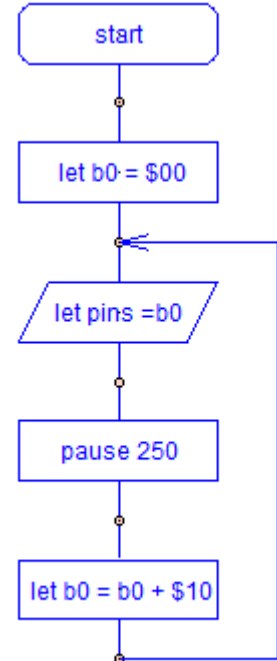
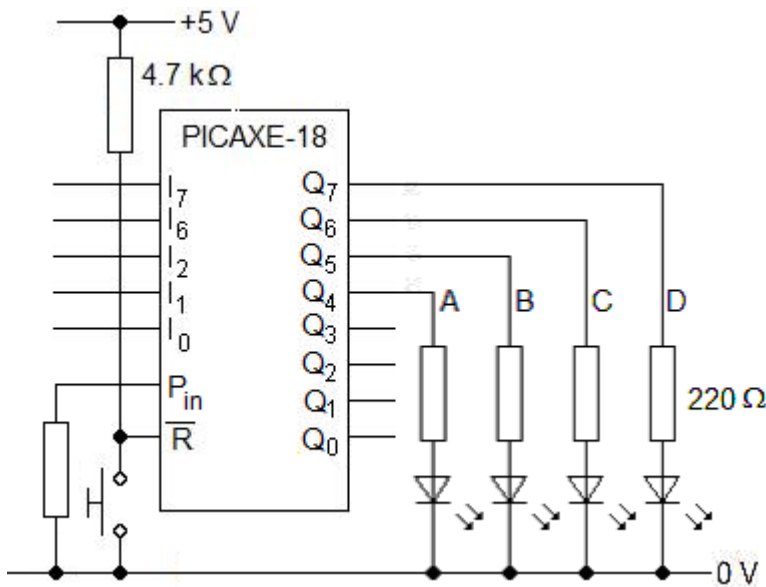


Oscillators

You are going to write and test flowcharts which make a PICAXE-18 into an oscillator.

- 1 Write the flowchart opposite into the PICAXE Programming Editor. Download it into a PICAXE-18 i.c.
- 2 Insert the i.c. into the circuit below.
- 3 If all is well, the LEDs should indicate that the top four outputs are counting up in binary, at a rate of four per second.

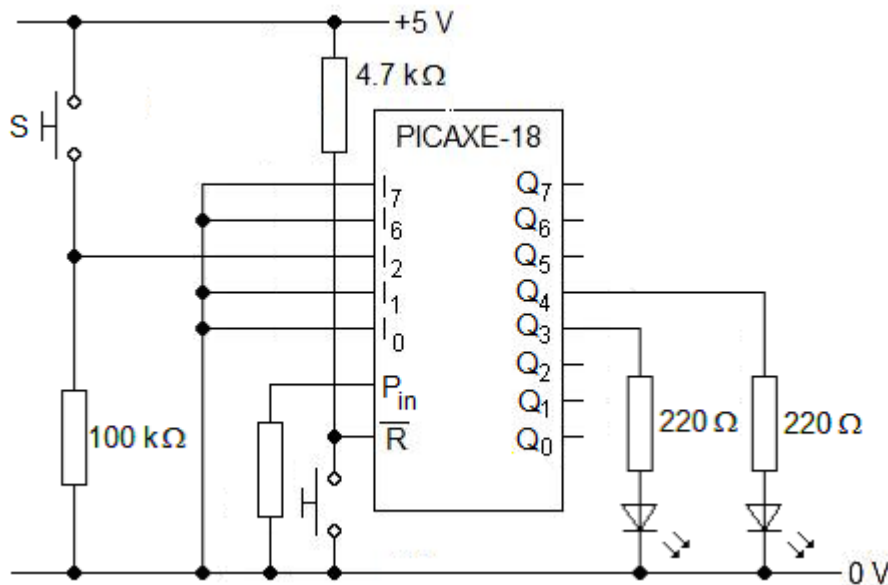
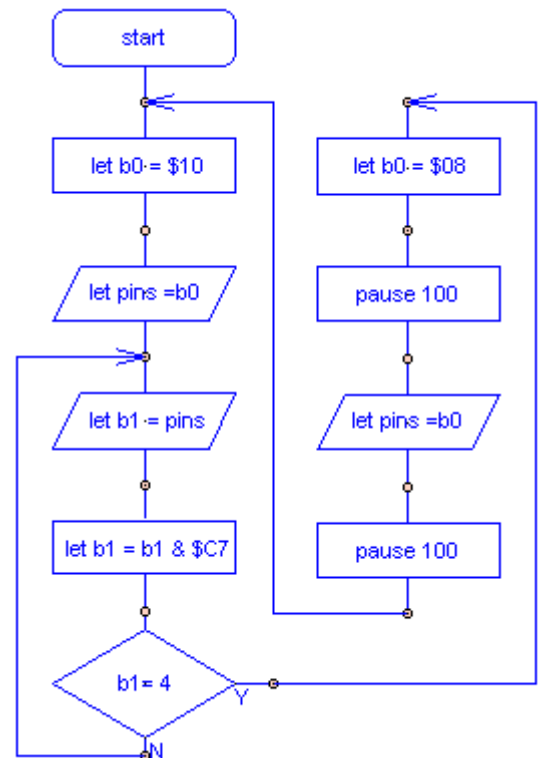


- 4 Adapt the flowchart so that the system counts up at a rate of one per second. Download it into the PICAXE-18 and see if it behaves as required.
- 5 Adapt the flowchart with a decision box so that the system counts from 0000 to 1011 before resetting to 0000, at a rate of two per second.
- 6 Adapt the flowchart so that the system counts **down**, in binary, from five to one before resetting to five, at a rate of one per second.

Testing inputs

You are going to test the use of test-and-skip loops in programs.

- 1 Write this flowchart into the PICAXE Programming Editor. Note the use of a test-and-skip loop to monitor the state of input I₂. The **let b1 = b1 & \$C7** command resets the 'hidden' input word I₅I₄I₃ to 000.
- 2 Download the program into a PICAXE-18 i.c. and insert it into the circuit below.
- 3 If all is well, pressing switch S should allow the LEDs to glow alternately several times a second.

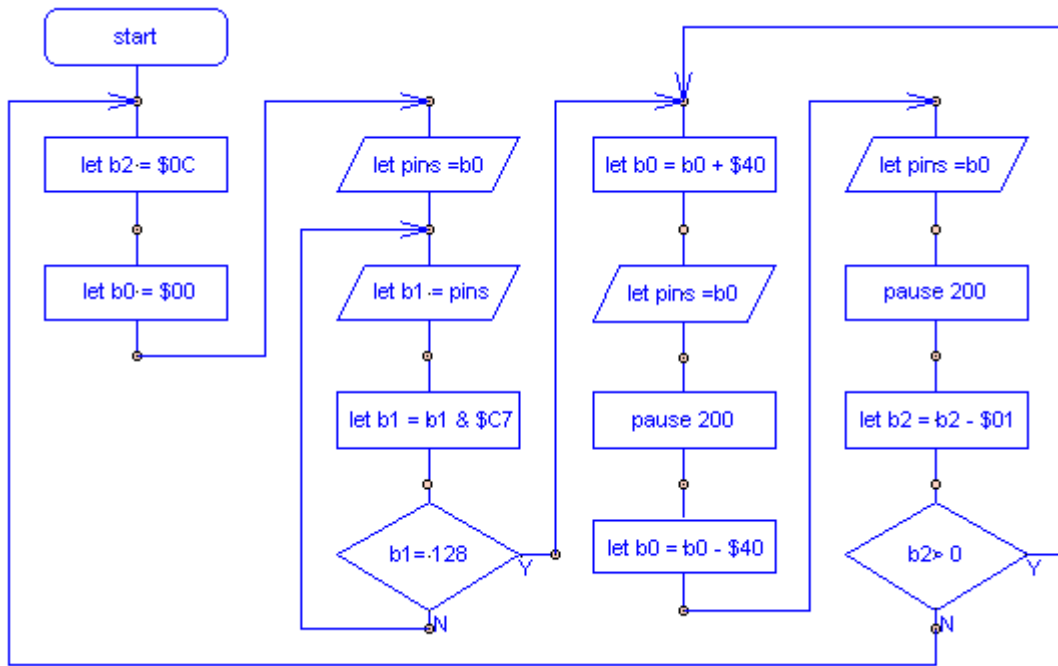


- 4 Adapt the program so that the LEDs only glow alternately when I₇ is high.
- 5 Connect the LEDs to Q₆ and Q₅. Connect the switch to I₆. Adapt the program so that the LEDs only glow alternately when S is pressed.
- 6 Connect separate switches to inputs I₁ and I₆. Adapt the program so that the LEDs connected to O₆ and O₅ only glow alternately when both switches are pressed.

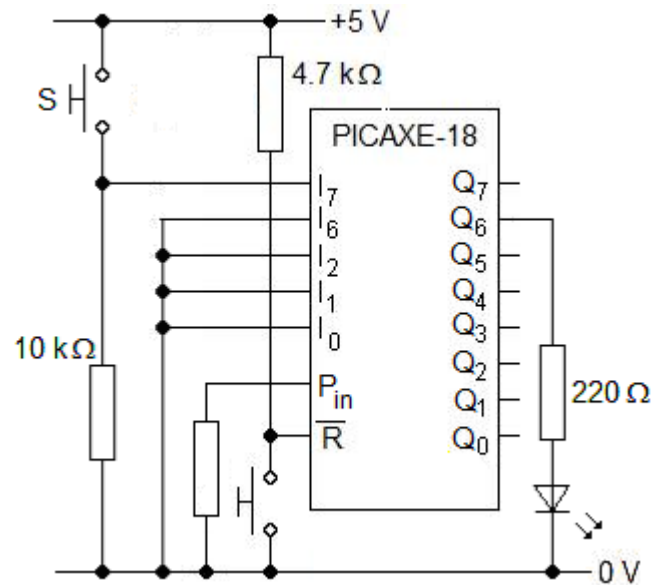
Multipulse monostables

You are going to investigate programs which act as one-shot sequencers.

- 1 Enter this flowchart into the Programming Editor. Download it into a PICAXE-18 i.c. Note the use of the **let b1 = b1 & \$C7** command to reset the 'hidden' input word $I_5I_4I_3$ to 000.



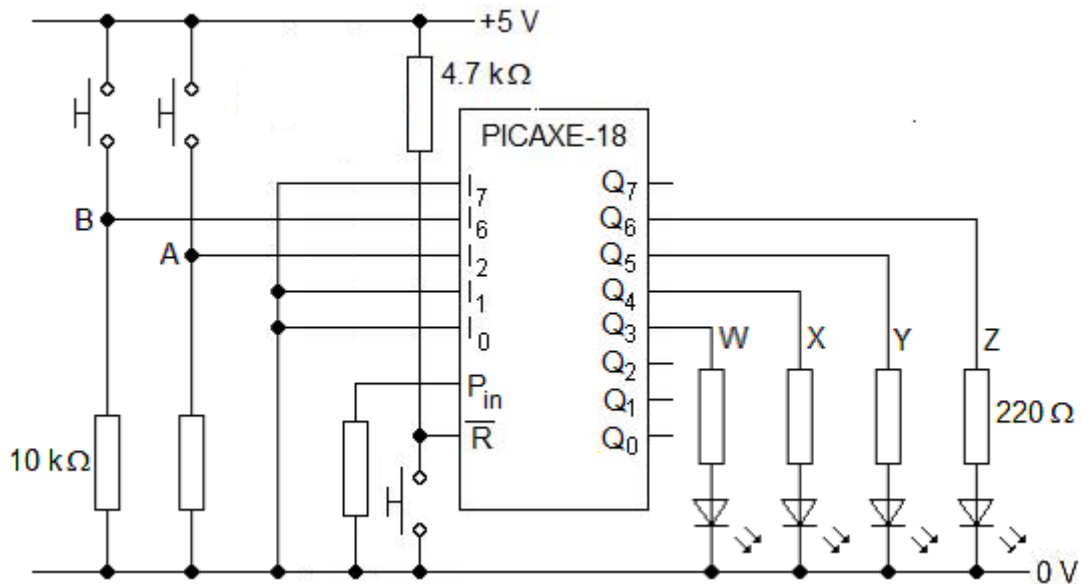
- 2 Insert the i.c. into this circuit.
- 3 Press and release S. If all is well, the LED should flash twelve times.
- 4 Adapt the system so that the LED flashes twenty times when S is pressed and released.
- 5 Adapt the system so that the number of times the LED flashes is the decimal equivalent of the three-bit binary word $I_2I_1I_0$. Use DIL switches and 10 kΩ pull-down resistors to generate the word.



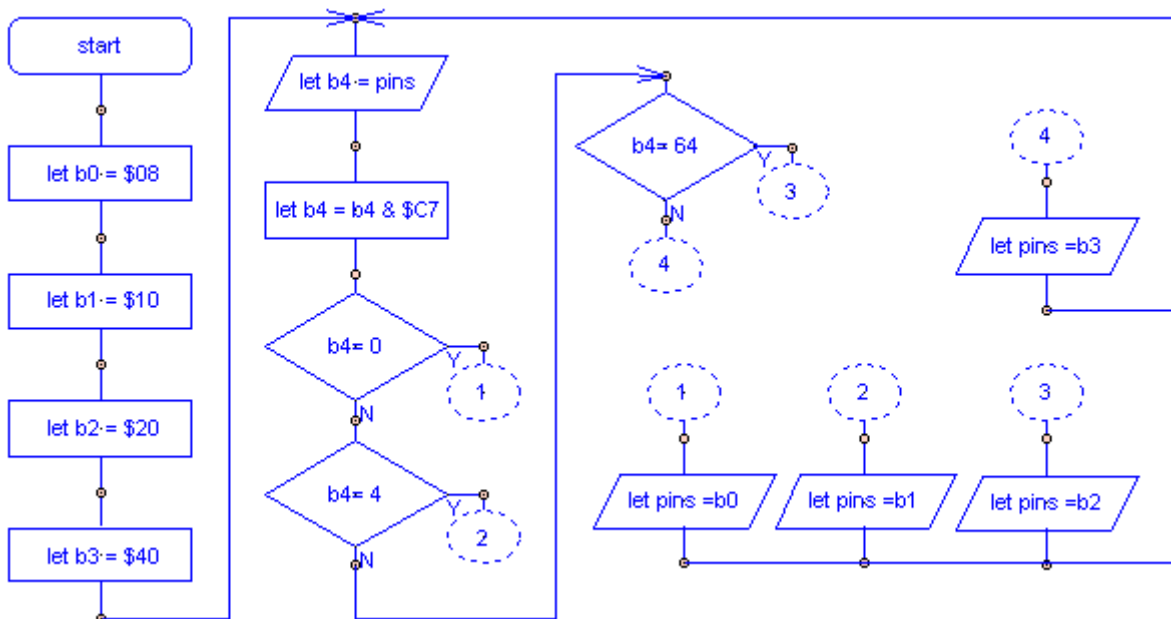
Logic systems

You are going to investigate how a microcontroller can be made to behave like a logic system.

1 Assemble this circuit.



2 Download this flowchart program into the PICAXE-18 i.c.



3 If all is well, the system should obey this truth table.

B	A	W	X	Y	Z
0	0	1	0	0	0
0	1	0	1	0	0
1	0	0	0	1	0
1	1	0	0	0	1

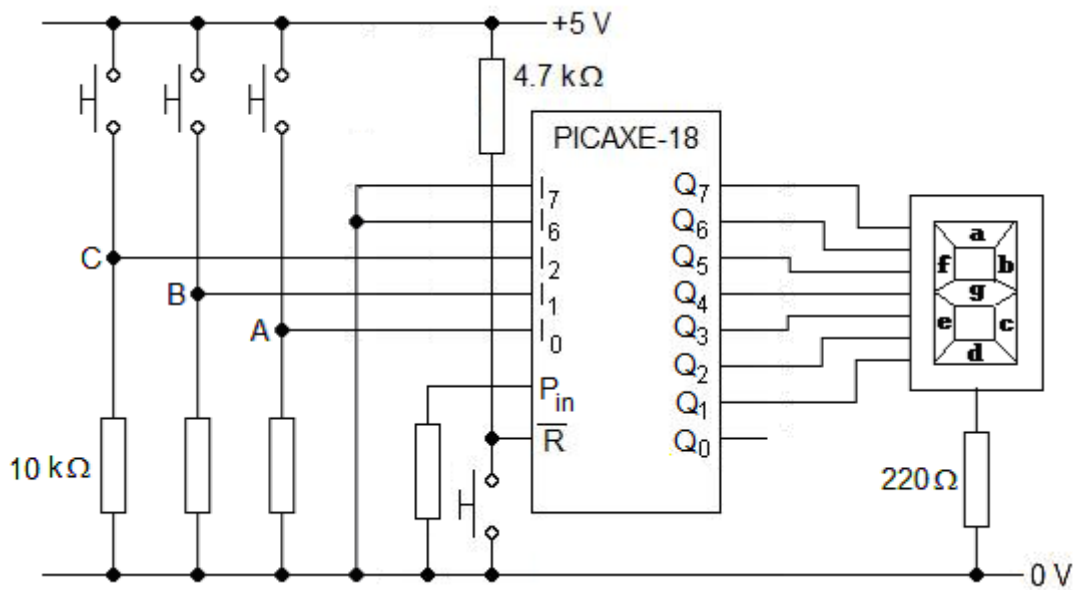
4 Adapt the system so that it obeys this truth table.

B	A	W	X	Y	Z
0	0	0	0	0	0
0	1	1	0	0	0
1	0	1	1	0	0
1	1	1	1	1	0

5 Arrange for signal B to enter at I₇ and signal A to enter at I₀. Adapt the system so it obeys this truth table.

B	A	W	X	Y	Z
0	0	0	0	1	1
0	1	0	1	1	0
1	0	1	1	0	0
1	1	1	0	0	1

6 Assemble this circuit so that it has three inputs and seven outputs.



7 Program the PICAXE-18 so that the seven-segment LED displays the decimal equivalent (0 to 7) of the three-bit binary word CBA (000 to 111).