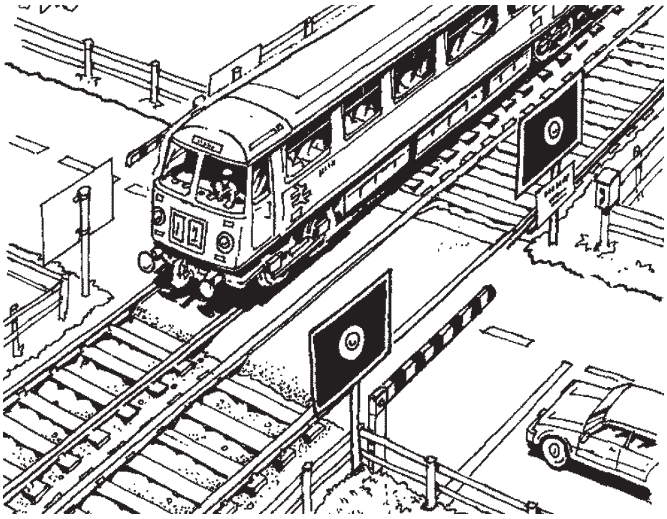
Railway-crossing gates

A railway company has decided to test an automatic barrier system at this level-crossing.



The train operates a switch 1 mile from the level-crossing.

Part 1 – Programming a sequence with one input

What to do

1 Set up a working model of the level-crossing control system including:

- a barrier driven by a motor. Think about the structure that you will use to support the barrier and the mechanism that you will use to make it move;
- a mounted light. Think about the structure that you will use to support the light.

Connect the motor and lamp leads to outputs on your control interface.

2 Set up a switch to trigger the barrier sequence and connect it to an input on your interface.

3 Use your control software to test that the input and output devices are working correctly.

4 Design a program to operate the barrier for the train shown. The sequence of events looks like this:

Time (s)	Event
0	Train presses switch
0	Red traffic light switches on
10	Traffic barrier starts to move down
120	Traffic barrier starts to move up
125 *	Red light switches off

* This assumes that the motor takes 5 seconds to raise the barrier. Time how long it takes your barrier to rise.

Student's Book:

Programs pages 240-4

Time available:

120 minutes

You will learn:

How to program a sequence of events.

You will need:

- ❑ Your workbook
- ❑ Pencil
- ❑ Computer with control software
- ❑ Control interface
- ❑ Connecting wires
- ❑ Two push-to-make switches
- ❑ Electric motor (or a model motorized barrier)
- ❑ Two bulbs or red LEDs

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What to write

How you design your 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 flow chart to describe the sequence of events and use the chart to help you write down a series of commands in the control program.
- Draw a system 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.

What to do

5 Test your program and modify it until it works well.

6 Get a print-out of the working version for your workbook.

Part 2 – Programming a sequence with two inputs

Live tests show that trains must move at 60 m.p.h. or faster to get clear of the crossing before the barriers rise. The company decides to fit a switch on the far side of the crossing to detect when a train is clear.

What to do

1 Modify your program so that:

- the barrier doesn't rise until a train presses a second switch;
- the red light stays on until the barrier has had time to rise fully.

What to write

- Design your program using either a flow chart or a system diagram.

What to do

2 Test your program and modify it until it works well.

3 Get a print-out of the working version for your workbook.

Part 3 – Programming a more complex sequence

After more tests, the company decides to add another red light, and make the two lights flash on and off alternately.

What to do

1 Modify and test your program to make this happen.

2 Keep copies of your new flow chart and print-out.

Part 4 – Programming for trains in both directions!

What to do

1 Now modify and test the program so that it works for trains going in both directions.

2 Keep copies of your new flow chart and print-out.