**Sound **

Just as bitmapped graphic files have a resolution and a bit depth, the quality of a digital sound file depends on the sample rate (the number of times the value of the signal is recorded) and its bit depth (the number of bits used to store the sample). Just like graphics files, digital sound files can be very large indeed, so compression is often used to reduce the file size.



When an analogue signal is converted into a digital one, a digital sample is taken often enough to accurately reproduce the sound on a digital device such as a MP3 player or computer. The sample must be taken often enough and the sample quality must be high enough so that the human ear cannot distinguish between the analogue and the digital version. The benefit of storing sound digitally is that reproduction becomes error-free because every bit is either on or off and error detection and error correction can be built into the transmission process. Analogue recordings lose quality every time they are copied. Digital recordings are identical every time they are copied. The fact that digital media can be copied and transmitted easily without degradation in quality has resulted in enormous changes in the way music and other digital data are sold and distributed.

As a sound is played, digital signals have to be converted to analogue in order for us to hear it. The bit rate is the number of bits each second that have to be processed in order for a digital sound to be played. If the sound is high quality, then there will be a greater number of bits as there will be a greater number of samples each second to be converted back to analogue plus each sample itself will be a larger number of bits as the sampling depth will be greater. If a digital sound is being streamed over a computer network, then the number of bits each second is important. If the number of bits each second is very high then this will also place demands on the computer hardware, as it all needs to be processed.

The bit rate for sounds can be calculated as follows:

Bit Rate (bits per second) = sampling depth (bits) \* sampling frequency (Hz)