

Learning Objectives:

At the end of this topic you will be able to;

- recall that the transfer of data can be carried out through free space and cable systems;

Data Transfer

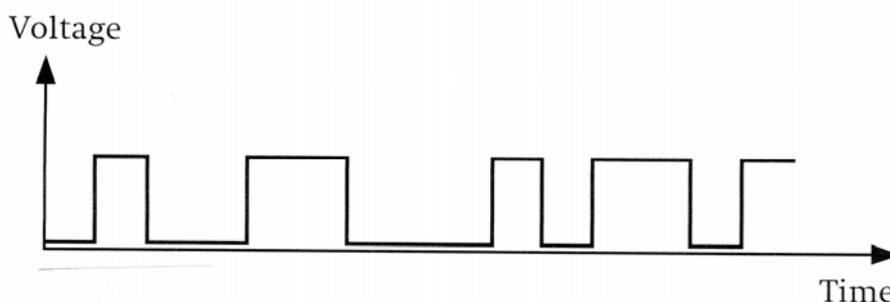
The ultimate aim of any communication system is to move data successfully from one location to another.

The data may consist of text, numbers, pictures, video, sound, or combinations of all of these. The data to be transferred may also be in analogue or digital form, but we should remind ourselves of the difference between these two.

An analogue signal is a signal which can have any value between two extremes of voltage, and is continually changing between any values within this range. An example of an analogue waveform is shown below.



A digital waveform on the other hand can only have one of two values, set at the extremes of the voltage supplied to a system. The signal is either 'on' or 'off', and cannot have any value in between.



Whatever data signal we are using, and no matter what the content of the message it is necessary to move it from one location to another.

This means that the signal will have to pass through another 'medium' in order to get from the source or 'transmitter' to the destination or 'receiver'.

The word 'medium' is used to cover a whole variety of materials and substances that the data could pass through, however the most common examples are:

1. The Air (free space).

This is used by radio waves, microwaves and infra-red waves. This is a 'wireless' communication system where transmitter and receiver are not physically linked by wires. The distance is limited only by the type of wave involved and power of the transmitter. Distances can range from just a few metres, to millions of kilometers.

2. Copper wire.

These are used to carry data between transmitter and receiver when a physical electrical link is established between the two systems. e.g. PC to printer. The link can be very long but this would require special 'repeater' stations along the route to boost the signal every so often (~10km) to maintain the integrity of the data.

3. Optical Fibre.

These are being used to replace copper cables in long distance communication systems e.g. telephone network. Optical fibre is smaller, cheaper, more flexible, and does not suffer from the effects of external electrical noise that copper cables do. The integrity of the data signal is also much better than that sent via copper wire and therefore repeater stations are not required to be as close together (~100km).

The type of medium used will depend upon the system being used and we will be considering some of these during the forthcoming units of work.

When trying to understand communication systems for the first time it is helpful to start with a system that we are very familiar with. You should recall that in Topic 4.1 we discussed the transfer of information between two people, Person A and Person B. We can consider this as a very simple communication system:

- There is a **source** of information (A's brain and voice)
- There has to be a **carrier** for this information (the sound wave)
- There has to be a **receiver** for the information (B's ear and brain)

If Person 'A' has only learnt one sound, e.g. 'Ohhhhh' then it would be very difficult for Person 'A' to communicate anything to Person 'B'. For effective communication to take place Person 'A' has to change the sounds they make into a range of sounds e.g. 'Ahhh, Doh, Soh' etc.

This establishes a very important point about any communication system, i.e. it is impossible to transmit any information unless the carrier is made to change in some way from its normal state.

The process of making the carrier change or 'wobble' from a normal state is called '**modulation**' and there are many ways that this has been achieved in recent years, many of which are very ingenious.

The development of new and highly complex modulation techniques continues even today as we continually try to increase the amount of information carried by a signal.

In this unit we will look at several different modulation techniques, some of which are quite old and others that are more modern. The important thing to remember is the principle behind each of these modulation techniques because modern communication systems use aspects of many of these older techniques in combination to produce a more efficient communication system, for example **broadband** which is far too complex to understand fully in this introductory course.

Self Evaluation Review

Learning Objectives	My personal review of these objectives:		
			
recall that the transfer of data can be carried out through free space and cable systems;			

Targets: 1.

 2.
