The most common method of storing the program is a cassette tape. Originally chosen because it was both readily available and inexpensive, the system is now used on almost every home computer sold. The way in which each computer stores its information tends to vary slightly; a program created and stored on a Commodore computer won't load on a ZX Spectrum, for example. However, the method used to convert the program into a storable form is almost universal.

An audio cassette recorder of the type used by most home computers is obviously best suited to storing sounds, yet the program is stored inside the computer in the form of binary numbers. These must be turned into sounds in a way that will allow the computer to recognise the difference between a bit that is set 'on' and a bit that is set 'off' — the zeros and ones of binary. The simplest method of doing this is to create one sound that represents a 1 and another that represents a 0. Typically, these are chosen to be a tone of 2,400 cycles for 1 and a tone of 1,200 cycles for 0.

When the command SAVE is typed into the computer the first thing to be recorded on the tape will be a number of seconds of a constant tone. This is done so that when that tape is being played back into the computer at a later date it can tell the difference between the blank tape and the section that holds the program. The first real information to be recorded is the series of tones that represents the characters of the name that we have given to the program. Each character consists of one byte — a total of eight bits — so each character needs eight tones to represent it. However, in order to indicate the beginning and end of each byte the computer usually puts one extra tone at each end. These are called the start and stop bits and their value is always the same: either 1 or 0 depending on the particular computer.

The program itself is stored in much the same way, except that it is often broken down into segments. Typically these are 256 bytes long and they will often include extra information which enables the computer to be sure that it is reloading the correct information. The system used here is quite simple and is called a 'checksum'. The first byte of the segment contains the number of bytes that are held in the segment and the last byte contains a specially calculated number representing the total of all the bytes added together. When the computer reads the cassette back it checks the figures found on the tape with those it has calculated for itself and, if they don't match, informs the user of the mistake.

Certain cassette systems, like the one found on the BBC Micro, extend this checking to the extent of naming and numbering every segment. If an error occurs it is possible to simply wind the tape back a few inches and try again. Other systems, in strong contrast, don't even show the name of the program that is being loaded.


**Motor**
The motor drives the capstan at a constant speed and also turns the 'supply' and 'takeup' reels to wind and rewind tape

**Remote Control**
A useful facility that allows home computers to control the cassette recorder

**Earphone Socket**
Many micros use this output to feed the tones back into the computer

**Microphone Socket**
Often used as the input for computer data to the recorder. However, it should only be used if the Auxiliary and DIN sockets are not fitted. Careful adjustment of the tone and volume controls are usually needed when this input is used

## The Baud Rate

The speed at which the tones are produced and recorded on the tape is usually (and incorrectly) referred to as the Baud rate. The name originates from the Baudot code used in the earliest forms of the electric telegraph and actually relates to the number of times the signal changes per second. A more accurate measure would be the number of bits that are recorded per second. The faster the quoted speed – they range from 300 to 1,200 bits per second – the quicker your programs will be stored on the tape and the less time it will take to load them back into the computer. Unfortunately, the reliability of the system suffers the faster the tones are stored; a speed of 1,200 bits per second is both reliable and sufficiently fast to prevent frustration. Some systems offer two speeds, usually an ultra-reliable slow speed of 300 bits per second and a fast speed of either 1,200 or 2,400 bits per second. Copies of valuable programs can be held in both forms in case of accident.

The cassette tape itself should be of good quality: there is nothing wrong with using audio tape rather than the specially packaged cassettes, but care should be taken to choose a reputable brand and length in excess of C-60 should be avoided. The approximate capacity of a given length of tape can be established by dividing the speed of the cassette interface by 10. This gives the number of bytes that will be stored on the tape each second; a C-60 with 30 minutes on each side where the interface works at 1,200 bits per second, could hold some 432 Kbytes of program.