



thought of as the number of bits that are transmitted every second, although in practice this is not an accurate definition — for reasons we'll come to later in this article.

The two most common baud rates for communications devices are 300 and 1200/75 (the latter meaning that data is received at 1200 baud, and transmitted at 75). Most micros, by way of comparison, save programs to tape within the same range (between 300 and 1200 baud).

A 300 baud rate is used for systems where roughly equal amounts of data are being transmitted each way. These include bulletin boards and electronic mail systems like Telecom Gold. A 1200/75 rate is used for viewdata systems like Prestel, where most of the information is being sent in one direction.

Unfortunately, as with many other aspects of computing, these 'standards' are not universal. Because of differences between the UK and US telephone systems, the two countries use different frequencies. The UK frequency is known as the CCITT (or V21) standard, while the US equivalent is the Bell tone (named after the telephone company).

ALL ABOUT BITS

Because the telephone system can tell only a limited number of frequencies apart with any reliability, data is transmitted in binary form. To do this, each character is translated into its ASCII equivalent first, and then into binary form. Thus, the letter 'A' would be converted into 65 (ASCII) and then 01000001 (binary). Ones are represented by one frequency (just above the carrier tone, and thus referred to as 'high'), and zeros by another (just below the carrier tone, and thus referred to as 'low').

Because the receiving computer (known as the 'host') needs some way of telling where one character ends and the next begins, start and stop bits are also used. These are simply agreed frequencies; when the host receives a stop bit, for example, it decodes the preceding bits. The most common protocol for ASCII communications is eight data bits followed by one stop bit. An alternative setting is seven data bits and two stop bits. Other systems use both start and stop bits, the change indicating the end of a character.

Since communication over the public phone system is less than totally reliable, we need some form of error checking — a method by which the host can ensure that it has received a character correctly. The simplest solution is known as 'parity checking'. This involves counting the number of high bits and adding an additional parity bit to make the total number of high bits either odd (an 'odd parity' system) or even (an 'even parity' system). For example, returning to the letter 'A', the total number of high bits in 01000001 is two (an even number). Therefore, to make the parity odd, the parity bit would also have to be high. In the case of the letter 'C', however, which is translated as 01000011 in binary, the parity bit

Information Flow

Baud rate, named after JME Baudot, the French data transmission pioneer, is a measure of the speed of information flow between communicating devices. A baud rate of 1 means that information is being transferred at 1 bit per second. Typically, devices communicating via a modem use baud rates of 300, where roughly equal two-way transmission is required. Where data transfer is mainly in one direction as in viewdata-type communications, for example, a faster baud rate of 1,200 can be used. These transmission rates are very similar to the speed of data transmission during tape loading and saving.



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would have to be low.

Parity checking is relatively unsophisticated: it will detect an error in a single bit, but will not detect two errors in the same character since the parity would be correct. It is, however, simple and is useful for most applications where 100 per cent accuracy is not vital.

Earlier in this article, we mentioned that bits-per-second is not an accurate definition of baud rate. The reason for this is that start, stop and parity bits have to be taken into account. For example, in a parity-checked system using eight data bits and one stop bit for each character, only eight bits out of every 10 transmitted contain useful information. Thus, the true bits-per-second is 80 per cent of 300 baud — or 240 baud.

We have taken a detailed look here at the fundamental principles behind data transmission using modems. In the next instalment, we will consider further aspects of modem operation, such as duplex transmission and terminal protocols, and briefly discuss some of the uses to which computer communications can be applied.