Syllabus reference

1.2.1 Data transmission

Learners should be able to: show understanding of the use of serial and parallel data transmission, in universal serial bus (USB) and integrated circuit (IC).

See also:

3.3 Inside the CPU

Data bus

Introduction

You have learned about data transmission between computers. In this section you will learn about data transmission within a single computer system. This is how the different parts of a computer "talk to" each other.

The lines on the circuit board are actually thin copper wires acting as data buses

Integrated circuits

Data in the computer is stored using on/off electronic switches. An integrated circuit (IC) is a collection of microscopic electronic circuits, sealed into a single plastic or ceramic package. Different ICs are used for different tasks inside the computer. Many ICs are used for data storage. One of the ICs, the central processing unit (CPU), contains the computer's processor and registers. All these parts must be connected together. We will talk more about the CPU in *3.3 Inside the CPU*.

The different ICs are linked by wired connections called data buses. Some ICs, particularly CPUs, have internal buses too, made from metallic layers within the IC. Each part of the IC works very quickly. The speed of a whole computer is strongly affected by how quickly the buses can transmit data between the different parts.

Parallel data bus

The buses inside the CPU, and between CPU and RAM, use parallel transmission, which has advantages and disadvantages:

- The advantage of parallel transmission is speed. The speed of each data bus strongly affects the performance of the computer system.
- The disadvantage of parallel transmission is that it needs more wires, so it takes up more of the very limited space available inside the IC or on the circuit board.

Connecting peripherals

The processor is at the centre of the computer. That is where the work of the computer takes place. A computer needs other devices such as a screen, a keyboard and a mouse. These additional devices are called peripherals. The peripherals have to be connected to the processor. Buses are used to connect the peripherals to the processor.

There are several ways to join a peripheral to the processor. It can be done using:

- permanent wiring, for example the keyboard of a laptop is permanently wired into the computer casing
- a plug-in cable, for example a monitor can be plugged in to the computer
- a wireless connection, for example a wireless mouse.

In each case, a bus is needed to complete the connection.

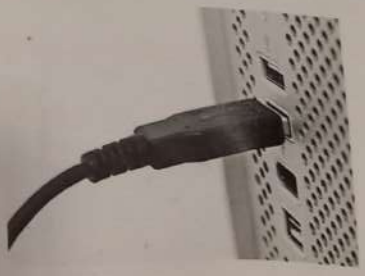
Peripherals work more slowly than the processor. For example, when you type data into the computer, your typing comes much more slowly than the computer works. A very fast connection is not so important. A serial bus is often used to connect a peripheral to the processor. A serial bus is slower than a parallel bus, but it is fast enough, and it is less expensive because it needs hardware for only a single signal.

Universal serial bus (USB)

Peripherals are made by many different companies. The manufacturers want people to buy their peripherals. They want to make it easy to connect the peripheral to a computer. They want the peripheral to work with all types of computer.

Nowadays most companies that make peripherals use a standard connection. It is called a USB (which stands for "universal serial bus"). It is a serial connection. It is called universal because it can be used in most modern computers.

Almost all modern computers have one or more USB ports. That means devices from many different manufacturers can be used with those computers.



A USB connection

Test yourself

1. What is meant by a data bus and why is bus speed so important?
2. Each part of the CPU works very fast. Explain why parallel transmission is suitable for use within the CPU.
3. A peripheral works much more slowly than the CPU. Explain why serial transmission is used to connect peripherals to the CPU.
4. A friend sets up a company making keyboards for computers. Write a short note to him, explaining why he should make keyboards that have a USB connection.

Learning activity

Investigate the computer where you are sitting. What peripherals does it have? What connections does it have? Is there a wireless connection? Write a short report giving your findings.