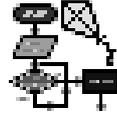


FlowolTM 2



A Control Program for

Windows PC
Apple Mac
Acorn RISC OS

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System Requirements

PC Windows:

6Mb of free Hard Disk Space.

Microsoft Windows 95, 98, Me, NT4, 2000 or XP.

Apple Mac

System 6, 7, 8 or 9

Power PC upwards

Acorn

RISC OS 3 or above

2Mb RAM

Installing Flowol

PC Windows:

Current Flowol users: Please refer to the notes below before commencing installation.

Close any open programs - you will need to restart your machine for configuration changes to be made after Flowol is installed.

USB Users: Make sure that the device (FlowGo or SOLO) is not connected to the USB port during installation.
Note for Windows NT, 2000, XP users: This program should be installed with Administrative Privileges on the system.

- Insert the Flowol 2 CD ROM into the CD Drive. This is an auto play CD ROM, so Windows should detect the presence of the CD and automatically start up the Auto run program.

Note: If the Auto run program fails to start, use Windows Explorer to navigate the CD ROM contents and double click on the file Setup.exe.

- Follow the on-screen instructions to complete the installation of Flowol and its associated files onto the hard disc.
- When installation is complete, eject the CD ROM and store safely.
- **RESTART** your system.

PC Flowol 2 network installation instructions: see Appendix I (page 35).

Notes for current Flowol users:

If you have an earlier version of Flowol on your computer it is best removed before commencing installation. To uninstall Flowol Version 2.81 or lower use **Uninstall** from within the **Programs/Flowol 2** part of the **Start** menu. If this method is used to uninstall, any existing mimics will remain on your system in the Flowol directory (default location C:\DHG\Flowol\Mimics). If Flowol 2.9 (default location C:\Program Files\Keep I.T. Easy\Flowol 2) is installed to the same directory as the previous version all existing mimics will work. Alternatively either copy & paste all the contents of the existing Mimic folder into the Mimic folder in the new directory or reinstall the mimics using the original Mimic discs.

USB Users:

You must uninstall any existing USB drivers for the FlowGo interface prior to installing Flowol 2.9. The Flowol 2.9 installer will not start if the old drivers are detected.

Remove the old drivers by opening the Control Panel (via Start/Settings), choose Add/Remove programs, and remove the 'FlowGo USB Drivers'. Follow the on screen instructions to remove the drivers.

Flowol Version 2.9 or higher will install the latest USB drivers for FlowGo and SOLO to your hard drive as part of its installation. You must **restart your system** after Flowol has been installed **before** connecting the FlowGo or SOLO device.

Connect the FlowGo or SOLO device to the USB port. Either the hardware information database will automatically be updated or a wizard will be generated to aid installation (depending on your operating system).

Windows XP users: You may be warned that the drivers have not passed Logo signing, please 'continue anyway' at this point.

Apple Mac:

USB Users: Make sure that the device (FlowGo or SOLO) is not connected to the USB port during installation.

- Insert the Flowol 2 CD ROM into the CD Drive.
- Install Flowol by copying the Flowol files from the CD into a folder on your hard/boot disc drive.
- **USB FlowGo/SOLO Users:** Copy the USB driver file [USBSerialConverter_0403FE59] into the Extension folder in System on the hard/boot disc drive.

Note: SerialShimLib (an Apple supplied library) must be available in your Extensions folder for these drivers to work.

Acorn RISC OS:

To Install to Hard disc:

Place the Flowol disc in drive :0
Click on the floppy disc icon.
Double click on the !Flowol icon
in the filer window.
Follow the on screen instructions.

To Run from Floppy disc:

Place the Flowol disc in drive :0
Click on the floppy disc icon.
Double click on the !Flowol icon
in the filer window.

Note: It is strongly recommended that Flowol is installed to the Hard Disc. When Flowol is run from floppy disc, the Mimics will NOT be available.

Getting Started

To start the Flowol software (once it has been installed).

PC Windows:

Click on the **Start** button on the taskbar.
Within Programs, select Flowol 2.90 and click on the Flowol 2 icon.

Apple Mac:

Double click on the Flowol2 icon on your hard disc.

Acorn RISC OS:

Double click on the Flowol2 icon on your hard disc.



Configuring Flowol

Flowol can operate with or without an interface attached. If the 'No Interface' option is selected, Flowol will automatically be in simulation mode with the maximum number of inputs and outputs available. If an Interface has been selected from the list then Flowol can operate either:

- Without the interface connected (in simulation mode) so that the correct number of outputs, inputs and the commands available for that interface are available or
- With the interface connected (with simulate deselected).

The following interfaces can be supported:

Data Harvest: Contact Controller Plus
 Contact Controller
 Sense and Control (used to operate the Control Interface or Buffer Box).
 Kids Chip P.I.C. System
 FlowGo (Windows and Apple Mac only)
 Solo (Windows only)

Fischertechnik: Intelligent Interface (Windows and Apple Mac only)

Deltronics: Serial Interface
 Serial Interface +
 Junior Interface
 Extra Sense [Serial Interface] to operate the Control IT Buffer Box.
 Digital Serial Adapter: to operate the Control IT Buffer Box.

Commotion: Serial Interface
 Junior Interface

LEGO DACTA: (Control Lab) Interface B (Windows and Apple Mac only). See Appendix II

Unilab: MFA Serial Interface

User Port Upgrade (Acorn only) will control Control IT Buffer Box and Sense IT (with an ADC).

To set the Interface:

PC and Mac, select Interface from the Control menu.

Acorn users, select Interface from the Icon bar menu.

Leave Simulate from the Control menu ticked until you have made the interface and communication port selection.

Select either:

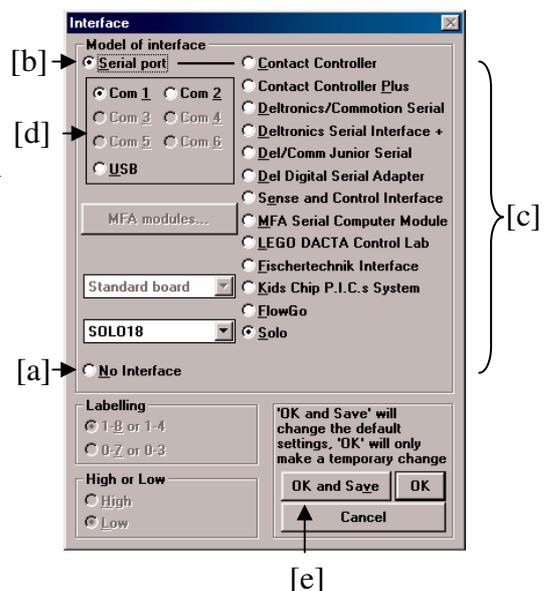
[a] No Interface and then [e] OK and Save

or

[b] Serial port if simulating or using an interface.

Then

- Select the model of interface being simulated or used from the list [c].





- Select [d] the appropriate communication port e.g. Com port 1 – 6 or USB (Windows version), Modem/Printer or USB (Mac version), Serial or User/Printer port (Acorn version).
- Select the labelling (0–7) if required (Tutorial is written for 1–8 setting)
- Select the High / Low state if required (This usually sets automatically).
- Select any secondary control interface (i.e. the appropriate board for Kids Chip or SOLO, the output module on the MFA Serial Interface or that on the Sense & Control).
- Select the sensing interface (for the Acorn only with an analogue port).
- Select OK and Save for Flowol to save your selection so that it will be automatically configured when next used, or OK for these settings to be used for this session only.
- Untick Simulate from the Control menu.

The Tutorial

Introduction.

This tutorial introduces Flowol software and the flowchart method of creating a control program. It is a hands-on approach that puts the reader through a series of exercises. Each exercise uses a control program to explore different elements of control, starting with simple ideas and progressing to more complex examples. The features of Flowol are introduced gradually at each stage.

Using the Tutorial.

The first section is an appropriate introduction for both primary and secondary (see page headers). Pages 16 – 20 use mimics from the Primary Mimic disc and are targeted at primary level. Pages 21 to 26 use mimics from the Secondary Mimic disc and are targeted at secondary level.

Each theme in the tutorial usually gives clear direction to possible solutions. Ideas need to be transferred from one area to another and extended to provide a complete solution.

Why Flowol?

Flowol can be set to operate in simulation mode. It allows all students on a computer to actively create, test and modify their control solutions. The mimics respond in a realistic way and the visual activity of the flowchart allows the logic to be easily followed and amended.

When models are connected and controlled through an interface, the mimics still respond. When readings from analogue sensors are logged and used to control events then the computer screen becomes an important monitoring tool. (Industrial processes, security system etc are monitored in a similar way).

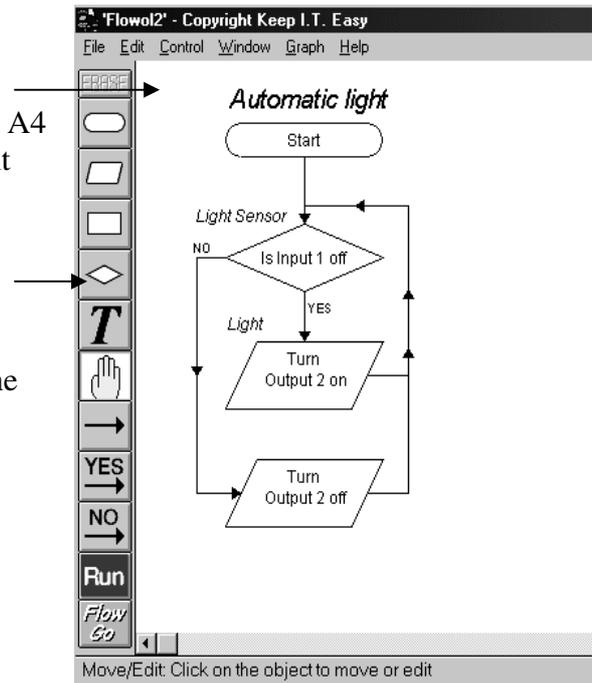
The Screen

The Workspace.

Flowol has a workspace that represents up to 4 x A4 sheets of paper, when printed. There is sufficient space to create a program with 220 symbols.

The Toolbar.

- i) Click on a Tool/symbol to select it.
- ii) Click again on the workspace to position it.
- iii) A prompt box will appear at the bottom of the window. It contains all the items that can be entered into that symbol. Some buttons are highlighted and others are dormant to avoid syntax errors.

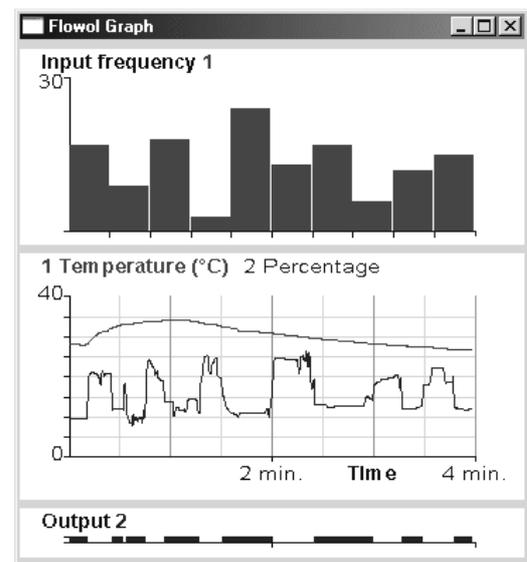


Mimics.

Allow the programs to be developed and tested in 'Simulate' mode

Graphs.

- i) Analogue and digital inputs can be logged as a separate application.
- ii) Inputs and outputs can be plotted together to show the response of the controlled outputs.





The Toolbar

ERASE

The **Erase Tool** will highlight and become active when part of the flowchart has been selected for editing.

Start/Stop/Sub



Use the **Start** symbol at the beginning of the flowchart program.
 Use the **Stop** symbol at the end of a sub-routine, and at the end of a program that is not recursive (repeating).
 Use the **Sub** symbol to head a sub-routine. (Note: sub-routines should be defined before the main program).
 Use the prompts to make your selection.

Output



Use the **Output** symbol to turn on or turn off an output or a motor.
 Use the prompts to make the selection. (Note: up to four outputs can be turned on or off at a time within one symbol or two motors).

Process



Use the **Process** symbol to put in a delay. (How long does the output need to be switched on for?).
 This is also used to call a sub-routine, or to set up a variable. Use the prompts to make your selection.

Decision



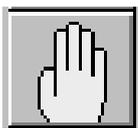
Use the **Decision** symbol to decide if 'Yes do this' or 'No do that'. It is used to check for feedback from an input signal such as: is the switch on, or is the temperature value more than, less than or equal to x etc.
 This symbol can also be used to check the values of a variable. Use the prompts to make your selection.

Text



Click on the **Text Tool** to add a title, or comments on the flowchart. A dialogue window will open into which text can be entered. There is a choice between small, medium and large text.

Edit



Click on the **Edit Tool** (or use right mouse button) when you need to highlight symbols, lines, labels or section of flowchart. They can then be erased, changed or moved.



YES



NO



Use the **Line Tools** to link the symbols together to create the flowchart. Where a decision symbol has been used, then both a YES and a NO line have to be selected.

E.g. If switch is pressed (Yes) - do something.
 If switch is not pressed (No) - go back and check again.

SOLO

A 'download' button will appear at the bottom of the toolbar if the selected Interface is Kids Chip PIC system, FlowGo or SOLO.

Zebra Crossing

Mimic

Zebra.

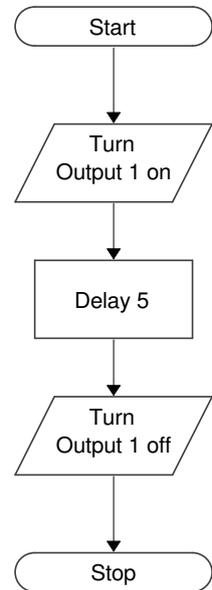
Resource

6V bulb connected to Output 1

Skill: To connect three of the basic flowchart 'Tools' to create a control program to light a bulb for 5 seconds, then switch it off.

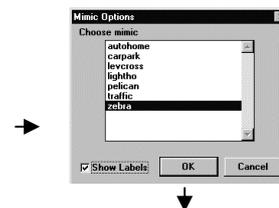
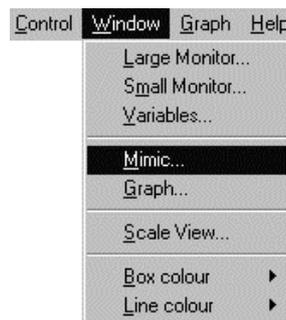
Program:

- 1 Select the **Start** symbol 'Tool' and position it on the workspace. Use the prompts to select **Start**.
- 2 Select an **Output** Box – position it under the Start symbol. Use the prompt to Select: **Turn, Output, 1, on**, click on OK.
- 3 Select a **Process** Box – position it under the Output box. Use the prompts to select Delay 5. Click on OK.
Note: Delays are in seconds and can be from 0.1 to 999.
- 4 Select the **Output** Box – position it under the symbol above. Use the prompts to select **Turn, Output, 1, off**. Click on OK.
- 5 Select a **Stop** symbol – position it under the symbol above. Use the prompts to select **Stop**.
- 6 Select the **Line** tool to link the symbols
 - i) Click on the 'Start' symbol (it will highlight green).
 - ii) Click on the symbol beneath it (the line will be drawn).
 - iii) Click on the second symbol (this is the start of the next line)
 - iv) Click on the third symbol and continue until the flowchart is complete.



To run this short program, click on the Red **RUN** symbol in the toolbar. To stop the program running click on **STOP** or press **ESCAPE**.

To open up the mimic: select Mimic from the Window menu. Choose 'Zebra', tick 'Show Labels' and click on OK. [Test the action of the mimic: click on one of the crossing lights to turn it on, click again to turn it off]. RUN your program again.



To save a program, open the File menu, then click on Save. Flowol follows the standard saving procedure for whichever computer you are using. **Now save your program** – Call it flash.

Editing a flowchart.

Mimic

Zebra

Resources

6V bulb connected to Output 1

- Skill:** To modify a flowchart
- i) Remove unwanted symbols
 - ii) Changing information in the symbols
 - iii) Adding extra symbols in a sequence
 - iv) Changing the flowchart colours

Removing a mistake:

Symbols or lines in the wrong place can be removed.

Select the **Edit tool** (Hand).

Note: the right mouse button is an edit short cut, instead of clicking on 'Hand'



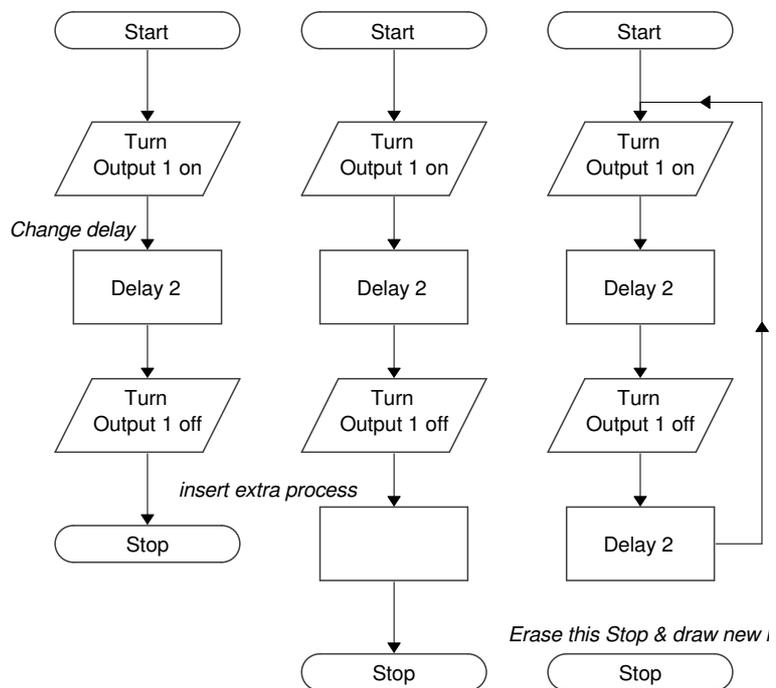
Click on the incorrect line or symbol to highlight it, and then click on **Erase** at the top of the toolbar.

Changing Information:

- 1 Select the Edit tool (Hand).
- 2 Click on the 'Delay' in the Flowchart to highlight it.
- 3 Click on 'Clear' in the prompt box and change to Delay 2, OK.

Inserting Additional Symbol:

- 1 Select another process symbol from the toolbar.
- 2 Place it on the line above the Stop symbol. The chart will automatically re-draw itself.
- 3 Use the prompt box to select Delay 2, OK.



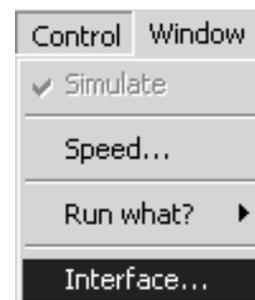
To change the colours of the flowchart: Select 'Colour options' in the Window menu. Stronger colours may be useful for demonstrations but strong, flashing colours can be hazardous.

To make the Zebra crossing flash forever (recursive):

- 1 Select Edit tool, click on the Stop symbol and erase it.
- 2 Re-draw the line from the second Delay to the process symbol turning on output 1.

Now save your program – call it flashes.

Nothing happens to the model. Flowol is set to operate in Simulation mode. **To use an interface**, select Interface from the Control menu, choose the interface you are using and then return to the Control menu to 'un-tick' Simulate.



The Lighthouse

Mimic

Lightho

Resources

Output 2 - buzzer
Output 1 – 6V bulb

Skill: To use multiple flowcharts:

- i) Move sections of flowchart.
- ii) Copy flowcharts.
- iii) Label parts of the flowchart.

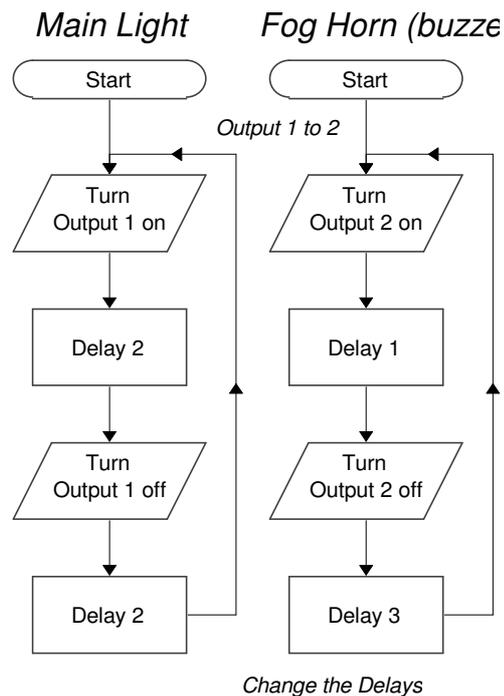
Re-load the **Flashes** program and run it with the lighthouse mimic.

Moving Sections of the flowchart: (individual symbols or as groups)

- 1 Select the Edit tool (hand).
- 2 Click on the symbol in the flowchart to be moved, it will highlight.
- 3 Use the left mouse button to drag the symbol and then release.
- 4 To highlight a group of symbols, drag a box around the group. (Click left mouse button at one corner of the group, drag a box across them and release).
- 5 Select any one of the highlighted symbols to drag the group.

Adding a Fog Horn to the lighthouse:

- 1 The sequence for the foghorn is similar to that of the main light.
- 2 **Copy the ‘Flashes’ flowchart:**
 - i) Select edit tool and highlight the entire flowchart by dragging a box around it (explained above).
 - ii) **Hold the Shift key** and drag one of the highlighted symbols to drag a copy of the flowchart to one side, release mouse button.
- 3 The outputs in the second flowchart now need to be re-defined as Output 2.
- 4 It may also be advisable to change the delays: Delay 1 when buzzer is ‘on’ and Delay 3 when ‘off’.



Labelling the Flowchart:

Select the **Text Tool**, position and click the ‘marker’ on the flowchart. Write the label in the text window at the bottom of the screen. Select the size of font required and click on OK. Labels can be edited and moved in a similar way to that of the symbols. **To align the headings**, drag a box to highlight them and select ‘Align’ (Edit menu).

Now save your program – call it Fog

Lighthouse with a switch

Mimic

Lightho

Resources

Output 3 – 6V bulb

Output 2 – buzzer

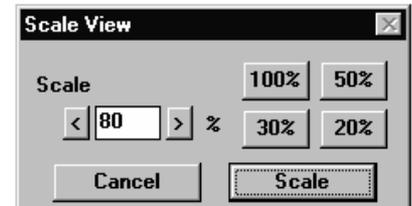
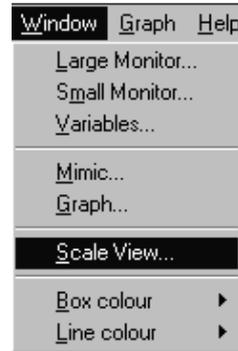
Output 1 – 6V bulb

Input 1 – switch or LDR

Skill: Changing the size (scale) of the flowchart
Using an Input (Decision box).

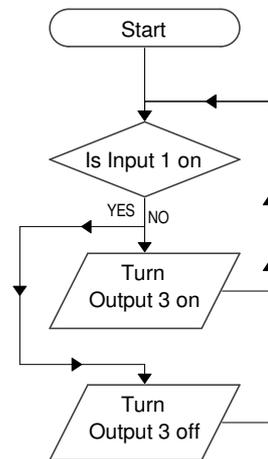
Re-scaling the flowchart to get more space:

- 1 Load the lighthouse 'Fog' program.
- 2 Choose Scale View from the Window menu.
- 3 Change the scale, as a % (i.e. 80%).
- 4 Click on Scale.



Using an input switch to control the interior lights:

- 1 An input is observed by a **decision symbol**. When the program is running the decision instruction 'looks' for a fraction of a second to see if the input is On or Off.
- 2 Build the procedure shown in the diagram to your 'Fog' program. When you select the line tool you must use the Yes and No. Just click on the 'source' and then on the 'destination' symbols as explained before and the lines will be drawn.
- 3 Label this part of the program with as much detail as possible. **Now save your program** (choose a name).



Note: Flowol 2 can support 20 flowcharts running simultaneously.

Using a light sensor (LDR) as the switch

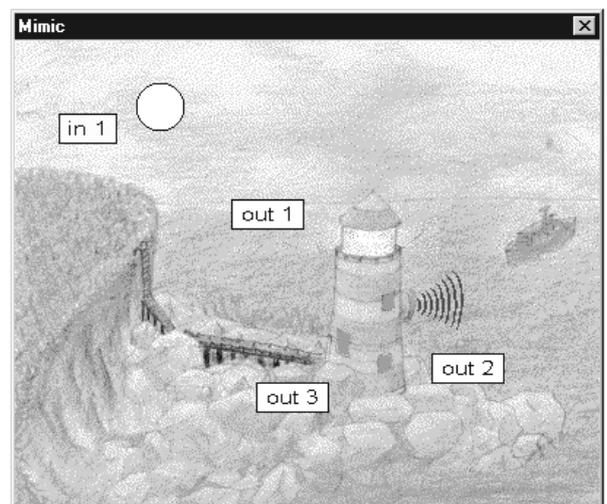
- 1 If a light sensor is On when it is light and Off in the dark, modify this part of the program to turn on the interior lights when it goes dark.

Save your new program.

Click on the Moon/Sun on the mimic to simulate input 1 (Moon for Off, Sun for On).

- 2 Try to add a decision symbol to the other flowcharts so that the main light or foghorn is also controlled automatically.

Test your program and save it.



Traffic Lights

Mimic

Bridlgh

Resources

Output 3 – 6V bulb

Output 2 – 6V bulb

Output 1 - 6V bulb

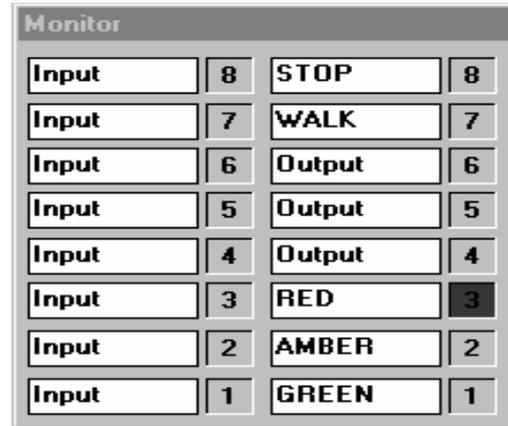
Skill: Simulations with monitor screens.
Multiple outputs in a symbol.
Drawing 'flow lines' manually.

Simulation without a mimic.

Flowol has two monitor screens that are accessed from the Window menu.

Both show the state of the inputs and outputs.

Clicking on their input numbers will simulate the inputs, providing the program is in simulate mode. (Simulate ticked in Control menu).



Large Monitor screen can have the inputs/outputs labelled (click on the label and re-write). This is useful to simulate: traffic lights, pelican crossing, lighthouse, etc. OR to have as reference when building a program.

(There is also an analogue inputs monitor screen, which should be closed at this stage).

Small Monitor screen will always appear at the bottom of the window when the program is running if the large monitor screen has not been opened.



Traffic Lights:

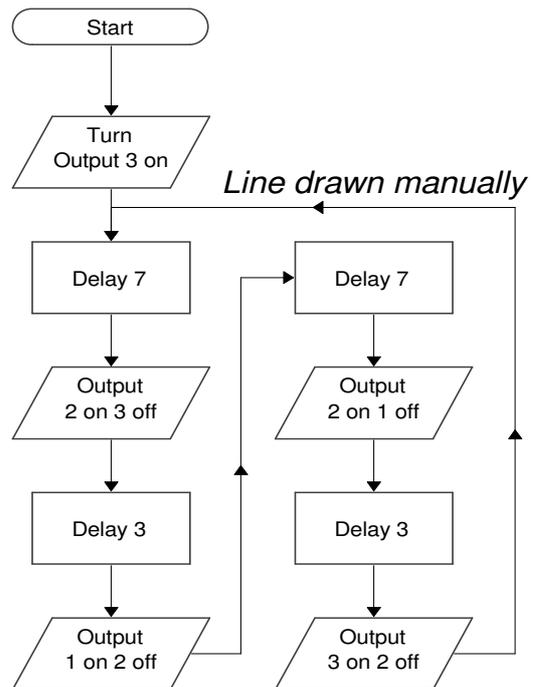
- 1 Open the Large Monitor screen, and label some of the outputs, as explained above.
- 2 Scale View the screen to 80% or less.
- 3 Build up the flowchart as shown.

Start a new column and work down.

Multiple outputs can be triggered in the same output box; follow the prompts (up to 4 outputs can go in each output box).

The final line is drawn manually to avoid a 'cross over'.

- a. Select the line tool.
- b. Click on the last output box.
- c. Click for the first corner for the line.
- d. Click for the second corner.
- e. Click where the new line meets the existing line.
- f. Click on the 'Delay 7' symbol.



Double Traffic Lights

Mimic

Bridligh

Resources

Outputs (1 to 6) – 6V bulbs

Skill:

- i) Modify and Edit flowchart.
- ii) Click on the mimic to test its function.
- iii) Click on the mimic labels when building the flowchart
- iv) Using 'Hot Keys'
- v) Auto-Scroll
- vi) Slowing down the flowchart

Single Set of Lights:

The light sequence on the previous page is not quite right. Make the correction and **save it as 3lights**.

Testing the Outputs on the Mimics:

- 1 Re-label the large monitor screen for the second set of lights.
- 2 Display Traffic mimic with 'Show Labels' ticked.
- 3 If you carefully click on each of the lights on the mimic you will make them turn on, click on them again to turn them out. Check the labels on the monitor screen.



Double Set of Traffic Lights

- 1 The sequence for the single set of lights now needs to be modified. Extra symbols can be inserted or some of those already there can be highlighted and edited, e.g. use the prompt box to 'Clear' and then re-write the instructions (up to four outputs can be in each symbol).
- 2 **Drawing the flowchart with the help of the mimic.** When building the command: Turn output 3 off output 2 off output 1 on, it is possible to click on the appropriate labels on the mimic to refer to the outputs but the On Off and OK still on the prompt window.
- 3 **Using the Hot Keys.** Letters and symbols in the PC prompt boxes are underlined e.g. Turn output 1 etc, which refers to the keyboard keys that can be used instead. [The initial letter will do the same on the Mac or Acorn versions].
Some instructions have different letters e.g. 'on' and 'off' are Yes and No.
OK is Enter or Return. (Combine the use of mimic labels, hot keys & prompts).
- 4 **Auto-Scroll:** Choose 'Auto Scroll' from the Edit menu. Choose again to turn it off.
- 5 **Reducing the Speed of the Flowchart:** is sometimes useful when demonstrating or checking for errors. Select the 'Speed' from the Control menu and adjust the slider. Using 'Space bar' allows you to 'step' through the flowchart.
[Note: Not suitable for use with Kids Chip].

Pelican Crossing

Mimic

Pelican

Resources

Outputs (1 to 8) – 6V bulbs
Input 1 - switch

Skill: Using Sub-routines.
Repeating sub-routines.
Run what?

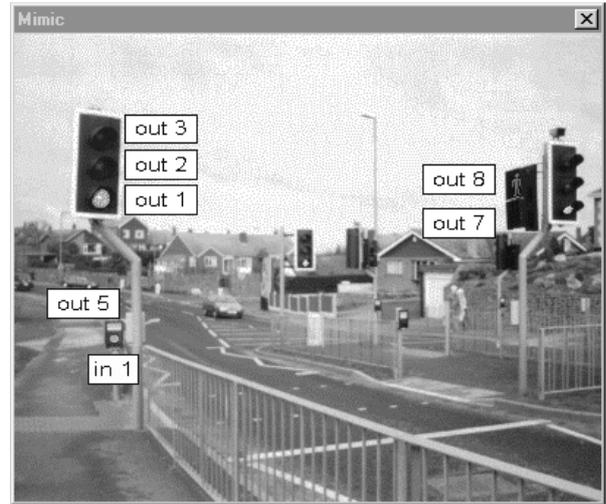
Pelican Crossing with Sub-routines

When a ‘string’ of symbols gets too long, it is better to split them into sub-routines and command them from a main routine.

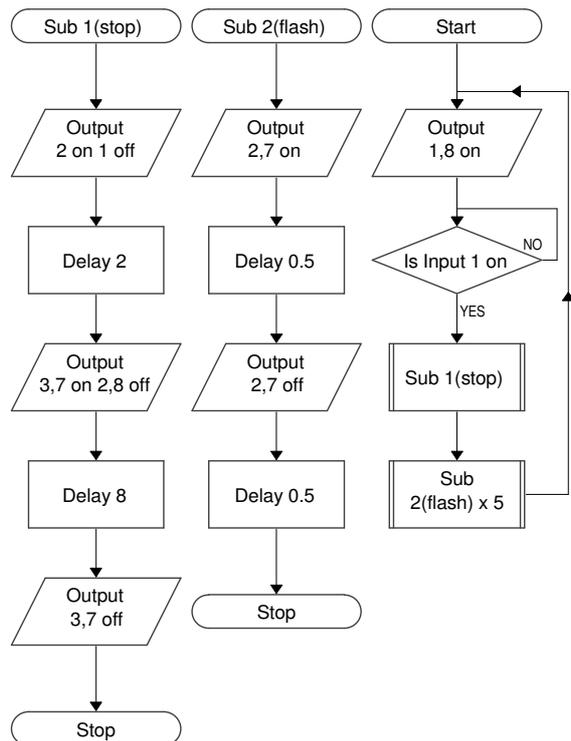
Note: The program repeats Sub 2, five times.

Build the Program

- 1 Draw and define the sub-routines first.
(Click on Sub and write the name in the text window before clicking OK).
- 2 Draw the main routine (with a ‘Start’).
Select the process box and click on ‘Sub’, a list of routines will appear, make your selection, to repeat this sub-routine, click on a number before clicking on OK.
- 3 **Develop the program to:**
Use Output 5 to indicate the need to WAIT.
- 4 **Save your programs** at each stage.
- 5 **Run** and click the button on the mimic.

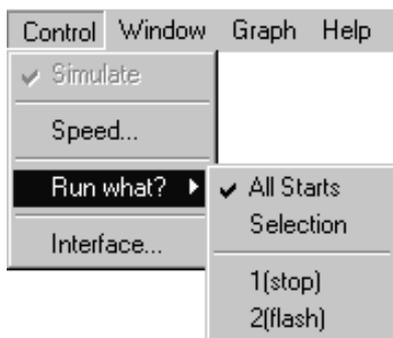


Pedestrian/Pelican Crossing



Flowol can support a total of 50 Sub-routines.

Run what? Allows you to test a sub-routine or selected flowcharts on their own. Select ‘Run what?’ from the Control menu; choose your sub-routine and RUN. Or choose ‘Selection’ from menu; highlight the chosen Start on your flowchart and RUN. Choose ‘All Starts’ at the end of the test.



The Robot

Primary Mimic Disc Robot

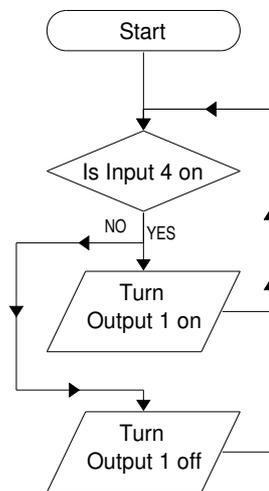
Skill:

Clicking on the mimic to check the inputs and outputs.
Using the 'Stop all'.

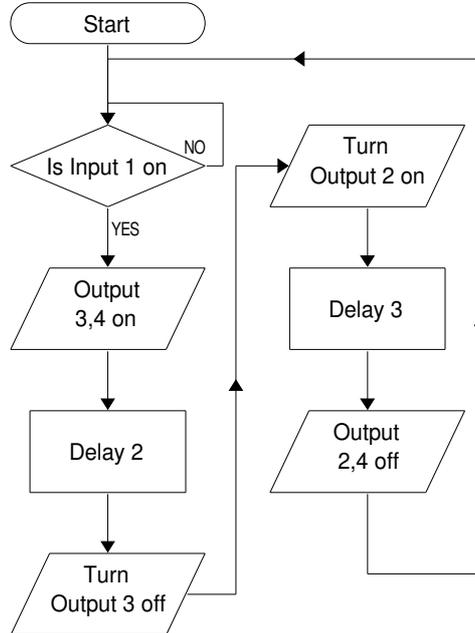
1. Load the Robot mimic and open the small monitor window.
2. Using the mouse, click on the 'input' shapes on the front of the robot and observe the monitor screen.
3. Click on the robot's mouth, each eye and the top of the aerial. Click again to reverse the effect. When are the outputs on or off?
4. Flowcharts can be drawn using the coloured buttons. Click on the button once to press it and then click again to release it.



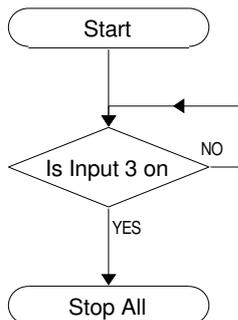
Use Input 4 (blue) to lift up the aerial (Output 1).



Input 1 (green) will set a sequence of events in action



Stop All



Input 3 will act like an emergency stop ('Stop All'). The whole program will stop running.

Level Crossing Barrier

Primary Mimic Disc

Levcrosp

Resources

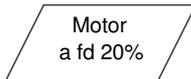
Inputs 1 & 2 – switches

Motor a – motor

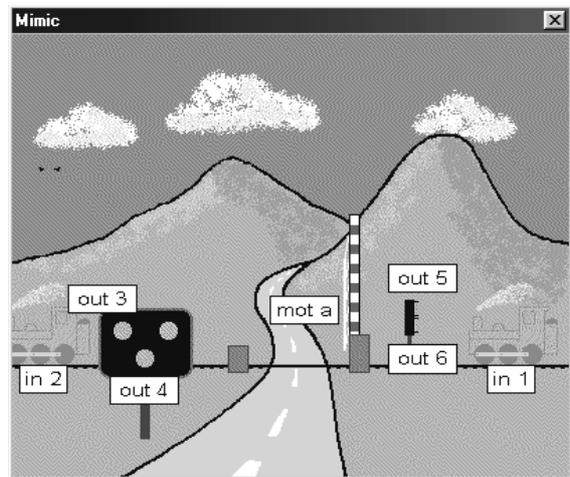
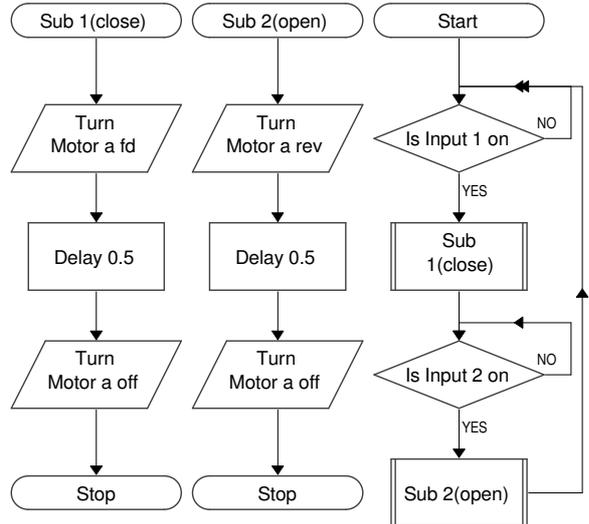
Other outputs - 6V bulbs

Skill: i) Using a Motor output with Power control.
 ii) Testing the outputs by using the monitor screens.

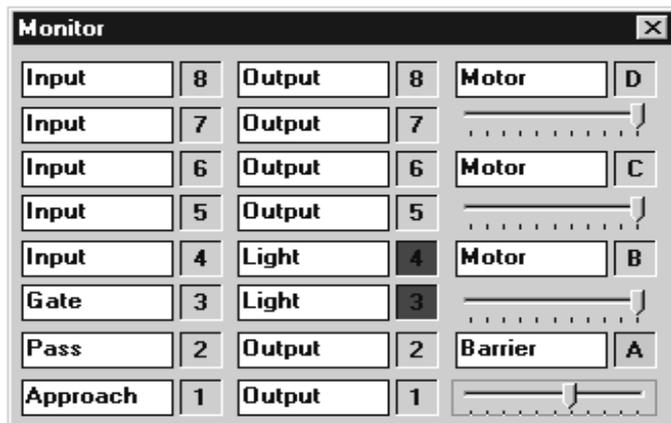
1. Display the mimic with labels and build this program to operate the Level Crossing gate. (Remember you can copy flowcharts).
2. The inputs 1 and 2 are the approach and pass switches and motor 'a' operates the barrier.
3. **Power control of the motor** is only possible if the program has been configured for a suitable interface. If this is available, the motor speeds can be altered in steps of 10%. Use the prompts: Turn Motor a fd 20 (for 20%).



4. **Developments** to the program:
 - i) Operate the lights to control the traffic on the road. This could be another sub-routine.
 - ii) Train signal lights should only go green if it is safe.



Testing your model on the interface



1. You will need the program configured for the right interface and remove the tick from 'Simulate' in Control menu.
2. Do not run the program but open a monitor window and click on the output numbers or motor letters. These icons act as toggle switches (left & right mouse button on motor).
3. Dragging the motor sliders will also vary the motor output power.

Logging the Level Crossing

Primary Mimic Disc

Levcrosp

Resources

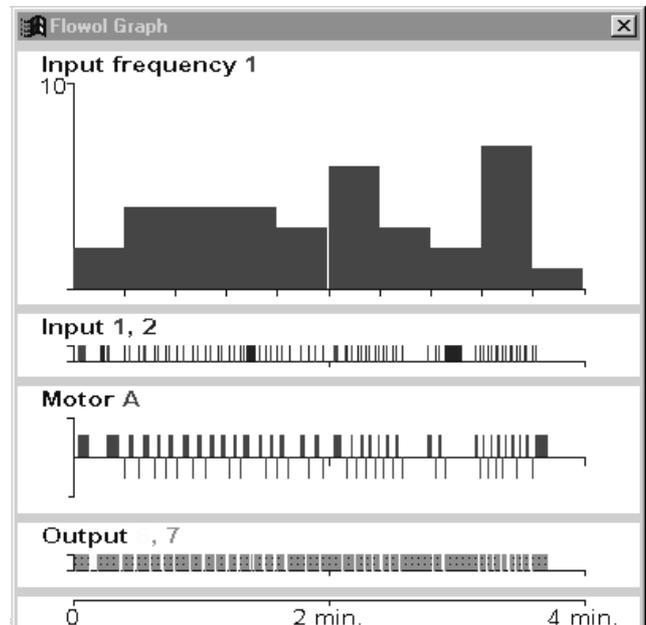
Level crossing model

Skill:

Use Graphs to data log the inputs, outputs and motors.

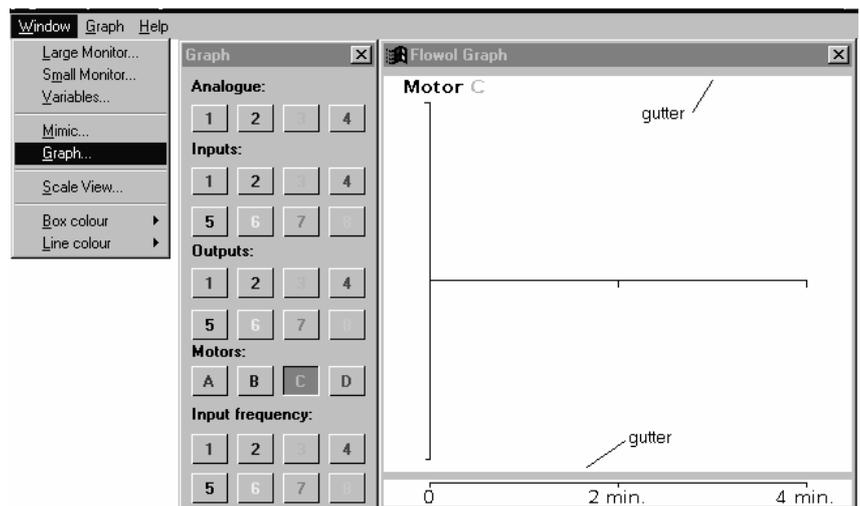
In this example Flowol Graph is monitoring some of the digital inputs and outputs.

- 1 The frequency graph of Input 1 shows how regularly the trains approach.
- 2 The approach and pass switches can be logged separately.
- 3 The response of the barrier motor A is shown both forward and reverse. The height of the 'blocks' can indicate the motor power.
- 4 The two train signal lights could also be logged (check the outputs on your mimic).



Building Up the Graph Axes

1. Open the Graph window from Window or Graph menu [‘Show Graph’].
2. Click on the icon of your first variable, turning it yellow, then click on the graph window.
3. Suitable axes will appear and also grey strips ‘gutters’ above and below the axes.
4. Further variables can then be selected and added to the same set of axes (from the same variables block) or given new axes by clicking on a gutter (pointer will change).
5. There are a maximum of 6 sets of axes available, of which: 2 can be analogue (see later), 2 can be frequency graphs, 4 for digital inputs, 4 for digital outputs, 4 for motors.
6. Data is automatically logged even when not being displayed on axes.
7. The logging time is initially 2 minutes and will keep doubling up if it has not been specified in the ‘Time Parameters’, accessed from the Graphs menu.
8. The size of the graph window can be changed by **dragging the bottom right hand corner**. The position of the graphs window can be moved in the usual way.



Auto-Home

Primary Mimic Disc

AutohP

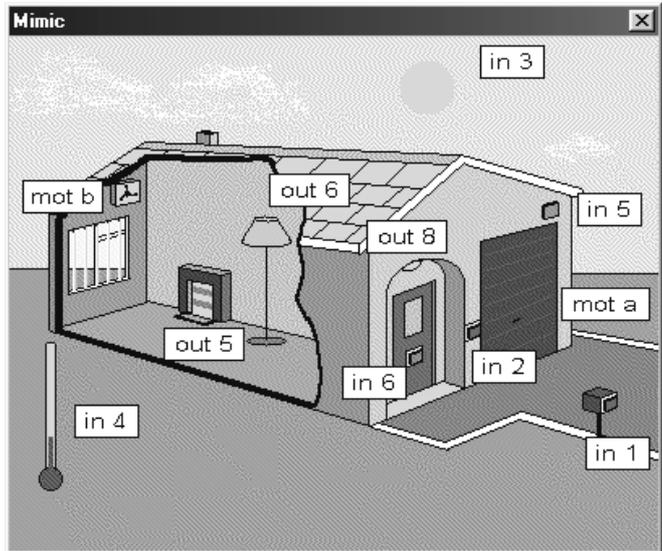
Resources

AutoHome model

Skill:

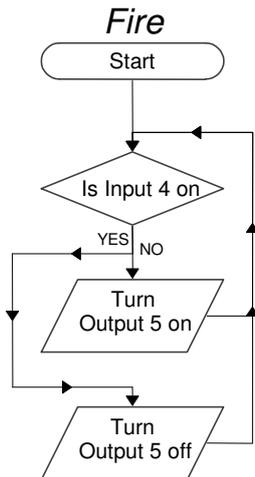
Using Sensors

Load the Autohome mimic with labels.
 Note: Input 3 for the Sun (the light level)
 Input 4 is the temperature.



Using temperature:

Build this flowchart to control the electric fire (output 5). Run in simulate mode and click on the thermometer.



Automatic lights:

Could also be done in a similar way by using input 3 (click on the Sun).

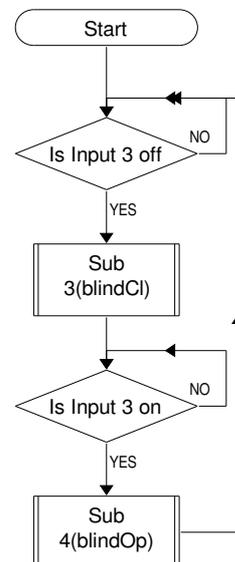
The Garage Door:

The digital input switches could be used to open and close the garage door. This is similar to the flowcharts needed to operate the barrier crossing.

Automatic Blinds:

Two more sub-routines (BlindCl) and (BlindOp) can be drawn to control the blinds. The 'master program' shown here on the right, uses input 3 again.

Blind Control



Using more inputs.

Input 5 could act as a **security** sensor to detect a person near by. How could this be used?

Perhaps the **door bell push** (input 6) should only work at daytime. (AND)

Add text to the Flowchart and remember to **save your program**.



Data Logging with Flowol

Resources

Analogue sensor 1 - Temperature
 Analogue sensor 2 - Light

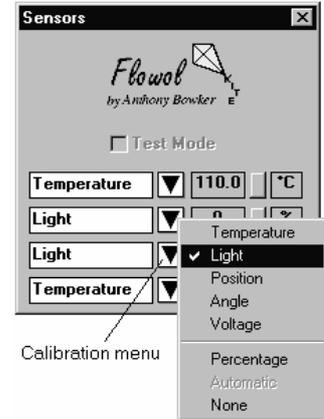
Skill:
 Use 'Graphs' to plot information from analogue inputs.

Calibrating the Sensors

The readings from the analogue sensors are displayed in the monitor windows, and are usually given as %.

If the program is configured for an interface (from the control menu) then calibrated values from some of the sensors can be displayed. To do this, select 'Sensors' from the 'Graph' menu. Drop down the menu near the val readings and select the sensor.

(Some interfaces detect the sensors automatically).



Setting Up 'Graphs'

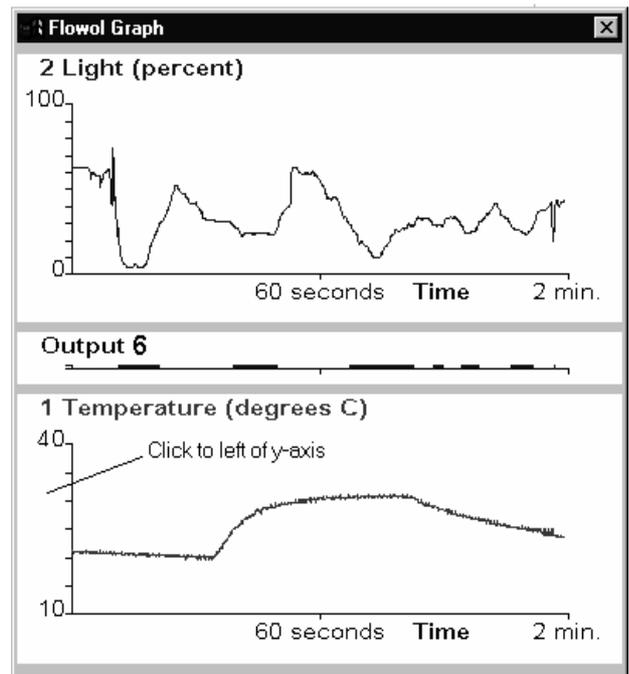
- 1 Check that Flowol is configured for a suitable analogue interface.
- 2 Un-tick Simulate in the control menu.
- 3 Build up the graph axes as explained on the 'Logging the Level Crossing' page.
 If you wish, select the logging time from: 'Time Parameters' in the Graphs menu. The time axis will otherwise default to 2 minutes and keep doubling up. When you stop the program in the default setting, the results will fill the time axis.
- 4 Re-size the graph window by dragging the bottom right corner, and position it in the usual way.

Note: Clicking on RUN will start the logging; a flowchart is not needed.

- 5 **Selecting 'Values'** from the Graphs menu allows a line to be scanned across the graphs to show the analogue values. These are displayed in either of the monitor windows.
- 6 **Change the feature of the y-axis** by clicking to the left of the y-scale:
 - i) Use the left mouse button to 'cycle' the calibrations for different variables on those axes.
 - ii) Use the right mouse button to change the range displayed.

Example: Logging the Classroom

- The Temperature from val 1 and the brightness val 2 are on different axes.
- Temperature is calibrated (-10 to 110 °C).
- After the readings were taken, the temperature range was changed to 10 - 40 °C.
- The automatic light (output 6) could be controlled with a flowchart and monitored. It comes on if brightness is less than 30%.



Level Crossing Barrier

Secondary Mimic Disc

Levercross

Resources

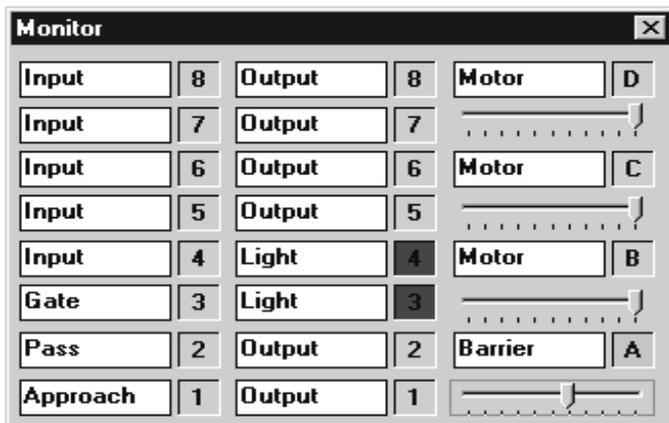
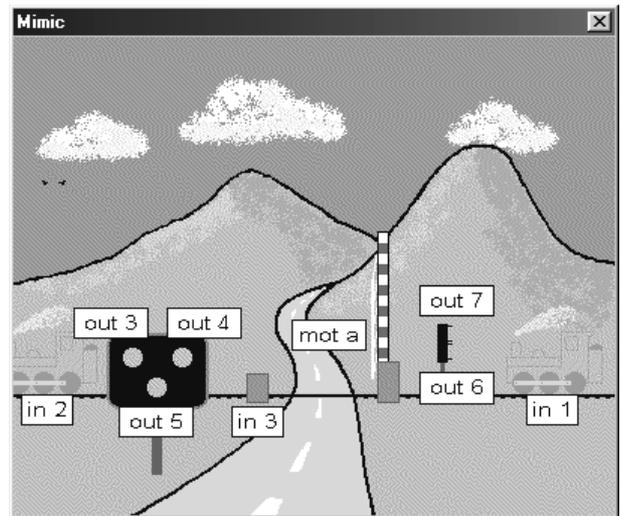
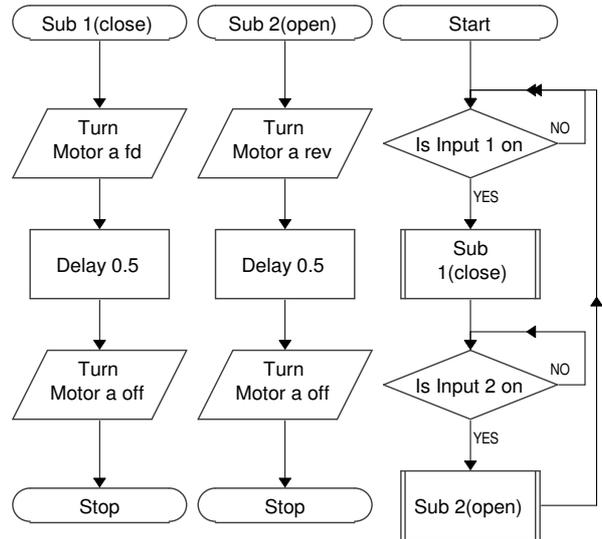
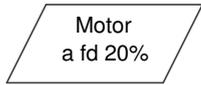
Inputs 1 & 2 – switches

Motor a – motor

Other outputs - 6V bulbs

Skill: i) Using a Motor output with Power control.
 ii) Testing the outputs by using the monitor screens.

1. Build the program for the Level Crossing. (Remember you can copy flowcharts).
2. The inputs 1 and 2 are the approach and pass switches and motor 'a' operates the barrier.
3. **Power control of the motor** is possible if the program has been configured for an appropriate interface. If this is available, the motor speeds can be altered in steps of 10%. Use the prompts:
 Turn Motor a fd 20 (for 20%).
4. **Developments** to the program:
 - iii) Operate the lights to control the traffic on the road. This could be another sub-routine.
 - iv) Input 3 is a switch on the barrier post that is ON when the gate is closed. Use this switch (**feedback**) to stop the gate motor at the right time.
 - v) Train signal lights should only go green if it is safe (use Input 3).
 - vi) Flashing red traffic lights might need variables – see later.



Testing your model on the interface.

- 1 You will need the program configured for the right interface and remove the tick from 'Simulate' in Control menu.
- 2 Do not run the program but open a monitor window and click on the output numbers or motor letters. These icons act as toggle switches (left & right mouse button on motor).
- 3 Dragging the motor sliders will also vary the motor output power.

Logging the Level Crossing

Secondary Mimic

Levcross

Resources

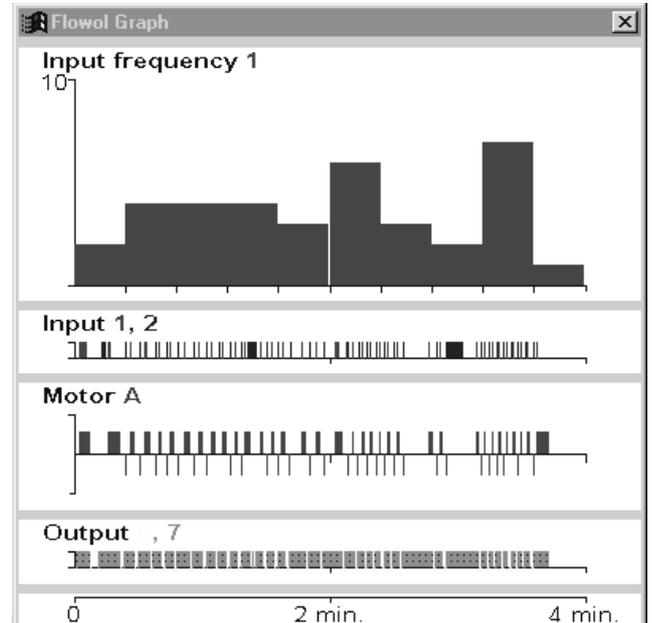
Level crossing model

Skill:

Use Graphs to data log the inputs, outputs and motors.

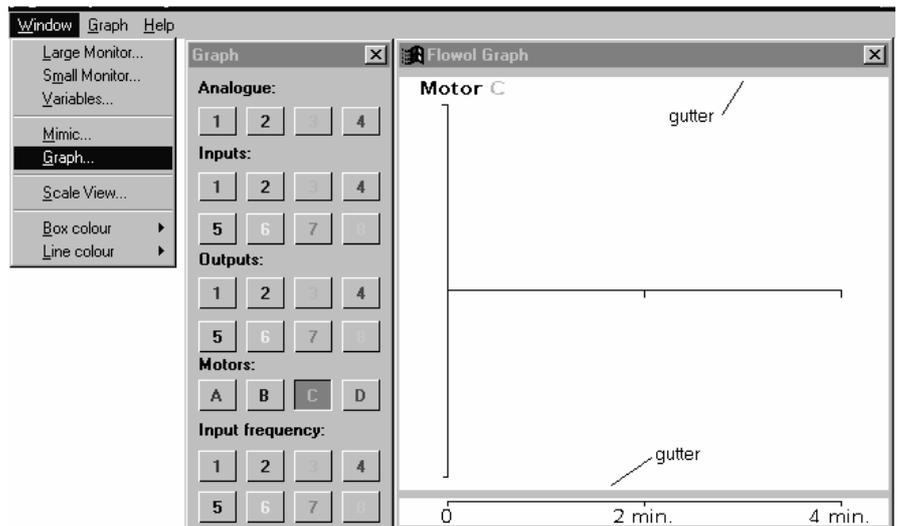
In this example Flowol Graphs is monitoring some of the digital inputs and outputs.

- 1 The frequency graph of input 1 shows how regularly the trains approach. Several inputs can be 'adjacent' or 'stacked' (click left of y-axis).
- 2 The approach and pass switches can be logged separately.
- 3 The barrier motor graph shows the forward and reverse. The 'block' height indicates the motor power.
- 4 The train signal lights are also logged.



Building the Graph Axes

1. Open the Graph window from Window or Graph menu ['Show Graph'].
2. Click on the icon of your first variable, turning it yellow, then click on the graph window.
3. Suitable axes will appear and also grey strips 'gutters' above and below the axes.
4. Further variables can then be selected and added to the same set of axes (from the same variables block) or given new axes by clicking on a gutter (the pointer will change).
5. There are a maximum of 6 sets of axes available, of which: 2 can be analogue (see later), 2 can be frequency graphs, 4 for digital inputs, 4 for digital outputs, 4 for motors.
6. Data is automatically logged even when not being displayed on axes.
7. The logging time is initially 2 minutes and will keep doubling up if it has not been specified in the 'Time Parameters', accessed from the Graphs menu.
8. The size of the graph window can be changed by dragging the bottom right hand corner. The position of the graphs window can be moved in the usual way.



Auto-home

Secondary Mimic

Autohome

Resources

AutoHome model

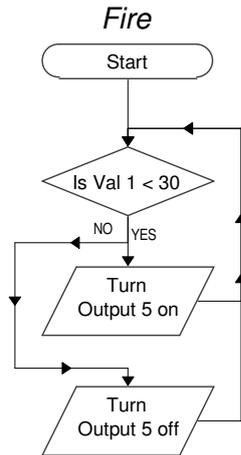
Skill: Analogue sensors:

- i) Respond to analogue inputs.
- ii) Calibrate analogue inputs.

Values from the analogue sensors in this mimic are shown as: -
 Val 1 for temperature.
 Val 2 for the light level.

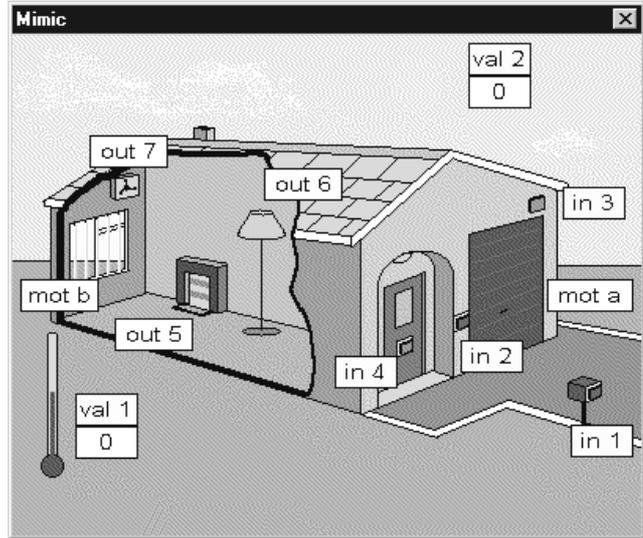
Using temperature:

- 1 Build this flowchart to control the electric fire.
- 2 Build a similar chart to work the fan if too hot.



Using Brightness:

- 3 Automatic lights could also be done in a similar way (use val 2).



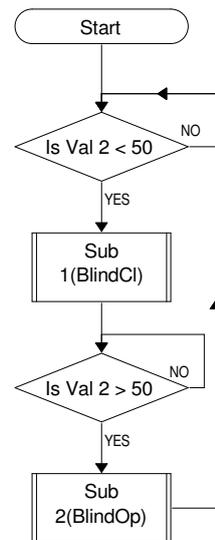
Automatic Blinds:

- 4 (Show labels on the mimic to identify the outputs and motors).
 Two sub-routines (BlindCl) and (BlindOp) similar to those needed to operate the barrier crossing can be adapted to control the blinds. The 'master program' shown here on the right uses val 2.

The Garage Door:

- 5 The digital input switches could be used to open and close the garage door, again similar to the barrier-crossing gate.
- 6 Input 3 could act as a **security** sensor to detect a person near by. How could this be used?
- 7 Perhaps the door **bell push** (input 4) should only work in daylight!

Blind control



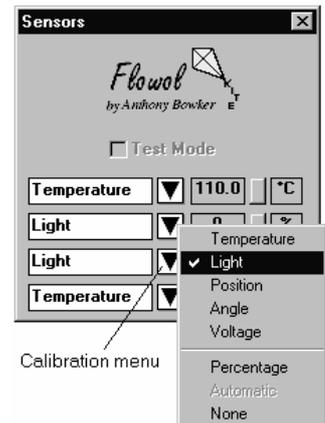
Add text to the Flowchart and remember to **save your program**.

Changing the Analogue sensor readings in Simulation mode:

Click on the val readings on the mimic with left mouse button to increase the value by steps of 10. Use the right button to decrease. Or click on the monitor window to 'toggle' the analogue reading between min. and max. values.

Calibrating the Sensors

The readings from the analogue sensors are displayed on the mimic and the monitor windows, and are usually given as a percentage. If the program is configured for an interface (from the control menu) then calibrated values from some of the sensors can be displayed. Select 'Sensors' from the 'Graph' menu. Drop down the menu near the val readings and select. (Some interfaces will detect the sensors automatically).



Data Logging with Flowol

Secondary Mimic

Autohome

Resources

Analogue sensor 1 – Temperature

Analogue sensor 2 - Light

Skill:

Use 'Graphs' to plot information from analogue inputs.

Setting Up 'Graphs'

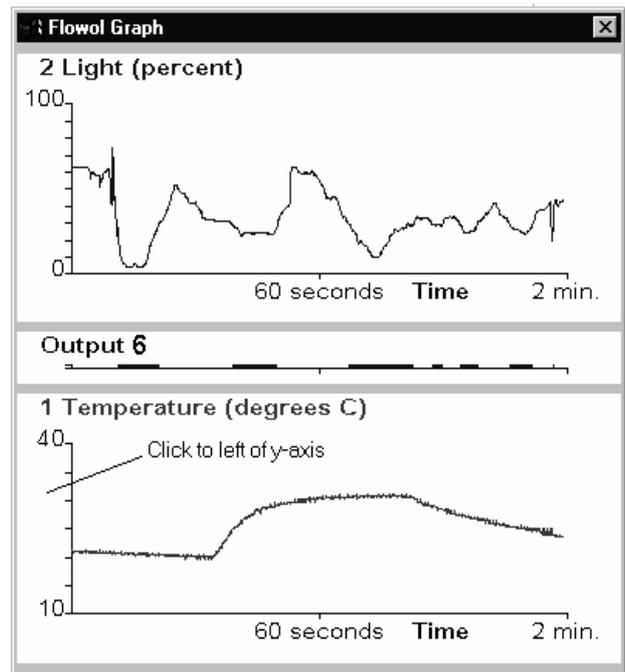
- 1 Check that Flowol is configured for a suitable analogue interface.
- 2 Un-tick Simulate in the control menu.
- 3 Build up the graph axes as explained on the 'Logging Level Crossing' page.
 - i) Choose Analogue inputs.
 - ii) All analogue values can be on the same axes but two sets of axes are available.
 - iii) Calibrate the sensors from the 'Sensors' window, (explained on previous page).
 - iv) If you wish, select the logging time from: 'Time Parameters' in the Graphs menu.
The time axis will otherwise default to 2 minutes and keep doubling up. When you stop the program in the default setting, the results will fill the time axis.
- 4 Re-size the graph window by dragging the bottom right corner, and position it in the usual way.

Note: Clicking on RUN will start the logging; a flowchart is not needed.

- 5 **Selecting 'Values'** from the Graphs menu allows a line to be scanned across the graphs to show the analogue values. These are displayed in either of the monitor windows.
- 6 **Change the feature of the y-axis** by clicking to the left of the y-scale:
 - i) Use the left mouse button to 'cycle' the calibrations for different variables on those axes.
 - ii) Use the right mouse button to change the range displayed.

Example from Autohome:

- (a) The Temperature from val 1 and the brightness val 2 are on different axes.
- (b) Temperature is calibrated (-10 to 110°C).
- (c) After the readings were taken the temp. range was changed (10 to 40°C).
- (d) The automatic light (output 6) is monitored.
It comes on if brightness is less than 30%.



Other Projects: to monitor and/or control

- 1 Automatic greenhouse.
- 2 The gerbil in its cage.
- 3 A baby's play area.
- 4 Conditions in a kitchen.
- 5 Solar water heating panel.

Saving and Printing Graphs (see Page 33).

1. Choose 'Save as Graph' from the graph menu.
2. Choose 'Print Graph' from the file menu.

The Greenhouse

Secondary Mimic

Greenhouse

Resources

Model greenhouse or propagator
With heater (bulb), fan (motor)

Skill:

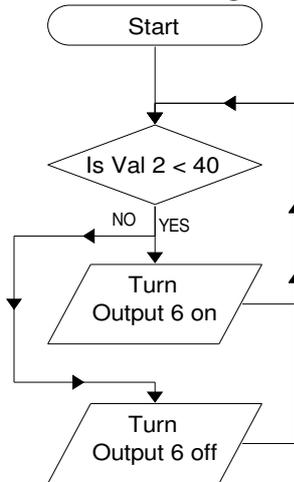
- i) To monitor and control a scientific investigation.
- ii) Test mode.

Values from the analogue sensors in this mimic are shown as: -

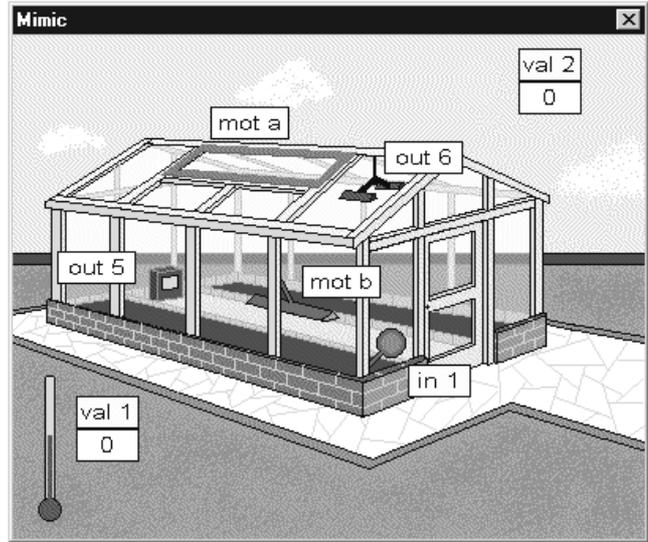
Val 1 for temperature

Val 2 for the light level

Automatic Light



1. Build this chart to control the light.
2. Click on the val 2 reading for the simulation
3. Draw a similar chart to control the heater (use val 1 & out 5).



To check the values of the analogue readings tick the box for **test mode** on the monitor screens. If Flowol is configured for your interface and not in simulate mode, then the readings will be displayed. This is useful to check the threshold values when creating the flowchart.

- 4 Draw another similar flowchart to operate the sprinkler with the sensor Input 1. A motor (output b) has been used so that any real pump (e.g. a car windscreen washer pump) can be adjusted with the power control if a control box is being used. Now construct a moisture sensor. Test the depth it should be placed.
- 5 Temperature control (val 1) should also be maintained with ventilation (window or fan). Draw flowcharts to open and close the window (motor a). Two sub-routines and a main routine are needed (similar to those used in the Level Crossing Barrier). OR control a fan with a flowchart similar to those used earlier.
- 6 After testing your program in simulation mode, connect it to your propagator and test the function of your sensors and outputs.
- 7 Set up 'Graphs' to monitor the analogue inputs and have a test run.
- 8 It might be possible to operate two propagators to compare different conditions.
- 9 Write a report of your investigation. You should be able to export the flowchart, graph and possibly the mimic to your final document. See page 34.

Car Park Barriers

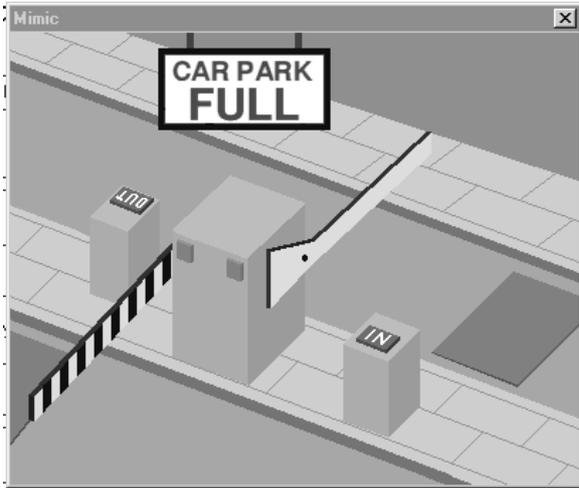
Secondary Mimic

Carpark

Resources

- 4 Input switches
- 2 Output motors
- 1 Output bulb

Skill:
Using Variables
Speeding up the flowchart.

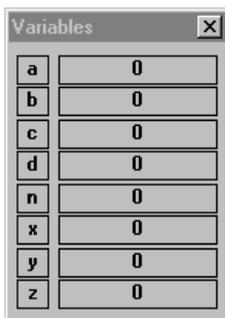


The flowcharts for each car park barrier are similar to that for the level crossing gate.

To **count the cars** in and out, the variable 'n' is counted up when the 'in' barrier closes and 'n' counted down by the 'out' barrier.

The **'Full'** sign can be triggered by this variable in a separate flowchart.

The value of the variable can be observed by opening Variables from the Window menu.



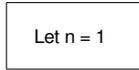
To make the car park most effective, the 'in' barrier should only open if there is a parking space. The 'master in' program therefore has an AND situation created by two decision boxes (Is input 1 on AND is n < 4).

Save and Print your program.

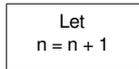
To Run the Flowchart Faster

- i) Close the mimic, monitor and variables windows.
- ii) Mac/PC: change the colour of the active box and lines to 'None'.
- iii) PC: minimise the window.
- iv) Acorn RISC OS: close down the window. You can Run and Stop the program from the Flowol icon on the icon bar.

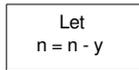
A variable is a letter that can be assigned a value: (Let n = 10).



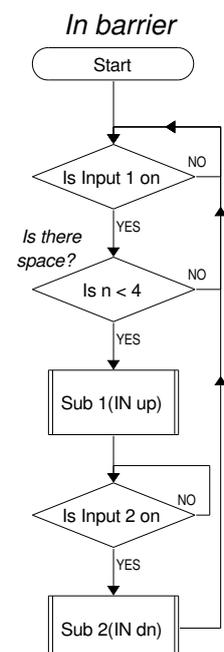
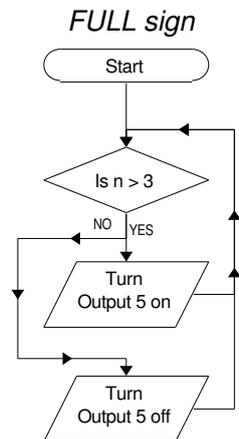
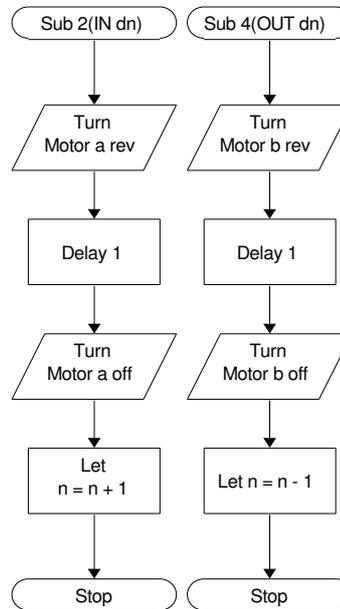
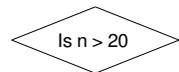
Variables can be subtracted or added to: (Let n = n + 1).



Variables can be subtracted: (Let n = n - y).



A variable can be checked in a Decision box.



A Fairground Ride

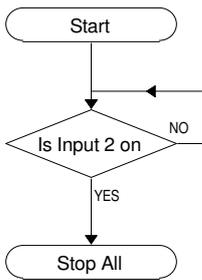
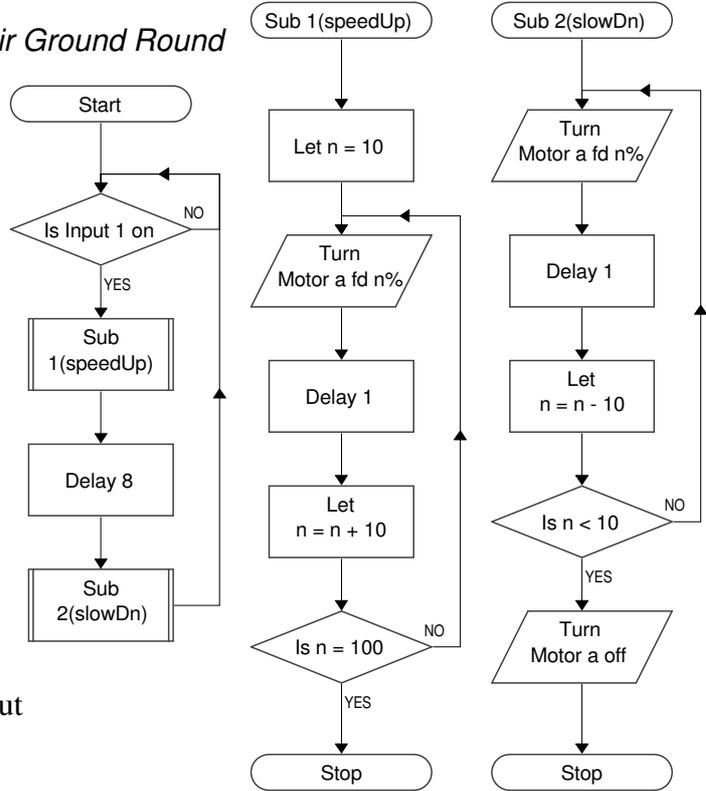
Resources

- Ferris wheel
- Input 1 – switch
- Motor a – 6V motor
- Input 2 – pressure mat

Skill
Using a Variable to change the speed of the motor

- 1 To avoid rapid changes in the movement of a fairground ride the motor speed is changed gradually.
- 2 The program uses the variable 'n' to change the speed in ten steps.
- 3 Remember to construct the sub-routines before the main program.
- 4 Open the large monitor window to observe the motor speed changing.
- 5 **Emergency Stop.**

Fair Ground Round



The 'Stop All' will stop all of the flowcharts in that program. The pressure mat input 2 could trigger this.

Other Uses for a variable:

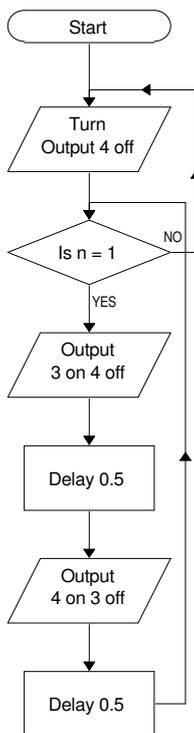
1 Flashing Traffic Lights

For the level crossing barrier.

The flashing lights stopping the cars need to start near the beginning of the sequence and only stop at the end.

A separate flashing routine similar to the one shown, can be triggered by the variable n = 1.

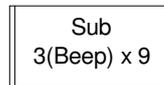
The variable can be defined in the main routine. Let n = 1 near the beginning and Let n = 0 at the end.



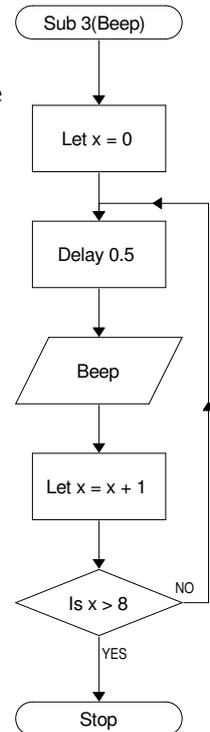
2 Repeating a Sub-routine

Beep at pelican crossing.

Flowol can define the repetition of sub-routines from the main procedure e.g.



Routines are normally repeated by increasing the variable as shown on the right.



The Buggy

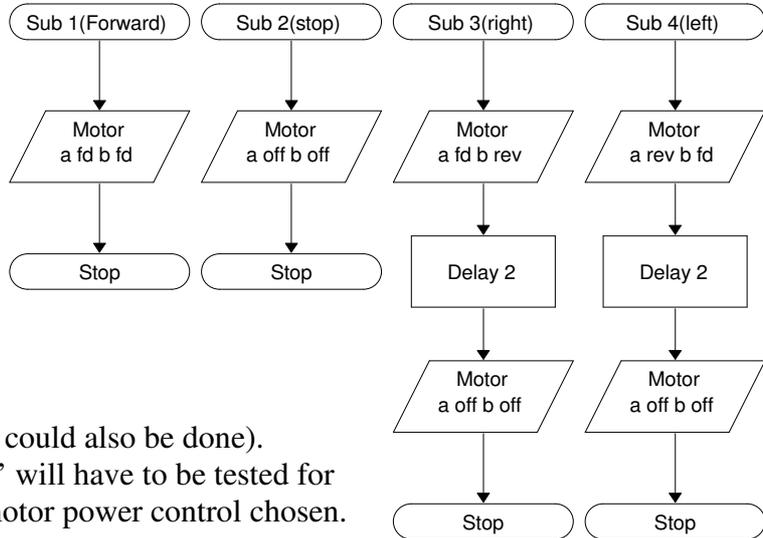
Resources

Buggy
 Motor a – 6V motor
 Motor b - 6V motor
 Input 1 – ‘buffer’ switch

Skill:

Controlling two motors in the same output symbol.

- 1 The movements of a buggy are defined as sub-routines.
- 2 Each output box (symbol) can control 2 motors.
- 3 The power control has to be the same for both motors in the same box.
 Note: if power is 50% in one sub., then it stays at that value until it is re-defined.
- 4 Build the sub-routines (reverse could also be done).
- 5 The delays in the ‘right and left’ will have to be tested for your particular buggy and the motor power control chosen.



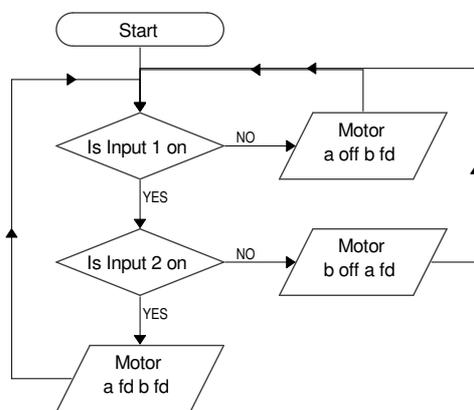
Obstacle Course:

- 1 Build a master program to define the path needed to be taken around a course.
- 2 An emergency stop, similar to that on the fairground ride, could be triggered with a ‘buffer switch’ (Input 1) on the front.

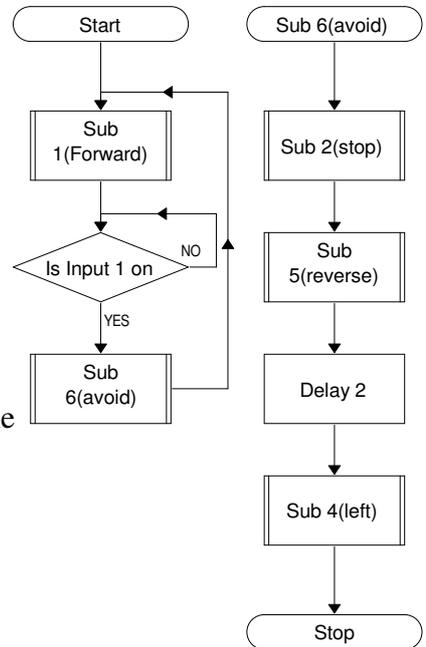
Random Mover: (Cleaning the carpet!)

- 1 Build a sub-routine of the movement needed when the buggy hits an obstacle. (The one shown is only one possibility).
- 2 Build the master program to trigger this routine.
- 3 You could have two different switches on the front!

Line Follower:



This flowchart could be one version of a line follower. The light sensors inputs 1 and 2 would have to be on either side of a dark line. It might be an improvement to use analogue sensors and compare their values as explained in the Solar panel.



Save and Print your programs.

Solar Water Heating Panel

Resources

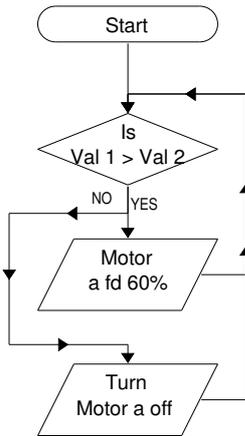
- Val 1 and val 2 – temperature sensors
- Motor a – water pump
- Val 3 and val 4 – light sensors
- Motor b – 6V motor (turntable)

Skill:

To compare two analogue inputs (a comparator).
Use the 'Margin'.

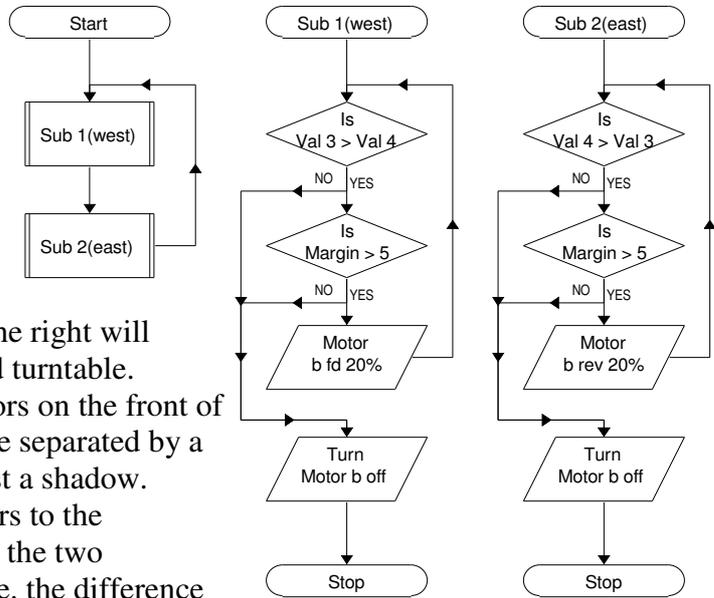
Temperature Control:

The flowchart below will only pump the water if the panel temp. (Val 1) is hotter than the water temperature in the tank (Val 2).



Sun Seeker:

The flowchart on the right will control a motorised turntable. The two light sensors on the front of the panel need to be separated by a piece of card to cast a shadow. The 'Margin' refers to the difference between the two analogue values (i.e. the difference has to be at least 5 units).



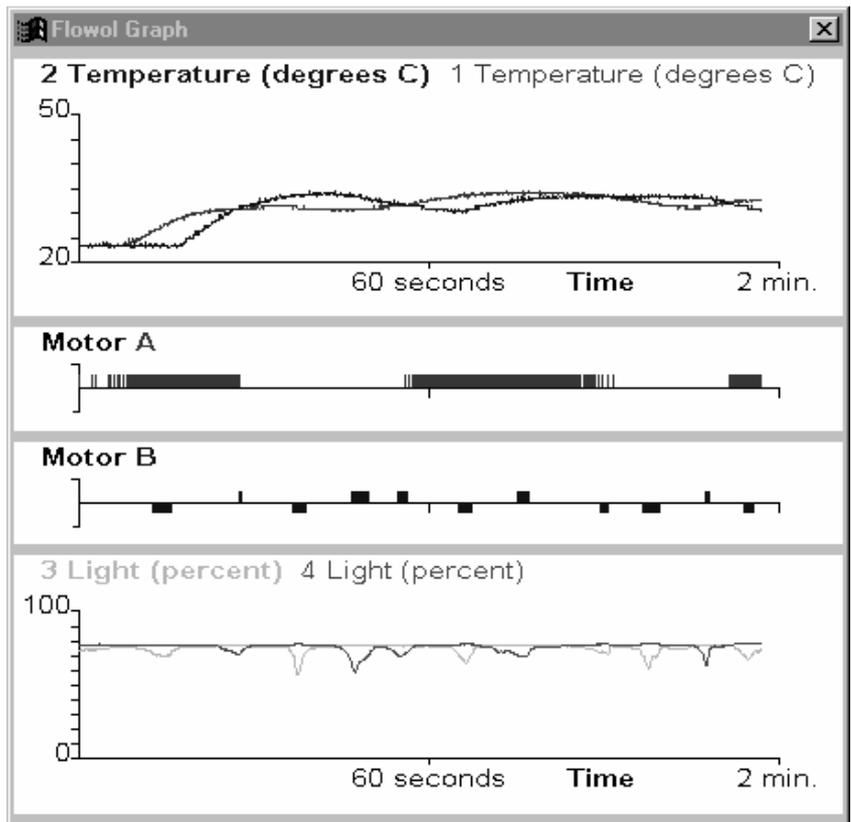
Data Logging and Control.

The 'cause and effect' is easily demonstrated by using Flowol Graphs:

- a. The pump motor A responds to the temp. differential.
- b. The 'Sun seeker' motor responds to the light differential.

Note: The light graph has been left as %.
The temperature sensors have been calibrated and then the temperature range (limits) changed.

Save your Program



Using Sound with Flowol 2.81 or above (Windows version only)

Using sound with Flowol can give extra realism to control situations. Sound is often used to help the partially sighted cope more easily with automatic situations e.g. lifts.

Flowol can use any sound files in a .wav format.

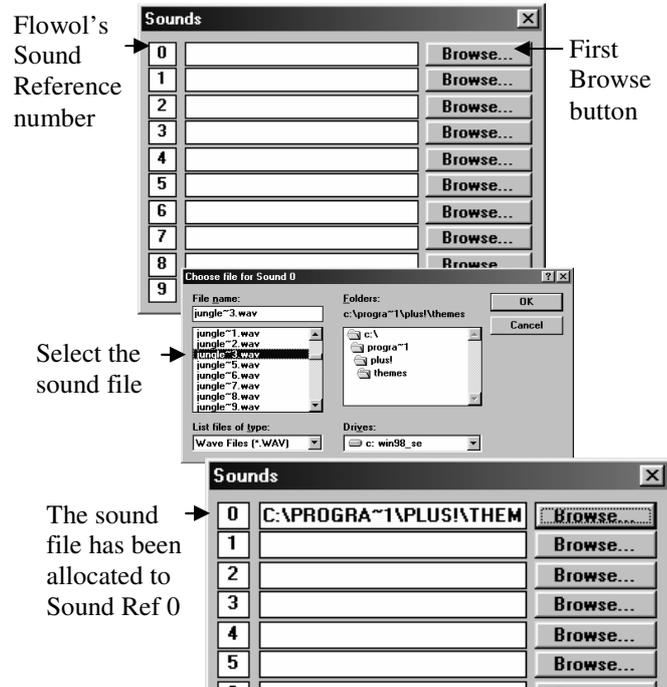
Note: to find some sound files (in a .wav format) that already exist on your computer, go to Start ► Find or Search ► for Files or Folders, type *.wav into the File Name box and click on Search or Find now.

A Sound file will run for the entire length of the recording (while the flowchart continues through its processes) unless the flowchart stops running or it is interrupted by another sound file.

Using sound files

The sound files (saved in a .wav format) need to be 'available' for building into a procedure. This can be done before, or at any time whilst building your flowchart program. Up to 10 sound files [0 to 9] can be used in a procedure.

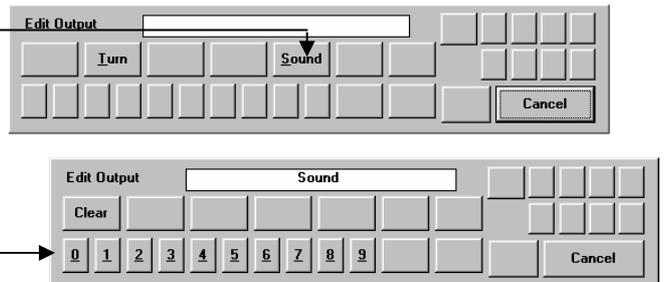
- Select **Sounds** from Flowol's **Window** menu.
- In the Sounds window click on the first Browse button (for Sound reference 0).
- Locate and select the previously saved sound file (.wav). Click on OK for the sound file to be allocated to Sound 0.
- Continue to browse and select any other sound files needed for your procedure, (use each number in turn).



Sound files can be added to this window while a procedure is being built. The Sounds window will automatically open when Sound is selected from the prompt box.

Using sound in your flowchart

- Select an output symbol  from the Flowol toolbar and place on the main workspace.
- Select **Sound** from the **prompt box**.
- The Sounds window will automatically open.
- Select the reference number for the sound (0 to 9) from the **prompt box**. The numbers correspond to the list in the Sounds window.
- Click OK on the prompt box.

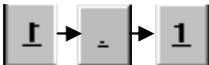


The Sound file will run for the entire length of the recording (while the flowchart continues through its processes) unless: -

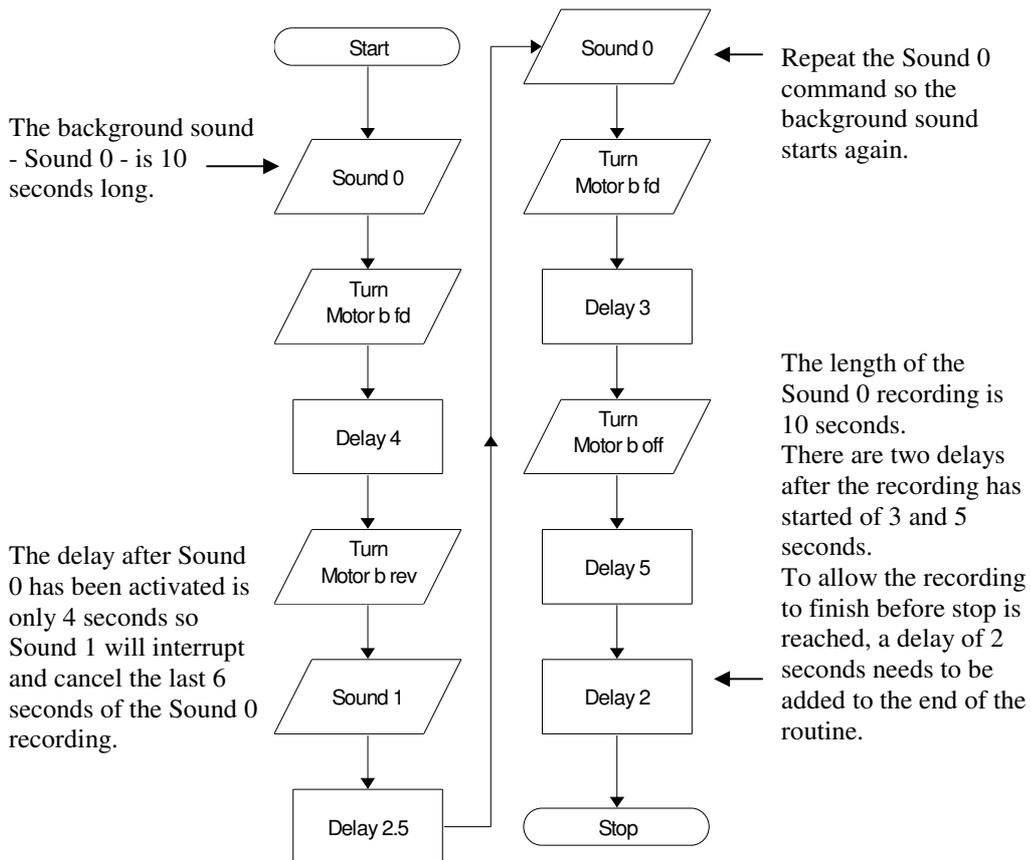
- a. The flowchart stops running or
- b. It is interrupted by another sound file (in any routine).

Note: To discover or check the length of a recording, select **Sound Recorder** from the **Window** menu or (if already open) from the icon bar. Use **Open** from the **File** menu in **Sound Recorder** to load the previously saved .wav file. The length of the recording time will be shown in the window.

You may need to add a delay to the flowchart to enable the sound recording to finish.

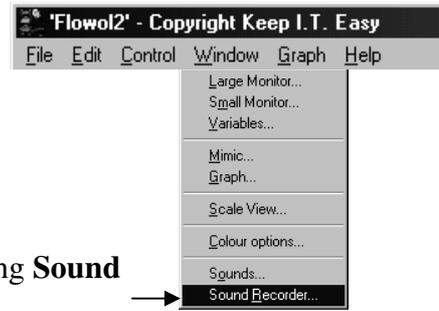
- Select the delay symbol  from the Flowol toolbar and place on the main workspace.
- Select Delay, and then the timespan required for the recording  to finish. Delays can be to one decimal place e.g. select 1.1, OK.

Although flowcharts can run simultaneously, the sounds they contain cannot. If a sound is initiated by one routine, then it may be interrupted or cancelled out by a sound in another routine if the two overlap.



Recording sound files.

- Attach a microphone and speakers to the sound card on your computer.
- Open the Flowol program.
- Launch Microsoft's Sound Recorder program by selecting **Sound Recorder** from the **Window** menu.



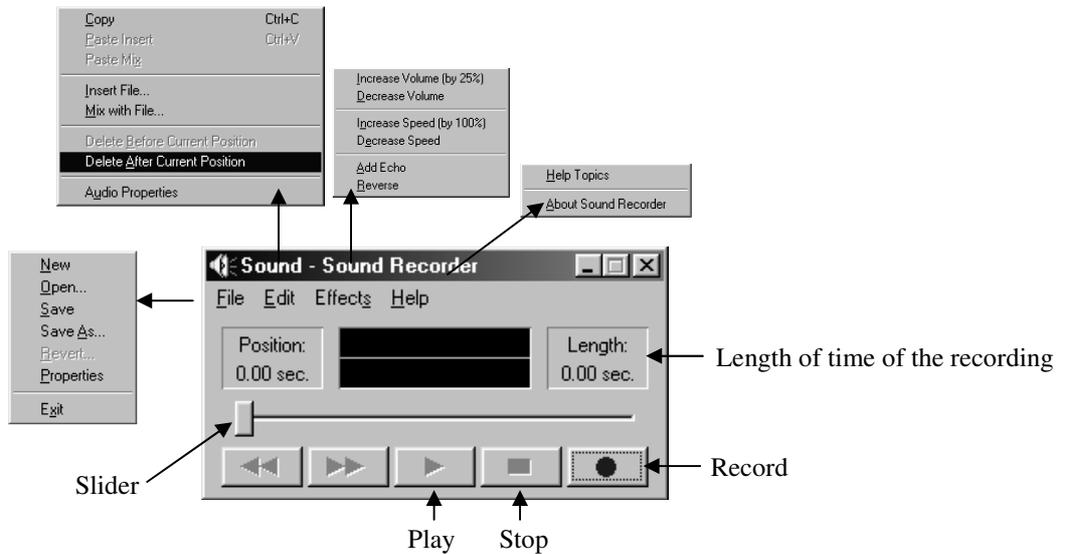
Note: once open Sound Recorder can be re-accessed from the icon bar.

- Click on the Record button to begin recording  Make the sound into the microphone. Click on the Stop button when the recording is complete. 

Note: There are several features in Microsoft Sound Recorder that can be used to modify and improve your recording. Example: to delete part of a sound file, move the slider to the place in the file that you want to cut. From the Edit menu, click 'Delete before Current Position' or 'Delete after Current Position'. Save using a different file name to prevent replacing the original file. See Help Topics from the Help menu for more information.

- Select **Save As** from Sound Recorder's **File** menu. Save as a .wav file type in the destination of your choice.

Note: Keep a note of the length of time of the recording. This information may be useful when the .wav file is run in a procedure. The duration time could be incorporated as part of the filename.



Saving Flowol programs that use sound files

When a Flowol file is saved, the information in the Sounds window is also saved (the location of the .wav files) but not the sound itself. If the location of a sound file is altered so Flowol cannot find the .wav file, there will be a 'beep' sound when the appropriate sound symbol is reached in the procedure.

If you transfer or open a Flowol file on another computer, you may also need to either:

- Transfer the sound files to the location specified in the Sounds window or
- Use 'Browse' to re-locate the sound file from the Sounds window.

Note: it can be useful to create a folder specifically for any sound files that you wish to use in a Flowol program. Any sound files created or copied can then be saved or pasted into this folder. Using this method the location specified will always be the same.

The ‘beep’ sound will also be heard if no sound file has been defined in the Sound window for the Sound reference number used in the flowchart.

Notes:

- Flowol files (*.flo) produced using an earlier version of Flowol (2.80 less) can be opened and adapted to include sound in the files.
- Flowol files (*.flo) produced or adapted using Flowol version 2.81 or above will not be able to open in earlier versions of Flowol.
- Sound files cannot be transferred to the PIC chip used in the Kids Chip PIC’s System, FlowGo and SOLO. Sound instructions used in a Flowol program will be ignored when the program is run independent from the computer.

Printing and Saving

Printing the Flowchart.

PC and Mac: Use the ‘Print...’ option in the File menu.

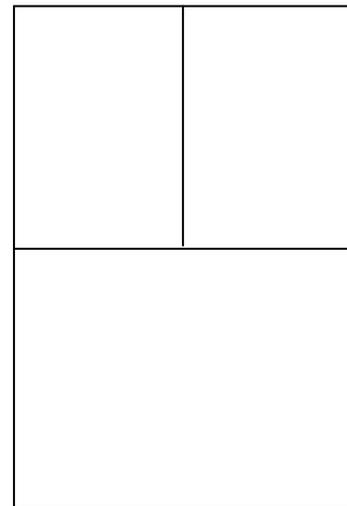
The flowchart workspace is divided into three sections (shown by green lines).

If only the top left-hand section is occupied, it will be printed in portrait format.

If the top left and top right are occupied by the chart, then the printing will be in landscape format (this must be specified in ‘Printer Setup.’ for PC and Mac).

If the bottom section is occupied, the entire page will be printed at 25% in portrait format.

Acorn: Click menu on the Flowchart Window and Choose Print.



Printing a Graph

PC and Mac: Use the ‘Print Graph ...’ option from the File menu.

The graph orientation can be changed from the ‘Printer Setup ’(‘Page Setup’ for Mac).

Acorn: Click menu on the Graph Window and open the Print sub-menu. Choose from ‘Portrait half-page’, ‘Portrait full-page’ or ‘Landscape’.

Saving Graphs.

Graphs can be saved in three formats:

SID – This type of file can be loaded into Flowol 2 again for viewing and printing. It can also be used to export the data to other graphing applications e.g. Insight2.

CSV (Comma Separated Values) – This is the best format to import the data into a spreadsheet or database.

TSV (Tab Separated Values) – This is useful to import the data into a word processor as a table.

To Save the Graph.

PC and Mac: Go to Graph menu and choose 'Save as Graph..' and use the 'Save As' dialogue box. The file type is selected in the lower left hand corner of this window.

Acorn: Click the menu on the Graph Window. Open the Save sub-menu which will yield four options, the first three being SID, CSV and TSV. Open the save dialogue box for the appropriate format you wish to save in. Adjust the filename and drag the icon to the filer window in the usual way.

If you only wish to save data for the traces currently displayed on the Graphs window, tick the 'Chosen data' box in the save dialogue. If this is not ticked then data from all the channels will be saved.

To Load Data from a previously saved SID file.

PC and Mac: Choose 'Open Graph..' option from the Graph menu and use the Open dialogue box in the usual way.

Acorn: Drag the SID file onto the Graph window.

Exporting into Documents

Exporting the Flowchart.

PC: To export the entire flowchart to the clipboard, choose the 'Copy flowchart' option from the Edit menu.

Paste to Microsoft Word. Re-size and drag the image to position.

To export a section of flowchart: Use the Edit tool to select the area of the flowchart required and choose 'Copy selection' from the Edit menu. Paste etc as above.

Mac: To export the entire flowchart to the clipboard as a PICT so it can be pasted into another Mac OS application, choose the 'Copy flowchart' option from the Edit menu. To export a section of Flowchart: Select the area of flowchart with the Edit tool, and choose 'Copy selection' from the Edit menu.

Acorn: Open the main menu over the flowchart window. Open the 'Save Draw' save box. If you only want to save a selected area of flowchart, highlight that area with the Edit tool and tick the 'Selection' box in the dialogue. Drag the icon to a filer window or another application.

Exporting the Graph.

PC: Choose 'Copy Graph' from the Graph menu. This will place a Windows Meta Image onto the clipboard. Use 'Paste' in the same way needed for the flowchart.

Mac: Choose 'Copy Graph' from the Graph menu. This will place a PICT image on the clipboard for other Mac OS applications.

Acorn: Click menu button on the Graph Window and open the Save sub-menu. The fourth option is DrawFile. Open its save dialogue box and drag the icon to the filer window or other application.

Exporting a Mimic.

PC: With the mimic on the Flowol screen, press 'Print Screen Sys Rq' to take a snapshot of the screen. This will export the whole screen to the clipboard. Paste this into Paint and select the mimic. This can then be copied and pasted into a Text box in a Word document.

Mac: To get a snapshot of the Flowol screen, press 'Apple Key – Shift – 3' (all three keys together). This will save as a PICT file in the root folder of the hard drive which can then be loaded into most word processors.

Acorn: Load !Paint. Open the filer window to save the image. Open Paint's icon bar menu. Choose 'Snapshot'. Change the settings in the dialogue box if desired, and then click on OK. Drag a box around the area of the screen required (you may have disabled this). A Save dialogue box will appear, adjust the filename and drag the icon to your filer window.

Appendix I PC Flowol 2 network installation advice

Installing on every machine

You may consider installing Flowol onto every machine individually (it's very small, only about 2Mbytes). To do this copy the contents of the CD Rom onto a network share and from every machine run the setup.exe program. When prompted for the location to install make sure you specify the local computer's hard drive.

Manual Installation on a network server/share

If you decide to install Flowol onto your network, you must first install onto the hard drive of a single machine. Do this using the setup.exe on the CD Rom disk. Then install any additional mimic disks so everything can be installed onto the network in one go.

Manual installation

Flowol 2 is a very straightforward piece of software to install manually; there aren't lots of support files or any registry entries.

The standalone installation installs the following files and folders into your specified folder:

Flowol2.exe	The main program file
Configure.fcf	The interface configuration file
Sensors folder	Support files for interfaces
Mimics folder	Flowol 2 mimics
FTD2XX.dll	
INI Creator	

Place these files onto your network where the users have read-only access. (Note the information on the interface configuration file below).

When run, the Flowol2.exe locates the other files and folders by looking at a flowol2.ini file that the setup.exe placed into the Windows folder of your computer (e.g. C:\Windows or C:\WinNT).

Your flowol2.ini file will look something like this:

[LOCATIONS]

SENSORS=C:\PROGRAM FILES\KEEP I.T. EASYFLOWOL 2\SENSORS

CONFIGURATION=C:\PROGRAM FILES\KEEP I.T. EASYFLOWOL 2\CONFIGUR.FCF

MIMICS=C:\PROGRAM FILES\KEEP I.T. EASYFLOWOL 2\MIMICS

FILEDIR=Z:\Pupils (optional, see below)

(Exact paths will depend on where Flowol has been installed to).



The flowol2.ini file references the configure.fcf file and the two folders: sensors and mimics. These can be placed in different places on the network or on local machines, provided the flowol2.ini file is adjusted accordingly.

Once the Flowol files have been placed onto a network share and the flowol2.ini file has been adjusted accordingly, place the flowol2.ini file into the Windows folder of every machine that you want to use Flowol on. You could do this by hand, or by writing a short .bat file that you get the user to run the first time they use Flowol
e.g.

```
Rem Copy flowol2.ini into the Windows folder  
Copy \\appserver\flowol2\flowol2.ini %windir%\flowol2.ini
```

With the Flowol files shared and the ini file adjusted and placed in the Windows folder everything should be working. Check that you can open a mimic and that the interface setting is correct.

Specifying the default folder for students to save their Flowol files

Note the FILEDIR line in the Flowol2.ini file above. This specifies which directory will be shown in the File Open and Save dialogs in Flowol 2.9.

If each student has a different document folder, then using an environment variable or a drive mapping will allow each user to see their files.

The interface configuration file (configure.fcf)

The interface configuration file, configure.fcf specifies the default interface to use with Flowol 2. This is set via the Interface dialog in the Control menu and saved to the configuration file by clicking on 'Save and OK'. If the configuration file is placed in a read-only share then the users will not be able to modify the default interface. If your school uses different interface setups for different machines/classrooms then it is perhaps better to place the configure.fcf file on the local hard disc of the machine and adjust the flowol2.ini file to reference it.

Associating the .flo files with Flowol 2

If you want to be able to double click on a saved Flowol file for it to start up in the Flowol program, it needs to be manually associated by double clicking on a .Flo file, click on the Other button, locate the Flowol.exe program and select 'Always use this program' & OK.

Automatic installation

There are various automatic software distribution and installation tools available. Flowol has not been explicitly tested with any of them.

Flowol 2.9 is packaged as a Microsoft Windows Installer 2.0 .msi file. Check the documentation with your installation tool for information on deploying an .msi file.

'Windows Installer' at <http://www.microsoft.com> can provide detailed information on how Windows Installer files can be used.

RM Connect network install

Flowol2 is installed as normal using the Application Wizard. The only difference is that the Flowol2.ini file in c:\windows must be specifically excluded in the File Protector. (Do not have the details of whether this is done just in the package or on each workstation.)

Again the COM port and Interface that is saved in the configuration file (referenced by the .ini) will not be remembered between sessions. The software should be run when making the session to make the initial .ini file to include in the package.

Guide for Installing on RM CC3

- 1) The first step is to put an .msi into the applications area on RMPackages. (Drive Q:). There are two methods to do this. Either copy the Data Harvest supplied .msi directly or use the RM Application Wizard and WinInstall LE to generate an .msi.

Copying the Data Harvest .msi directly:

- a) Log on as systemadmin (or a suitable user with access)
 - b) In Windows Explorer go to RMPackages\Applications
 - c) Make a new folder called "Flowol"
 - d) Copy in the Flowol 2.90 setup.msi file from the Flowol CD.
- 2) The second step is to make the shortcuts. The RM Application Wizard will do this automatically or the following manual method can be used.
 - a) Make a subdirectory under RMPackages\Applications\Flowol called "shortcuts" and under there one called "Flowol".
Note: The exact spelling is essential.
 - b) To get the actual shortcuts to install, double click on the "Flowol 2.90 setup.msi" from the CD or the RMAApplications directory to do a temporary install. It is essential that you choose the "**Install for Everyone**" option during the installation. This will generate the shortcuts in the directory "C:\Documents and Settings\All Users\Start Menu\Programs\Flowol". Copy all these shortcuts into the "shortcuts\Flowol" subdirectory made above.
 - 3) The third step requires the RM Management Console. Go to Workstations, right click on any site and select "Update Package List" from the popup menu.
 - 4) Go to the workstations that require this package and allocate Flowol to them. Right click and select Properties. Allocate from the Packages tab.
 - 5) In Resources->Program Sets add the Flowol shortcut to where required in the Start menu.
 - 6) The Flowol 2.90 setup.msi will configure Flowol with 'No Interface' selected. To be able to alter and save the interface configuration (when Flowol is used with an interface) there must be a 'writeaccess.ini' file under RMPackages\Applications\Flowol. This contains the two lines


```
[C:\Program files\Keep I.T. Easy\Flowol\configur.fcf]
Everyone=0x1301BF
```
 - 7) Reboot the required Workstations. Flowol will be available after logging in.

The **USB driver** for FlowGo and SOLO is automatically put into the package as part of the Flowol installation. However, the first time FlowGo or SOLO is attached to the workstation the "Add New Hardware" will run. This must be done as "systemadmin" or a user with equivalent access rights.

At the moment the **Mimics** are supplied on floppy disk which do not have an .msi installer. To install these use the RM Application Wizard or WinInstall LE to do a before and after snapshot to create the msi.

The floppy disk installer looks for Flowol before installing the mimics so the following steps have to be taken.

- 1) Do a temporary install of Flowol on the package-building machine. Make sure this has installed to the default C:\Program Files\Keep I.T. Easy\Flowol folder.
- 2) Use WinInstall LE to do the before snap shot
- 3) Install the mimics*. It will search for Flowol and find it at the C:\Program Files\Keep I.T. Easy\Flowol location.
- 4) Use WinInstall LE to do the after snap shot.

*Unless you want different groups of students to have access to different mimics, install all the mimic disks you have purchased between the before and after snapshot.

Appendix II Using Flowol with the LEGO dacta Interface 'B'

Labelling the Interface 'B'

Flowol is designed to respond to or control:

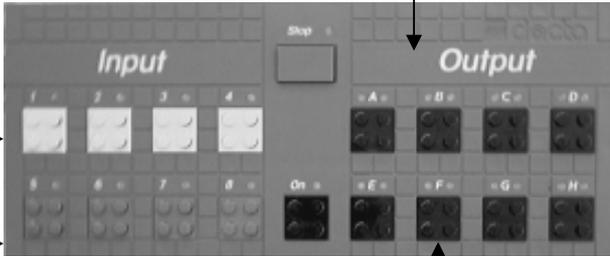
- 8 digital inputs, labelled Input 1 – 8
- 4 analogue inputs, labelled Val 1 – 4
- 8 outputs, labelled Output 1 – 8
- 4 motors (with speed control) labelled. . Motor A – D

The first 4 outputs are labelled correctly for the motors A – D. Only these outputs will allow a motor to be reversed and have speed control.

The LEGO interface therefore needs some re-labelling to make it compatible with Flowol.

All the inputs are labelled correctly for the digital inputs 1 - 8 (e.g. Touch Sensor).

The analogue sensors (Temperature, Light and Angle) should be connected to the 4 blue inputs only, which need to have additional labels: Val 1 to Val 4.



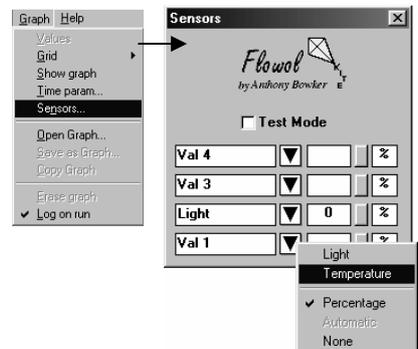
All eight outputs will need to be re-labelled: Outputs 1 – 8 to operate the Lamp, Buzzer and Motor (forward direction only).

Calibrating the Temperature and Light

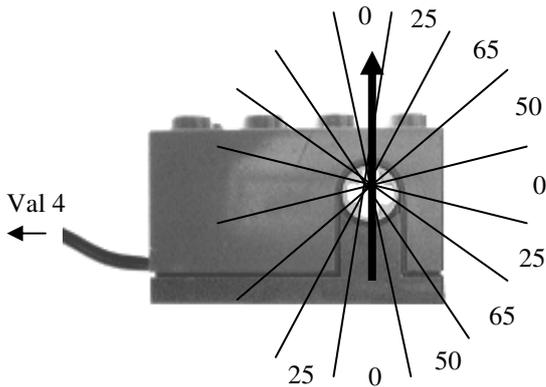
To calibrate a sensor, select 'Sensors' from the Graph menu. Open the menu from the 'down arrow' against the analogue input you have chosen.

Choose 'Temperature' to give readings in Celsius and give the correct heading to the graph.

The Light sensor gives reading as % but choosing 'Light' from the drop-down menu will give the correct heading to a graph.



Using the Angle Sensor with Flowol

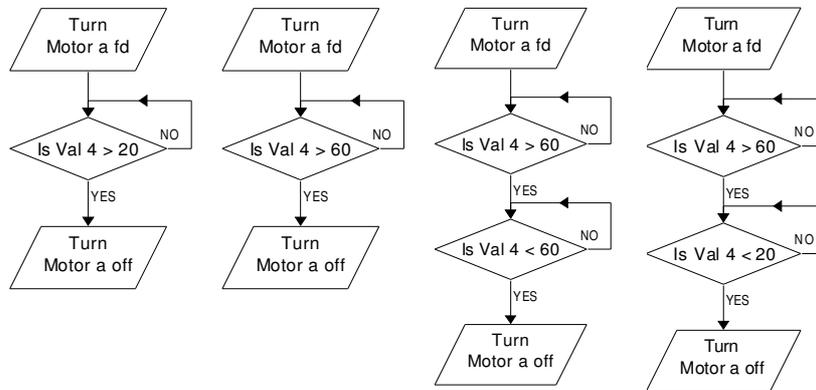


The Angle Sensor gives analogue readings Val: 0, 25, 65, 50, (approximately) for each quadrant as shown.

If instructions with combinations of > and/or < 20, 60, 40 etc. are used, Flowol can detect the position of a garage door or car park barrier etc. or count the number of revolutions of an axle.

Note: If the rotation is too fast the program might not detect the change (i.e. gear rotation down and Turn Motor a fd 10% etc).

E.g. If we consider the rotation starting from the top, these sections of flowcharts, below, should stop the motor 'a' in the different sectors in the first quadrant.



If the rotation is more than 90°, use another flowchart to count the quadrants with variable 'n'

Changing this value will allow many rotations to be detected.

