Overview

In this unit your students should:

- appreciate that the behaviour of a PIC depends on its program
- find out that the program in a PIC can be changed
- be able to copy flowcharts into a host computer
- be able to use a host computer to download a program into a PIC
- know that a PIC has digital outputs but both analogue and digital inputs
- know some of the advantages and limitations of using PICs

This should not require more than 2 hours of class time.

Hour	Suggested Activity
1	Introduce students to the hardware required for programming a PICAXE-18 microcontroller. Let them do the **Analogue systems** practical. This will show them how to use the Programming Editor to write flowcharts and download them into the PIC. There is no requirement for students to understand flowcharts at this stage. Note that the PICAXE-18 has a low resolution adc, which only recognises 32 different voltages. Students who have time to spare could add five extra LEDs and record the 32 different eight bit words produced by the adc. Ask them to study **9.1** before the next session.
2	Get students to answer all the questions of the **Programmable Systems** exercises. As they finish, let them start the **Digital systems** practical. This gives them more practice at copying flowcharts into the computer and downloading them into the PIC. Students are not required to analyse the flowcharts, just record the behaviour that they impose on the PIC. Ask them to study **9.2** and answer questions 1 and 2 on page 155 of the text book before the next session.

Model Answers

1 (a) Its transfer characteristic is determined by a series of binary words which are stored in its memory.

(b) Write a flowchart for the program. Copy it into a host computer, which can translate the program into a series of bytes and place them in the memory of the PIC. Place the programmed PIC into the circuit and reset it so that it runs its program.

(c) The NAND gate circuit will be able to react more quickly to signal changes.

2 (a) Software is the program inside the PIC, the series of bytes stored in its memory. Hardware is the set of registers and logic gates inside the PIC.

(b) Altering the transfer characteristic of a circuit is easy to do, PIC circuits are often cheaper to implement than hard-wired ones, behaviour of systems can be simulated beforehand by the host computer.