

An analogue signal is an electronic copy of the original sound wave or light spectrum. It is what you see on an oscilloscope screen when you plug in a microphone. It might look something like this:



1



The rate of sampling depends upon the need for accuracy. The music for a CD has to be sampled very often otherwise high frequency notes will be noticeably distorted.

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A telephone voice is sampled at a much lower rate because perfection is not required. You can hear the effect in a phone conversation where higher pitched voices are noticeably altered.

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If the sampling was done much more often then the signal transmitted and received would be a very accurate copy- as you can hear and see from a CD or digital TV. There is a lot more information to send but the reconstructed signal is almost perfect.

The major problem with analogue signals is that they pick up interference or noise. This can come from poor connections, from other signals or from nearby electrical machinery.

When that happens the signal might look like this :



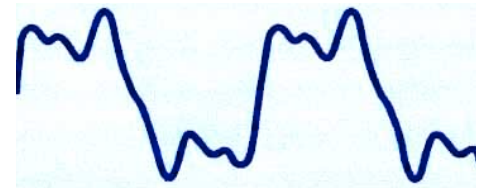
2

and it will sound distorted or mushy. If the signal carries video then you might see a lot of colour or white flecks that distorts the picture.

# Analogue and digital

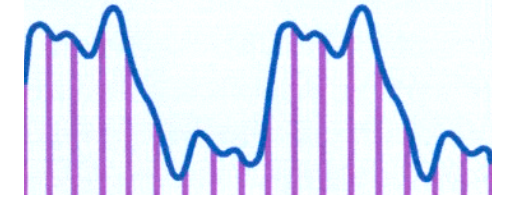
*The Fizzics Organisation*

To get around this we convert the analogue signal to a digital signal before we transmit it and then convert it back in the receiver.



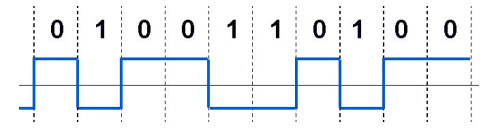
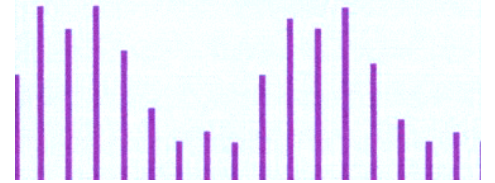
3

A sample of the analogue signal is taken at intervals.



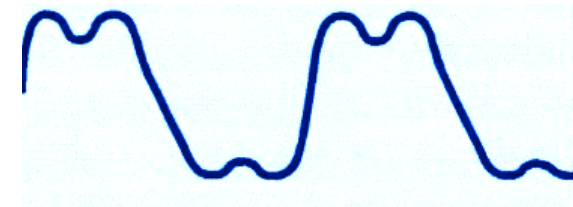
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The length of each line is then converted into a number. The number is written in binary and transmitted as a series of pulses, perhaps like this.



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The receiver then converts these numbers back in a reverse of the process. As you can see, the wave is similar but not exactly the same.



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## So what is the advantage of digital?

It is the square wave signal that is transmitted. Even if it picks up interference then the number can still be recognised and reproduced exactly, so the digital signal is not distorted by electrical interference.

7