

Child's toy

Many toys for children now have sophisticated electronic controls. You are going to design and implement a control system for such a toy.

In this task, you will be concentrating on the design of the control system rather than what the final product actually looks like.

What to do

Page 2 of this task describes what the toy you are designing has to be able to do. There are some different elements (**procedures**) in this control task.

- 1 Connect the input and output devices that you need to your control interface.
- 2 Use your control software to test that the input and output devices are working correctly.
- 3 Create a program for each procedure listed on page 2 of this task.

How you design each program depends on the software you are using. Do one of the following:

- ◆ Use a flow chart to describe the sequence of events and use the chart as the program.
 - ◆ Use a now chart to describe the sequence of events and use the chart to help you to write down a series of commands in the control program.
 - ◆ Draw a systems diagram that defines the input and output signals and the process steps that are required to create the outputs from the inputs. Use this system diagram as the program.
- 4 Test and modify each procedure until it works as specified. Gather print-outs of the final working versions of each procedure.
 - 5 Create and test a program for the toy that includes all the procedures you have written.

Student's Book:

Programs and microcontroller pages 240-4

Time available:

120 minutes

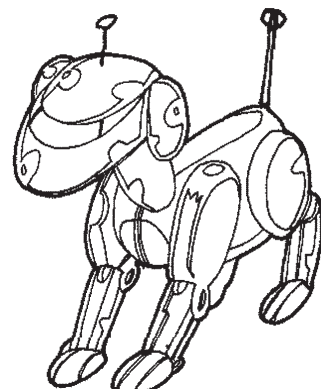
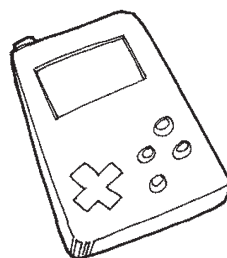
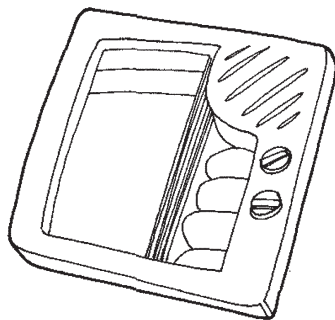
You will learn:

How to use procedures to build up a complex control program.

How to write your program into an integrated circuit.

You will need:

- Computer with control software
- Control interface (and, for Part 2, a system for programming a microcontroller (PIC) chip)
- LDR
- Sound sensor
- Microswitch on back
- Two lights for 'eyes'
- Solenoid to produce jumping up and down
- Buzzer



Child's toy*Procedures for 'My little friend' toy*

Procedure name	Sequence of events
Dark	
Torch	
Light	
Stroke	
Hide-and-seek	
Simon	

Part 2 — Programmable chips

You may be able to load the program you have written (with all its procedures) into a microcontroller chip. This allows the toy to be controlled by your program without your needing to have a computer nearby.

What to do

- 1 Check again that the program you have written and all its procedures are working exactly as planned.
- 2 Use the software to write your program to the microcontroller chip.
- 3 Connect all of your input and output devices to the connections on the chip's circuit board.
- 4 Check that the power to the circuit board is off and place the programmed chip in the circuit board.
- 5 Turn on the power to the circuit board.
- 6 Test the operation of all the listed procedures.

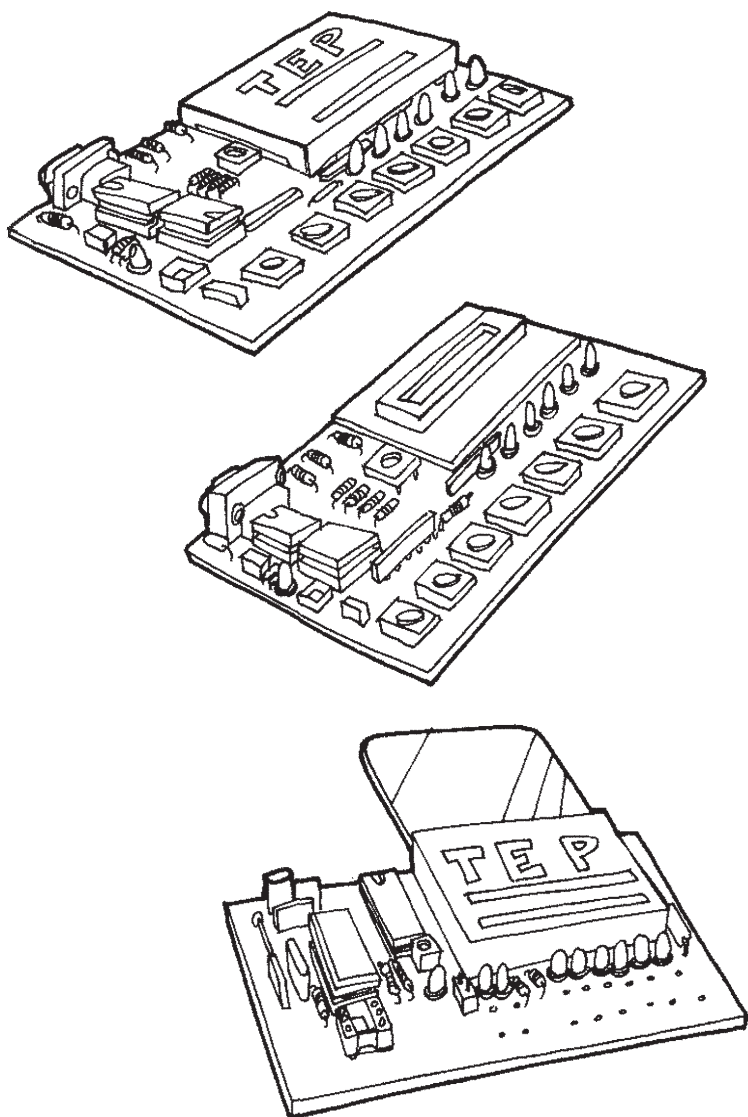
What to write

- ◆ Explain what you think the good things and the bad things are about using a single chip to control your toy instead of a 'proper' companion.

Child's toy

There are three different ways in which you can program TEP's smart card:

- ◆ using the bit-by-bit programmer;
- ◆ using the SmartBasic® programmer;
- ◆ creating the program on a computer and then programming a card by using a wire.



Student's Book:

Programs pages 240-4

Programming a micro-controller (PIC) chip pages 243-4

Time available:

120 minutes

You will learn:

How to program a smart card.

How to use a smart card to control a simple device.

You will need:

- Smart card
- Smart-card programmer
- Smart-card reader
- Input and output components (e.g. switches, lamps, buzzers, relays to switch solenoids and motors)
- Either a model of a door control system or the components to build one

Full details on programming a smart card using one of these methods are described in the smart card manual. If you have a choice of methods, the following information will help you decide which is most useful for you.

Bit-by-bit	A sequence of different output patterns can be programmed. Pressing the switches on the board selects the output patterns desired. Input signals cannot be detected with this system.
SmartBasic	This allows you to write a program using a programming language called SmartBasic®. This language has six commands and allows input signals to be detected. Pressing the switches on the board selects the SmartBasic commands.
Computer	SmartBasic programs can be written as a list on the computer screen. Once a program is written, it can be tested on the screen before being written onto a smart card. Programs can also be printed and saved.

All the methods allow programs of up to 100 steps to be programmed onto a card.