents of variables and then continue program execution where you left off. Once a program is bug-free, the break key is usually disabled by the program so that it can't be stopped during execution. This reduces the risk of accidental loss of data, and protects the program listing from inquisitive eyes.

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## BUBBLE MEMORY

*Bubble memory* stores information (patterns of 1s and 0s) in the form of magnetic force, unlike the tiny electrical charges or currents used in semiconductor RAM memory. But unlike other magnetic media, such as floppy disks or tapes, bubble memory is completely solid state (it has no moving parts). A bubble memory is created by treating a small crystal of garnet, which will form itself into hundreds of tiny magnetic domains, or bubbles, each one of which may be magnetised to store a '1' or left unmagnetised to indicate '0'. The characteristic pattern formed on the crystal can also be created by mixing water and oil containing a fine suspension of iron particles, and applying a strong magnetic field to them.

The bubbles in a bubble memory are arranged in the form of loops, which circulate constantly. Each loop interfaces with a central control loop, and information is passed across the boundary where the two meet. The result is that bubble memory cannot achieve the same kind of access speeds as true random access memory, though it is considerably faster than disk or tape. However, bubble memory does have advantages over RAM: it is non-volatile (its contents are retained even when the power is switched off) and considerably less susceptible to corruption from electrical interference.

## BUBBLE SORT

The *bubble sort* is an algorithm for sorting an array of data into alphabetical or numerical order. It is one of the easiest algorithms for the beginner to comprehend (and therefore program), but the corollary is that it is slow and inefficient compared with other techniques. The name derives from the way that, with each sorting 'pass' through the data, an item will 'bubble' towards its correct position. The same algorithm is also sometimes referred to as a *ripple sort*.

## BUFFER

The function of a buffer at the end of a railway line is to absorb the difference in speed between a moving train and a stationary end-stop, if that should ever become necessary. Buffers in computing are named by analogy with these familiar devices. There are two kinds of buffers in a typical home computer system: hardware buffers and software buffers.

A *hardware buffer* 'absorbs' the difference between the electrical operating voltages of different parts of a computer system. Most peripherals, for example, would draw more current than the output from a microprocessor or peripheral interface chip could deliver. A separate buffer chip is therefore installed, effectively just to amplify the strength of the digital signal.

A *software buffer* 'absorbs' the difference in operating speed of parts of the system. It consists of a section of RAM memory that can be filled with data by one device at its own desired speed, and then emptied by another at a faster or slower rate. There will generally be buffers between the microprocessor and the keyboard, the disk drive, the printer, and sometimes the screen.

If you use a microcomputer for word processing, then it is possible to increase your rate of working by adding on a large memory buffer between the computer and printer. When the PRINT command is given, the computer will send the entire page to the buffer almost instantaneously. Then, while the printer is emptying the buffer at its own rate, you can be typing in the next document instead of being forced to wait. Such buffer boxes can contain as much as four Kbytes of RAM — enough for a 700 word document.

## BUS

A *bus* is simply a channel within a computer system along which data is transmitted. It usually takes the form of either a group of wires or a set of tracks on a printed circuit board. Some buses are internal to the system, others lead to sockets to be used for expansion. There are three essential buses inside every computer, linking its microprocessor with the rest of the system. The *address bus* carries the address of the memory location or device to be used and the *data bus* carries information to or from that location. The *control bus* carries the signals that control and synchronise the operations of the various chips in the system.