

# Flowol<sup>TM</sup> 3

The logo icon for Flowol 3, featuring a stylized flowchart with a red box at the top, a green box in the middle, a yellow box on the right, and a blue box at the bottom, connected by lines.

## A Computer Control Program for **Windows PC**

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Document Flowol 3.10 U.S.

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## System Requirements

- Microsoft Windows 2000, XP, Server 2003 or Vista (32 or 64bit).
- 20 Mb of free Hard Disk Space.
- Adobe Acrobat Reader to access the CD version of the tutorial.
- We recommend that all the latest critical updates are installed from: <http://windowsupdates.microsoft.com>

**Note:** The mimics in the Flowol 3 package will also be installed. The 'Big Wheel' and 'Cot Mobile' are new F3D mimics which have 3D animations. The speed of the animation will depend on the graphics capability of your computer. One way to speed up slow animation, at the expense of image quality, is to remove the check mark from the 'Use anti-aliasing' option in the Mimic tab of the Options dialog from the Settings menu.

## Installing Flowol

- Insert the Flowol 3.10 CD ROM into the CD Drive.
- This is an auto play CD ROM, which means that Windows should detect the presence of the CD and automatically start up the Auto run program.
- Follow the on-screen instructions to complete the installation of the Flowol and its associated files onto the hard disc.
- When installation is complete, eject the CD ROM and store safely.

**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.

[See p.33-37 for installation onto Windows and RM networks]

### Important Notes:

1. When using the Mimic Creator after installing Flowol3, you will need to use the 'Set Mimic Directory..' in the Mimic Creator's file menu each time you need to access the 2D mimics. Or transfer the mimics as explained above if you need to access them by default.

**USB Users:** Ensure that the interface is NOT connected when the Flowol software is installed. If you have installed the FlowGo/Solo drivers with a previous version of Flowol, uninstall them first by going to the Add or Remove programs control panel and remove the 'FlowGo/Solo USB Drivers (Flowol 2.91)' program.



## Getting Started

To start the Flowol software once it has been installed:

1. Click on the **Start** button on the taskbar.
2. Within Programs, select Flowol 3 and click on the Flowol 3 icon.

## 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,  open (in simulation mode), so that the correct number of outputs, inputs and commands are available for that interface.
- Or: with the interface connected,  closed (interface in operation).

### The following interfaces are supported:

Data Harvest: Contact Controller Plus  
Contact Controller  
FlowGo [Serial/USB]  
Solo

Fischertechnik: Robo [Serial/USB]  
Intelligent Interface [Serial]

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.  
Control and Data Capture Interface [USB]

Economats: Smart Box  
Control Station

Commotion: Serial Interface  
Junior Interface  
Commotion CoCo [USB]

LEGO DACTA: (Control Lab) Interface B

PICAXE

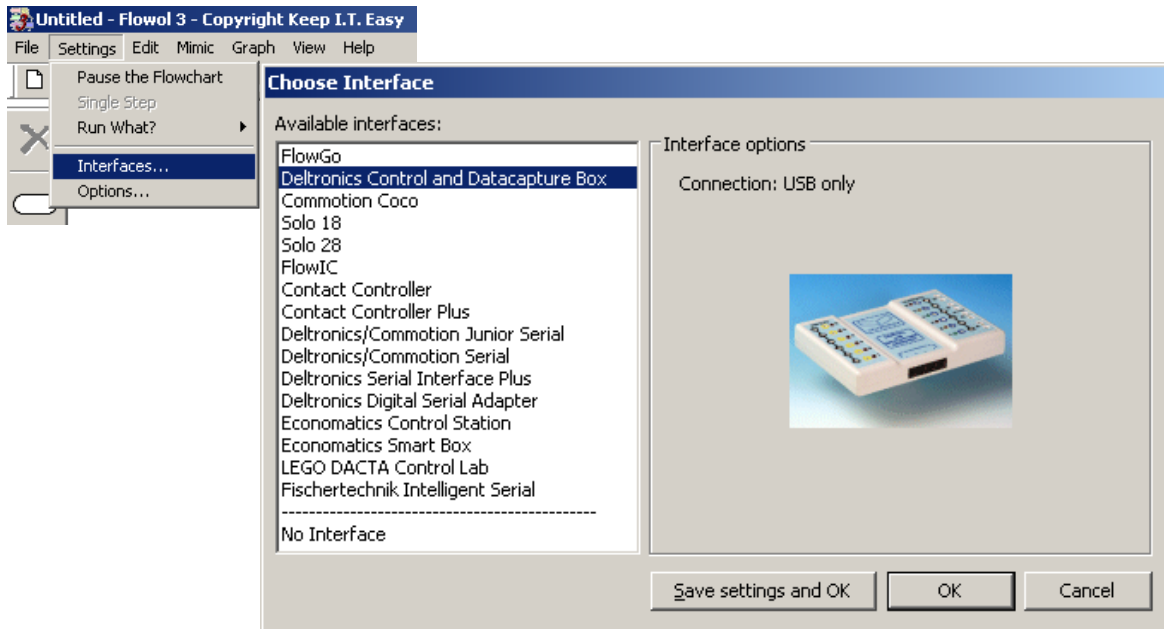
FlowIC


Other interfaces may be added in the future and available for download from the website.

<http://www.flowol.com/flowol3/interfaces.aspx>

## Setting up Flowol for your Interface:

- Open the Settings menu and select 'Interfaces' to open the 'Choose Interface' window.

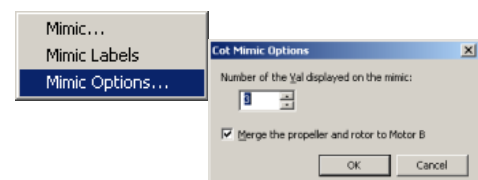


- Select your interface from the list shown and wait a few moments until its picture is displayed.
  - If your interface is USB connection only, there will be no further options.
  - If there is a dropdown menu you will need to select the appropriate communication port. E.g. an available COM port for Serial connection, or the USB.
  - Select the labeling (0 – 7) if required. [Note: the Tutorial is written for the 1 – 8 setting].
  - If you are using the Digital Serial Adapter or Extra Sense, the interface connected to it might need to have the 'High' selected.
- Click 'Save settings and OK' if you would like this selection to be automatically configured when Flowol is next used. Click 'OK' for these settings to be used for this session only.
- The program should now detect the interface if it is connected to the computer. The  [connecting plug icon] will flash and close [interface in operation]. To work in simulation mode, click on the icon to open the connection.

**Note:** Some interfaces have restrictions on the number of inputs, outputs and motors available, which will not always match the labels on the mimics. When the 'No Interface' option is selected, Flowol will have the maximum number of inputs and outputs available but will only work in simulation mode. These can be changed with the 'Advanced' option.

**Mimic Options:** Some 3D mimics can be re-labeled to suit the user's interface.

E.g. after configuring for the interface, open the 'Mobile' mimic and select 'Mimic Options' from the Mimic menu. The user now has the options of changing the 'Val' label and the use of Motor B. These changes will be saved by Flowol in the .flo file with the flowchart.



# The Tutorial

## Introduction

This tutorial introduces Flowol software and the flowchart method of creating a control program. It is a hands-on approach which puts the reader through a series of problem solving 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 tutorial, also on the Flowol CD, will be installed automatically so it can be accessed from the 'Help' menu].

Pages 7 to 20 are an appropriate introduction for all students. Since the examples are progressive, you can decide how far your students should go. Each theme in the tutorial gives direction to possible solutions, and several of the pages can also be used as worksheets. Ideas should be transferred from one section to another and extended to provide a complete solution.

It might also be useful to refer to the Student's Activities available on the web site. These activities are a pupil based text to support parts of the Flowol tutorial and also the extra Primary and Secondary Mimic Discs. The controllable tasks are progressive, similar to those in the tutorial, but focus more on the problem solving aspects of the examples rather than acquiring the skills to use the software.

Extra mimic packs are available, check <http://www.flowol.com> for details.

## Why Flowol?

Flowol is normally set to operate in simulation mode. This allows all students on a computer to actively create, test and refine their control solutions. The mimics are controllable pictures which 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 operated through a control interface, the mimics still respond. Readings from analogue sensors can also be logged and used to control events. The computer screen then also becomes an important monitoring tool. Industrial processes, security systems etc. are often monitored in a similar way.

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## Flow Control and Data Logging

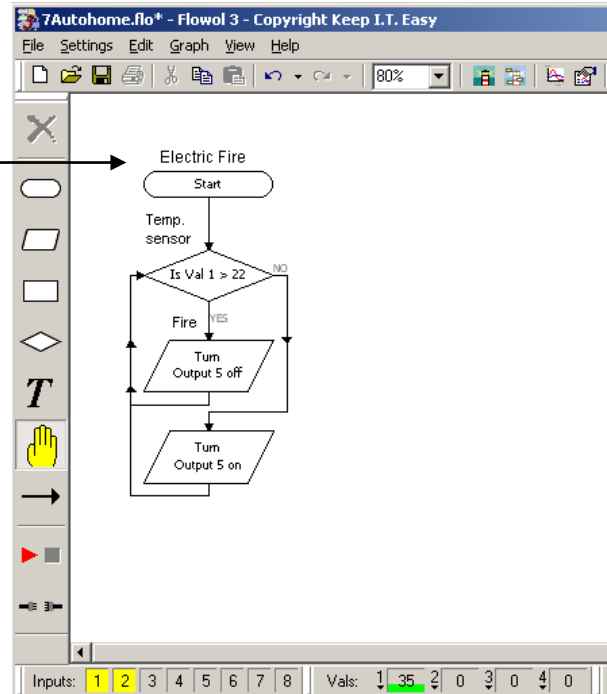
### The Screen:

#### The Workspace

The Flowol workspace is the area of screen available to build the flowchart program. This initially has a size of 4 pages, capable of holding 220 symbols, but these dimensions can be changed.

#### 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.

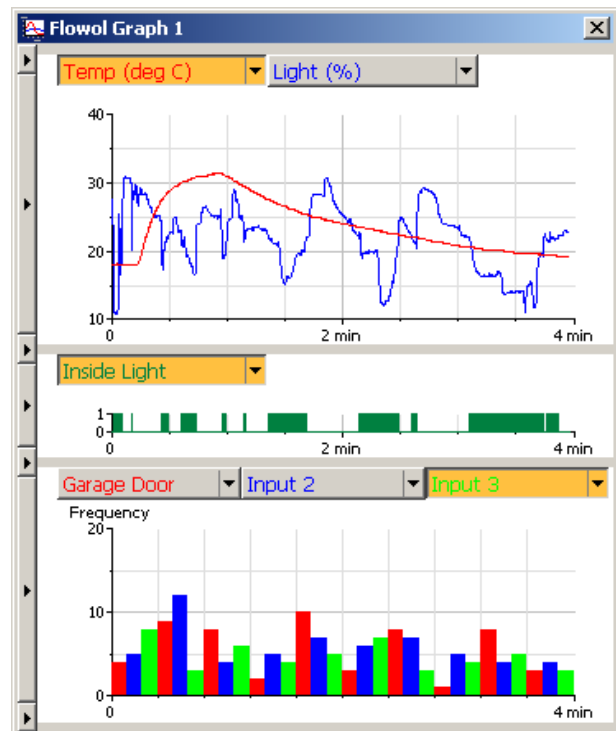


#### Mimics

These are controllable pictures which 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 Tools / Symbols

### Erase/Delete



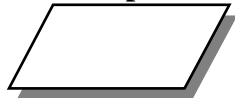
The **Erase Tool** will highlight and become active when part of the flowchart has been selected for editing.

### Start/Stop/Sub



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

### Output



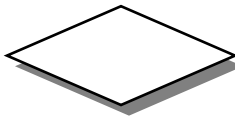
Use the **Output** symbol to turn on or turn off an output or a motor.  
Use the prompts to make the selection. (Note: all the outputs or all the motors can be turned on or off within one symbol).

### Process



Use the **process** symbol to put in a delay. (e.g. how long the output needs to be switched on for).  
This is also used to call up a subroutine, 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'.  
For example, it can be 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? 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. Click on the workspace to position the text window. Type in the text window that appears on the workspace. Edit the text with the font toolbar at the top of the screen

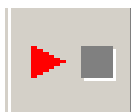
### Edit



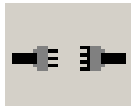
Click on the **Edit Tool** (or use right mouse button) when you need to highlight symbols, lines, labels or section of flowchart. They can then be erased, changed or moved.



Use the **Line Tool** 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 used. [The Yes/No selection box appears when you first click on the decision symbol]. e.g. If switch is pressed (Yes) - do something. If switch is not pressed (No) - go back and check again.



**Start / Stop** button to run or stop the program.



**Interface connection.** E.g. if configured for an interface you can switch between simulation mode and interface operation mode.

Note: a '**Remote**' tool will become available when configured for FlowGo, Solo or PICAXE



**Mimic**  
'All Stop'

**Resource**

6V bulb connected to Output 1

## An All-Stop road intersection

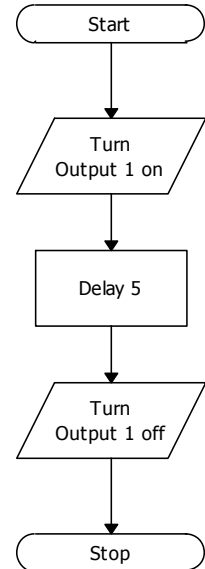
**Skill:** To connect three of the basic flowchart 'Tools' to create a control program to turn output 1 on for 5 seconds, then turn it off.


### Program:

- 1 Select the **Start** symbol 'Tool' and click again on the workspace to position and fix the gray image of the symbol. Use the prompts to select **Start**.
- 2 Select an **Output** symbol – position it under the Start symbol. Use the prompt to Select: **Turn Output 1 on**, click on OK.
 

Turn Output 1 on			
Turn Output	1	Output	Off On
	2	Output	Off On
Turn Motor	3	Output	Off On
Sound	4	Output	Off On
	5	Output	Off On
Speak	6	Output	Off On
- 3 Select a **Process** symbol – position it under the Output symbol. Use the prompts to select **Delay 5** Click OK.
 

Delay 5			
Delay	5	seconds	
Sub	7	8	9 C
Let	4	5	6 .
	1	2	3 0
- 4 Select the **Output** symbol – position it under the symbol above. Use the prompts to select **Turn Output 1 off**. Click 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 again. (This is the start of the next line)
  - iv) Click on the third symbol etc and continue until the flowchart is complete.



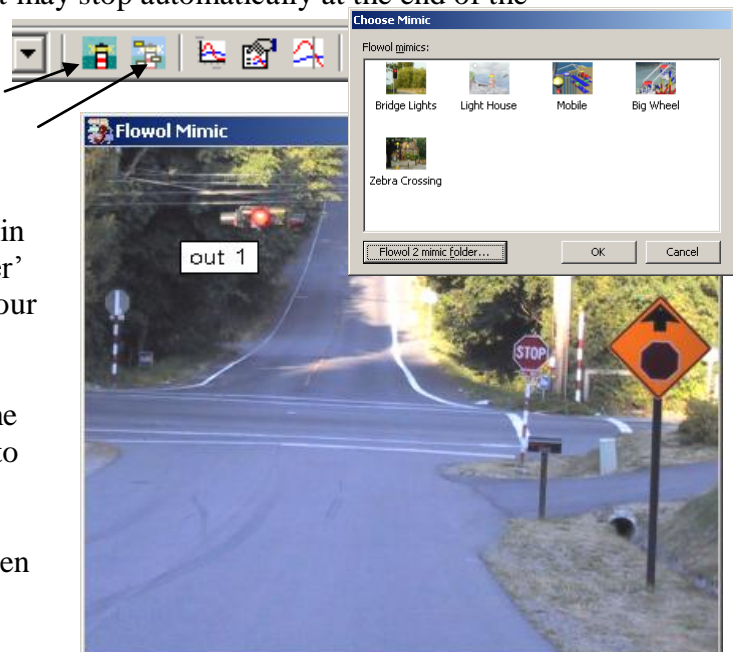
To run this short program, click on the  symbol in the toolbar. To stop the program click on the symbol again [note: in this example it may stop automatically at the end of the sequence].

**To open up the mimic:** click on the mimic icon on the Toolbar. Choose 'All Stop'. To show the labels, click on the label icon.

**Note:** If you already have Flowol 2 mimics in another folder, select 'Flowol 2 mimic folder' in the Mimic window. Browse and select your old Flowol 2 mimic folder.

**To test the action of the mimic:** click on the light on the mimic 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 As... give your program a filename [e.g. 'allstop'], OK



## Changing and Adding Instructions.

### Mimic

'All Stop' and 'Crosswalk'

### Resources

6V bulb connected to outputs 1 & 2

**Skill:** To modify a flowchart


- i) Remove unwanted symbols
  - ii) Changing information in the symbols
  - iii) Inserting extra symbols in a sequence
  - iv) Have multiple outputs in a symbol
- Moving the prompt box

### 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'



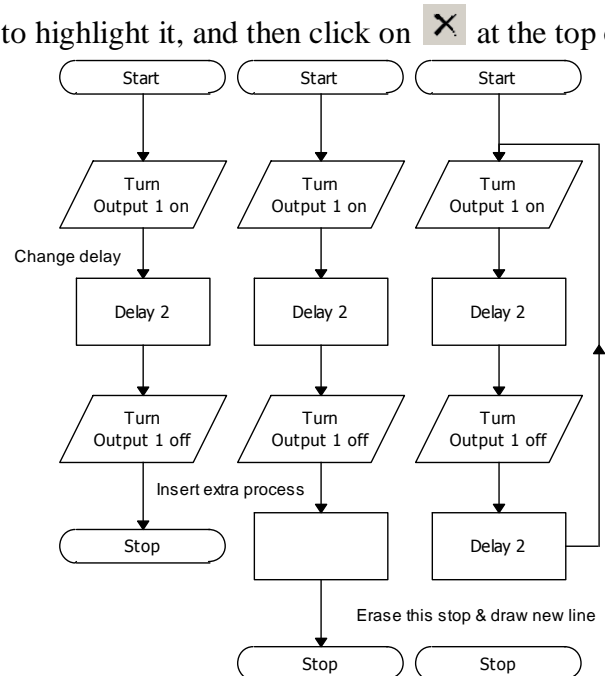
Click on the incorrect line or symbol to highlight it, and then click on  at the top of the toolbar.

### Changing Information e.g. delay time


- 1 Select the edit tool (Hand)
- 2 Click on the 'Delay' in the flowchart, to highlight it.
- 3 Click on 'C' on the prompt box number pad and change it to 2. OK.

### Inserting Additional Symbol:

- 1 Select another process [delay] symbol from the toolbar.
- 2 Place the orange image on the line above the Stop symbol. The chart will automatically re-draw itself.
- 3 Use the prompt box to produce: Delay 2, OK



### To make the 'All Stop' flash forever (recursive):

- 1 Select Edit tool, click on the Stop symbol and erase it with  tool.
- 2 Now draw a line from the second Delay to the process symbol at the top which turns output 1 on.

### Run and Save this new program –

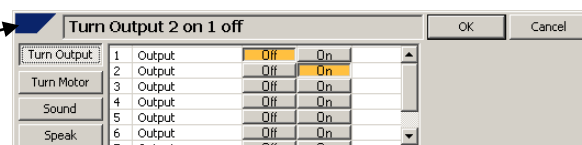
Now load the 'Crosswalk' mimic and modify your 'all stop' routine [see Multiple outputs below] so that the lights (outputs 1 & 2) flash alternatively.

### Run and Save your program –



**Multiple outputs** can be triggered in the same output box by simply selecting as many as you wish in the prompt box.

**Move the prompt box** if it is in the way by dragging it with its shortened title bar on the left hand corner.



**Mimic**

‘Intersection Lights’

**Resources**

Output 3 – 6V bulb

Output 2 – 6V bulb


Output 1 – 6V bulb

Etc.

**Traffic Lights**

**Skill:** Putting Text on the flowchart  
 Simulations with monitor Toolbars.  
 Editing the information in a symbol.  
 Printing the flowchart.

**T****Labeling the Flowchart:**

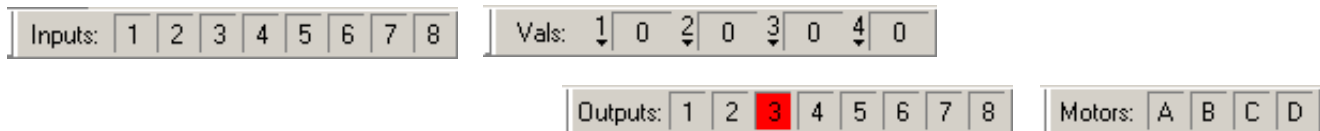
- 1 Select the **Text Tool**, position and click the ‘Label’ window on the flowchart.
- 2 Re-write the label in the text window.
- 3 Edit the font by using the Font toolbar.  Text edit icon
- 4 Labels can be moved in a similar way to that of the symbols [click once on the label].
- 5 To edit the text in the label, double click on the label or click once on the label to highlight it, and then click on the Text edit icon.

**Simulation without a mimic.**

Flowol has monitor toolbars which are normally at the bottom of the workspace.

They can be moved by dragging them around the screen. When in the workspace, they become windows which can then be closed. They can be re-opened from ‘Toolbars’-View menu.

These monitor bars show the state of the inputs and outputs.



When the program is in simulation mode, the input can be clicked on to simulate the input changing.

**Traffic Lights:**


Let Output 1 be green, Output 2 - amber and Output 3 - red and build up the flowchart shown below.

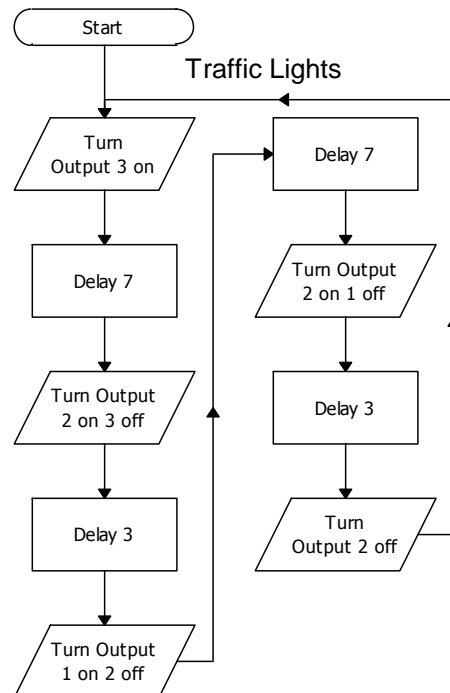
**To Edit the instructions in a symbol:** re-select the symbol on the workspace [highlight blue] to re-open its prompt box

**Note:** If the symbol is already selected but the prompt box is not open, then you need to click on the workspace first; and then click on the symbol again.

Click on the options in the prompt box to make the changes. E.g. to change an On to an Off, just click on the Off [they will toggle]. To remove the On altogether just click on it again. **Note:** When starting a new column always work downwards.

**Run** the program. Note: the light sequence is not quite right. Make the correction and **save your program**.

**To print** the flowchart,  click on the printer icon on the top toolbar. [See details about the full printing options on page 25].



### Mimic

'Intersection Lights'

### Resources

Outputs (1 to 6) – 6V bulbs

## Double Set of Traffic Lights

### Skill:

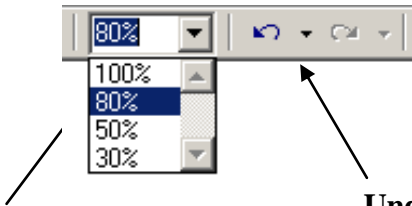
- i) Changing the scale of the flowchart
- ii) Undo and Redo
- iv) Click on the mimic to test its function.
- v) Slowing down the flowchart

### Testing the Outputs on the Mimics:

Display 'Intersection Lights' mimic and show the labels .

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 off. Also observe the output monitor bar. Now click on the outputs on the monitor bar to see the effect on the mimic.

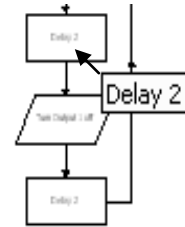
Run the Traffic Lights program and check it out on the mimic. Change/edit the delays until you have the best result.



**Undo and Redo** can be used to step back and then forward again through the stages of creating the flowchart.

**Re-scaling [Zoom] the flowchart.** When the flowchart becomes too large to be seen in one frame, use zoom to observe more symbols on the monitor screen. [80% is a useful, readable size]. The **Zoom default** can be changed from 'Options' in the Settings menu.

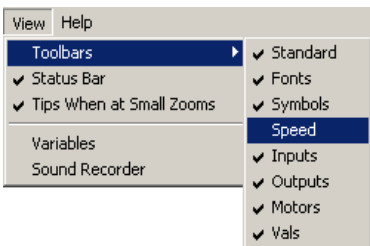
**Symbol Tooltips:** Having < 80% is useful when re-arranging the flowchart but the symbols are difficult to read. Tooltips will appear [if Zoom<80%] when the cursor hovers over a symbol. These Tooltips can be turned off from the View menu.



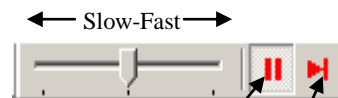
### Double Set of Traffic Lights

This can be done by either constructing another flowchart for the second set of lights, or by modifying the sequence for the single set of lights. [e.g. insert extra symbols or edit some of those symbols already there]. Run the program and observe the effect on the mimic so your program can be checked and refined. **Save** your new program.

**Reducing the Speed of the Flowchart or Stepping Through the Program** is useful when demonstrating or checking for errors. Open the Speed toolbar from 'Toolbars' in the View menu.



Make the speed adjustment by moving the slider. The 'speed tool' window can be closed or dragged to the top or bottom toolbars.



**To step through the program,** first pause the flowchart by clicking on the icon [or from Settings menu] and then step from one symbol to the next using the Spacebar or step icon.



## The Lighthouse

### Mimic

Light House

### Resources

Output 2 - buzzer

Outputs 1 & 3 – 6V bulbs

**Skill:** To use multiple flowcharts:

- i) Move sections of flowchart.
- ii) Copy a flowchart.
- iii) Changing the color of the flowchart.
- iv) Controlling a model through a control box.

Open the Light House mimic, re-load the 'allstop' program, from the earlier example, and run it to observe the effect on the mimic. Stop the program again.

**Try moving Sections of flowchart:** (individual symbols or groups of symbols)

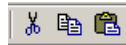
- 1 Select the edit tool (hand).
- 2 Click on the symbol in the flowchart to be moved and it will highlight.
- 3 Use the left mouse button to drag the symbol and then release.
- 4 To highlight a group of symbols, drag a box around the group. (Click left mouse button at one corner of the group, drag a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

Controlling the Foghorn on the lighthouse:

### Copy the flowchart:

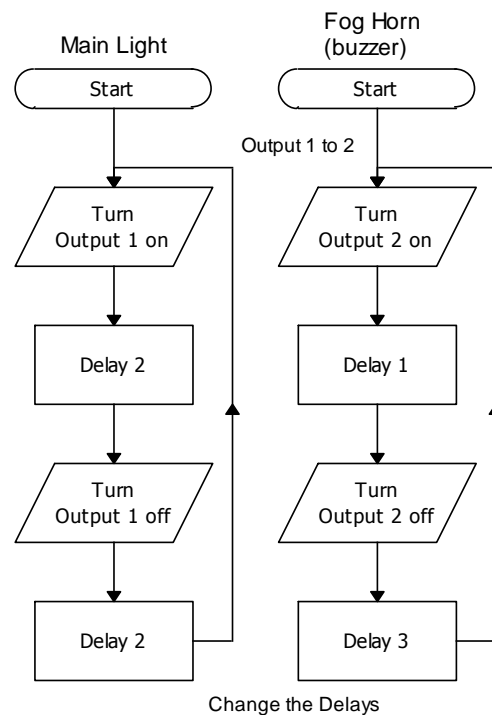
Select edit tool and highlight the flowchart by dragging a box around it. (explained above).

- i) **Hold the Shift key** and drag one of the highlighted symbols to drag a copy of the flowchart to one side, release mouse button.
- ii) OR: use the Copy and Paste icons. See details of Cut, Copy and Paste on page 17.



The outputs in the second flowchart now need to be re-defined as Output 2.



It may also be advisable to change the delays: Delay 1 when buzzer is 'on' and Delay 3 when 'off'. **Save** the 'lighthouse' program.



**To change the colors of the flowchart:** select 'Colors' from 'Options..' in the Settings menu.

Note: stronger colors may be useful for demonstrations but strong, flashing colors can be unpleasant for the user, or even dangerous for some users who suffer from epilepsy.

### Connecting to an Interface and controlling a model:

If Flowol is configured for an interface [see p.5] and your control box is connected to the computer, you can switch from simulation mode to interface mode by closing the plug connector icon on the toolbar e.g.  to  or vice versa to return to simulation mode.

## Lighthouse with a switch

### Mimic

Light House

### Resources

Output 3 – 6V bulb

Output 2 – Buzzer

Output 1 – 6V bulb

Input 1 – switch or LDR

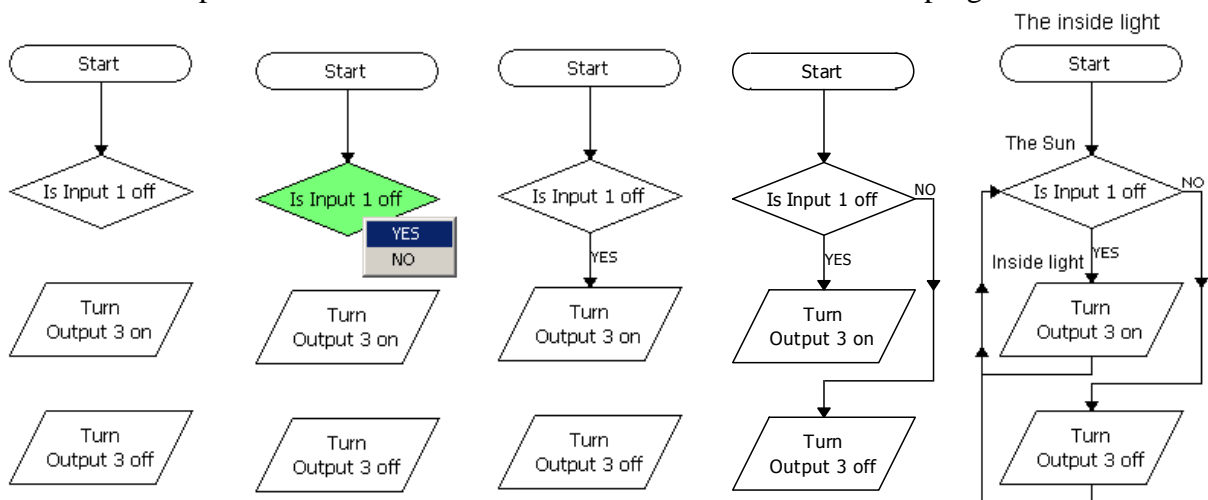
**Skill:** Using an Input (Decision) symbol.

**Using an input switch** to control the interior light in the lighthouse:

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.

The diagrams below show the steps needed to build the procedure for the interior light program.

Create and position these four symbols. When you click on the decision symbol to draw the first line it will highlight the symbol [green] and open a window for you to decide if this first line is to be a YES or NO line. Make your decision (e.g. YES) and then click on the destination symbol [Turn Output 3 on]. When you highlight the decision symbol for the second line, the program will already know it is for the NO line. Click on the destination symbol [Turn Output 3 off]. Add the extra lines to complete the flowchart. Write some labels and **Re-Save** the program.



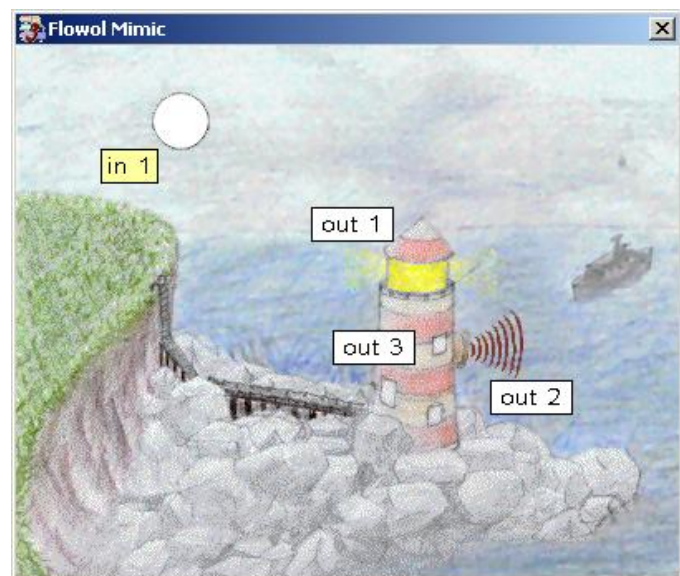
### Using a light sensor as the switch.

A light sensor is On when it is light and Off when it is dark.

Run the ‘lighthouse’ program and click on the Moon/Sun (input 1) on the mimic. This will simulate the effect of changing the light sensor.

Now insert decision symbols to the other flowcharts so that the main light and foghorn are also controlled automatically by the daylight.

**Test your program and re-save it.**



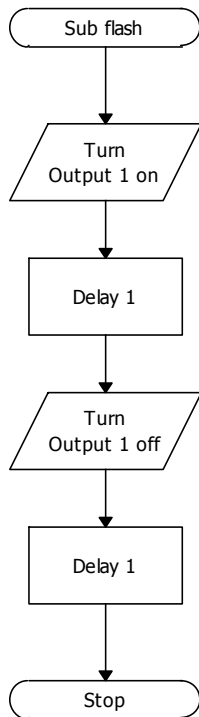
## Lighthouse with Subroutines and Sound

**Skill:** Using Subroutines

### Subroutines

When a section of flowchart needs to be repeated, it is better to use a subroutine and a separate main routine to command this subroutine. The subroutine however, must be defined and drawn first, so it can be selected and included in the main routine.

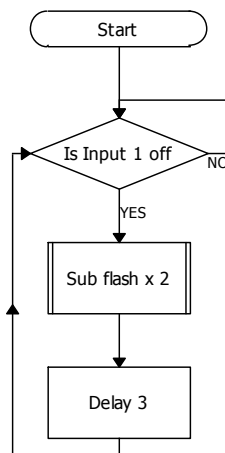
[In the lighthouse example we can use a subroutine to give the flashing light a signature].



**Building a subroutine:** Select the 'Start symbol' but click on Sub (not Start) in the prompt box. Write the name 'flash' in the text window and click OK.

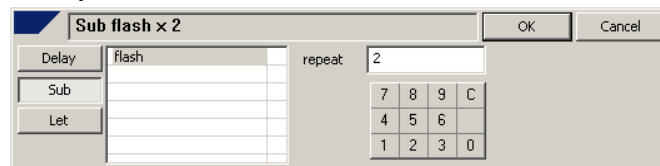


The flowchart for the subroutine can then be built up in the usual way but it should finish with a 'Stop'



### Building the main routine:


Draw the main routine (with a 'Start'). After selecting the process symbol, click on 'Sub' in the prompt box. A list of your subroutines will appear. Make your selection.



To repeat this subroutine, click on the number pad before clicking on OK. [e.g. 'flash' repeated twice].

You can now modify the main routine by adding delays and calling up the 'flash' subroutine in different ways to give the flashing light a different flashing routine [e.g. a signature].

### Adding a fog horn sound to your lighthouse program.

One of your flowcharts should be controlling the foghorn output 2. Insert another output symbol  below the one in the foghorn flowchart which turns Output 2 on.

When the prompt box opens, choose Sound and type C:\WINDOWS\Media\ringout.wav in the prompt box window to select the 'ringout' sound file already on your computer. Alternatively this can also be found by clicking on Browse... and locating the file. Click OK in the prompt box.

**Note:** If you use Browse, you may then have to re-locate your .flo files folder before saving. See details 'Using Sound on PC Flowol' [p.16], particularly if you wish to create your own sound.

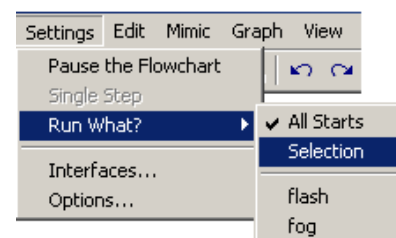
[**Extension task:** Use the 'Crosswalk 2' mimic to build a program using inputs, subroutines and

**Run what?:** allows you to run a subroutine or selected flowcharts on their own.

Select 'Run what?' from the Settings menu. Choose your named subroutine from the list, and RUN the program.

Or choose 'Selection'; highlight the chosen Start [or Ctrl and select several Starts] on your flowchart and RUN.


**Remember** to choose 'All Starts' again at the end of the test.

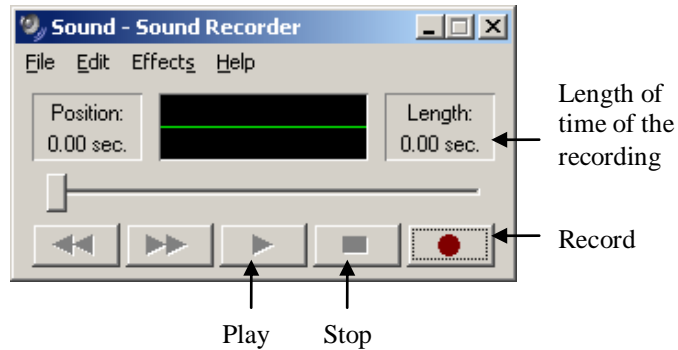


## Using Sound on PC Flowol



[For PC computer only with sound card, microphone and speakers connected]

Sound can give extra realism to the control situations for example the foghorn on the lighthouse. In automatic systems such as crosswalks and elevators sound is also frequently used to help the partially sighted cope more easily.

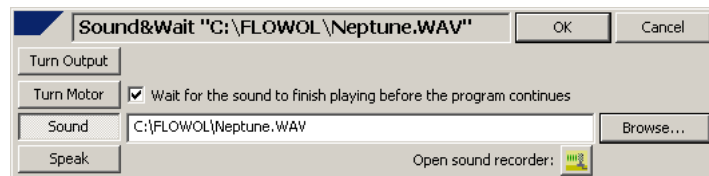
To record new sounds or listen to the pre-recorded sounds on your computer [at C:\WINDOWS\Media\...] you need to open the Windows Sound Recorder by clicking on the Sound Recorder icon  [menu bar or Sound prompt box].



### Recording your own sounds:

- Attach a microphone and speaker to the sound card.
- Open the Flowol program.
- Launch Microsoft's **Sound Recorder** by clicking on the  icon [Note: This 'Sound Recorder' can then be re-accessed from the lower taskbar].
- Click on the Record button to start a recording. Make your sound into the microphone. Click on the Stop button when the recording is complete.
- Only edit the sound if you need to. (E.g. you might need to delete a bit of recording just before or after the section of sound you need). To do this, move the slider on the Recorder window to identify the beginning and end of the sound, and use the Edit menu on the Recorder to delete the unwanted sections of recording.
- Select **Save As** from the Sound Recorder's **File** menu. Save as a .WAV file type in the destination of your choice but it may be best to save it in the same area that stores your flowchart .flo files.
- **To use the sound in your flowchart program** insert an output symbol . Select Sound from the prompt box and Browse.. for your .wav file and click OK. In the foghorn example above we wanted the sound to run with the visual fog horn on the mimic and therefore did not select the 'Wait for sound to finish...' in the prompt box.

If we want the sound to finish before the program continues [i.e. describing something], select 'Wait for sound...' in the prompt box before clicking OK.



- **Note:** Although flowcharts can run simultaneously sounds cannot. If a sound is initiated by one routine, then it may be interrupted or cancelled out by sound from another routine.
- When the sound file has been used in a Flowol program and the Flowol .flo file saved, the location of the sound .wav file is also saved but not the sound itself. If you transfer or open the Flowol file on another computer you may have to either:
  - Transfer the sound file to the location specified by the Sound prompt box or
  - Use 'Browse' in the Sound prompt box to re-locate the sound file, click OK in the prompt box to save this location in your program and re-save the Flowol .flo file.



## Using Copy and Paste

Flowcharts can be copied from Flowol3 and pasted into:

- the same Flowol3 application.
- a different Flowol3 application.
- a word processor (e.g. Microsoft Word) for a report or worksheet.

### Stage 1:

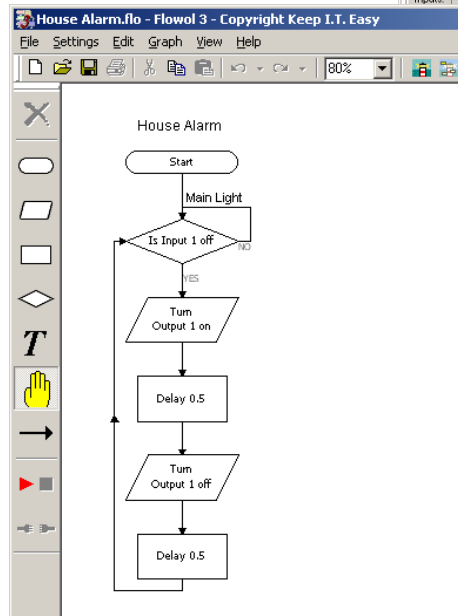
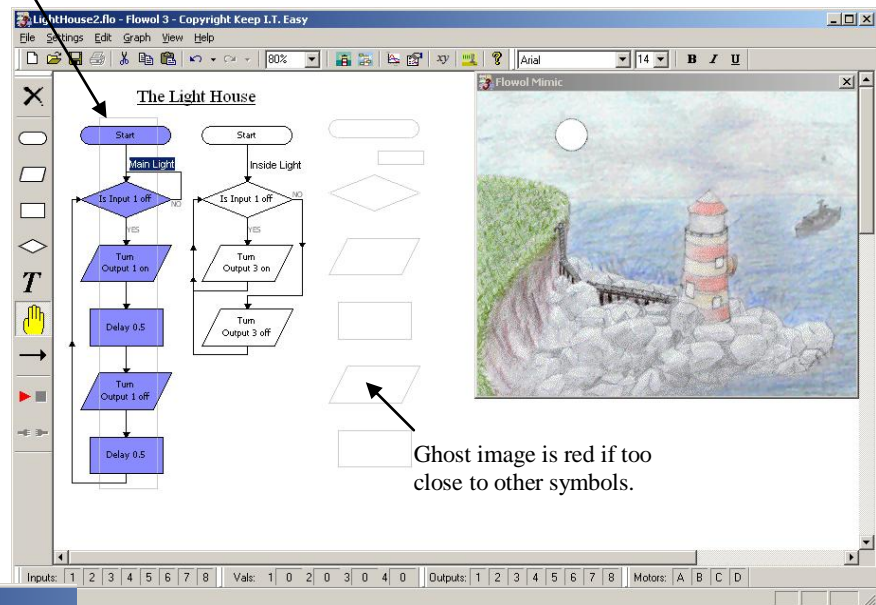
- Drag a box around the section of flowchart to be copied to highlight it blue.
- Click on the copy icon.

### Either Stage 2:


- Click on the paste icon.
- Move the gray ghost image to the new place on the workspace and click to fix it.

### OR Stage 2:

- Click on the paste icon **in the new application.**
- Move the ghost image to the new place on the workspace and click to fix it.



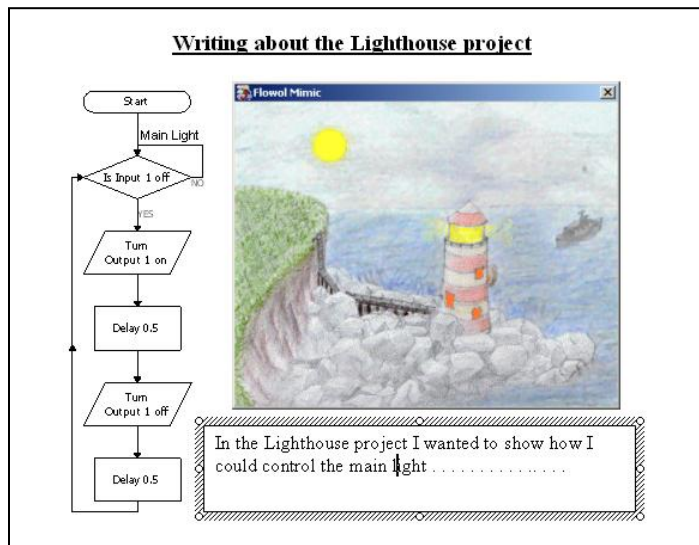
### OR Stage 2:

- Click on the paste icon **in Microsoft Word.**
- Click on the image; click on the 'Text Wrapping' icon  and select Square.
- Drag the image to a smaller size and position it.

### To copy a mimic into Microsoft Word:

#### Stage 1:

In Flowol, click on the mimic's title bar; press 'Alt Prt Sr' and follow stage 2 above.



After a flowchart has been copied back into Flowol:

- Edit the commands in the symbols to suit the new context.
- **Note:** the subroutine title will have changed automatically, since a program must not have two different subroutines with the same name.

**Mimic:** Mobile

**Note:** Different options are available with this mimic. See p.5

## Controlling Electric Motors

### Skill:


Using a Motor output on a mimic.  
Changing the speed of a motor.

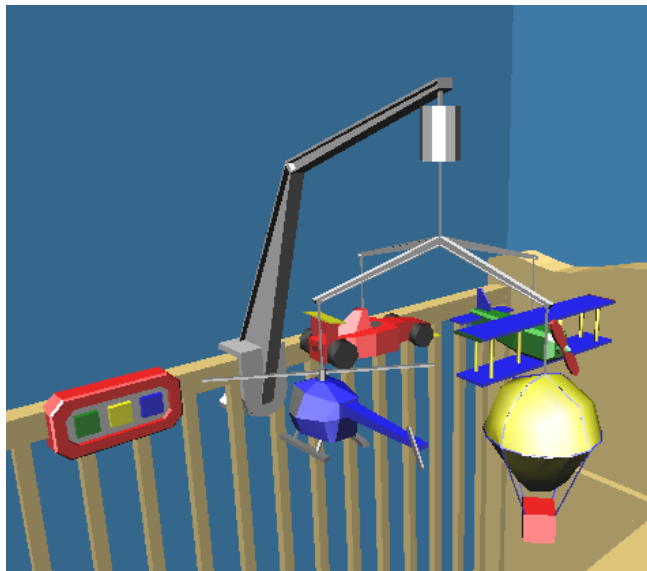
Electric motors produce movement. This can be the continuous rotation of a crib mobile or the forwards and backwards movement of a barrier.

Open the mimic  folder and select the Mobile mimic.


Use the left mouse button and click on the letters on the motor monitor bar

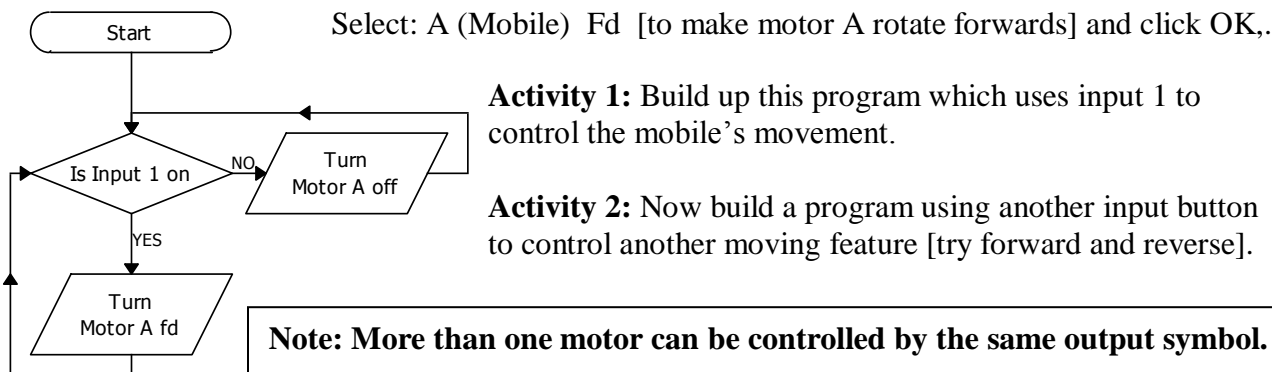
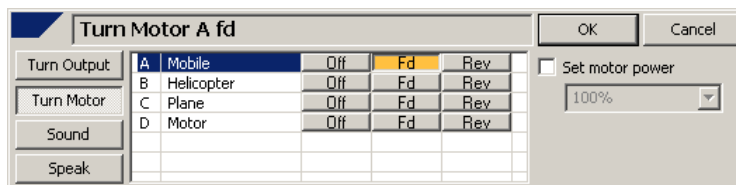
Motors: A B C D and observe the effect on the mimic. When letter A goes green, motor A should go forward. Click again to stop it. Use the right mouse button to turn the letter A red. This should make the motor reverse.

On the mobile mimic, motor A rotates the whole mobile but what do motors B and C do? You might like to have the labels on .



### Controlling a motor in a program:

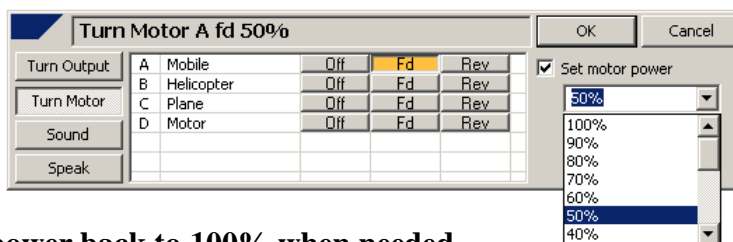
Choose an output symbol  to open the prompt box and select Turn Motor.. [Note the 3D mimics have written prompt names to remind you what the motors do].



### Motor Speed or Power Control.

Real motors on models and those on 3D mimics often rotate too quickly. To slow them down we need to give the motors a '%' speed setting. To do this, select the 'Turn Motor A fd' symbol to re-open its prompt box. Tick the 'Set motor power' check box and choose a % speed setting e.g. 50%, before clicking OK.

**Activity 3:** Edit your program to change some of your motor speeds. Add extra output symbols and delays to make the mobile go fast, then slow and then fast again.



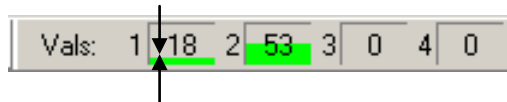
**Note: Set motor power back to 100% when needed.**

## Using Analogue Values [Vals] with the Crib Mobile

A switch is a digital input because it can only be either on or off. Analogue sensors on the other hand have a range of input values e.g. a light sensor can detect variations in brightness and a sound sensor can detect different levels of noise. [Note: a thermometer is an analogue device].

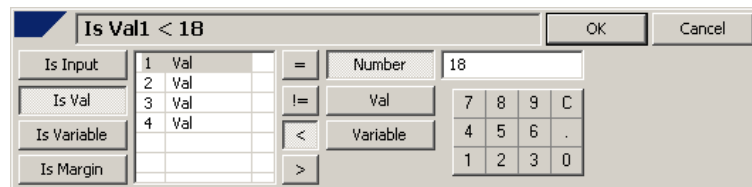
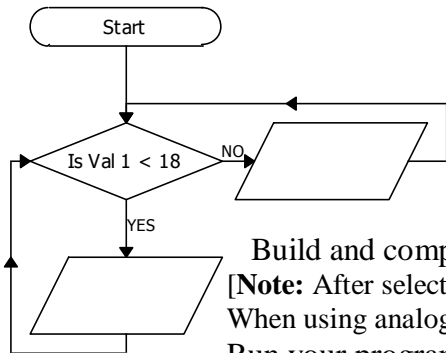
**When using Flowol in simulation mode we can simulate changes in analogue readings by:**

- Either clicking on the val reading on the mimic with the left mouse button to increase the value in steps of 5, and by using the right mouse button to decrease the value again.
- Or: By clicking on the reading on the 'Vals' monitor bar at the bottom of the screen or dragging its level up or down.



Explore the outputs on the mobile by clicking on the output monitor bar. [You will need to look closely at the mimic since some of the lights on the mobile's models are quite small].

**Activity 4:** We will now make the light in the hot air balloon act as a 'Night-light' (e.g. the balloon will light up automatically only when it is dark). For this activity we will assume that Val 1 is the value from a light sensor on the end of the mobile arm. A light sensor gives a high reading when it is light and a low reading when dark.



Build and complete this flowchart to control the light in the balloon.  
 [Note: After selecting the decision symbol, choose 'Is Val , 1 < [Number] 18' OK. When using analogue sensors it is often better to use < or > rather than =].  
 Run your program and simulate a change in the light level. Now edit your program to change the threshold value [the 18] at which the Night-light works.

**Activity 5:** To occupy the baby, create a program to automatically flash the car brake light and airplane wing tip lights, if the room light level falls below 60 units.

**Activity 6: The Automatic Mobile.** For this activity assume that the analogue value is from a sound detector which gives a high reading when it is noisy. Now create a program which brings the mobile to 'life' if the Baby wakes up during the night and cries. Remember you can control the lights, the movements and even produce your own sound file if you wish. Perhaps the mobile should become more active the greater the noise, and then gradually becomes less active and eventually stops.

Mimic: Big Wheel

## Controlling the 3D Big Wheel Mimic

**Note:** The 3D mimics can be re-sized but large 3D images might not work effectively on some computers. If this happens, re-open the mimic.

[including Speech Windows XP or 2003 only].

### **Open the Big Wheel mimic** [with labels]

Explore what the mimic can do by clicking on the monitor bars to see the effects of: Outputs 1, 2 & 3 and Motor A.

When motor A is running, look closely at the input monitor bar and the steps below the wheel. You should notice that Input 4 is an input which comes on each time a seat passes the steps. This is an 'Active Input' being controlled by the mimic itself. Note: clicking on Input 4 on the monitor bar has no effect.

Now click on Inputs 1 & 2 on the monitor bar and on the mimic. These are the usual manual inputs which you can control.

Now click on the gate on the mimic with left mouse button only. You should notice that you can control the closing and opening of the gate but the gate itself controls the active input 3 which is on the gate post.



### Possible Activities

#### **Activity 1**

To attract the crowd use the [manual] input 1 to control the lighting effects on the wheel. This might be a simple on/off routine but flashing sequences are more exciting [use subroutines].

#### **Activity 2**

Use the input 2 to control the simple Go/Stop movement of the wheel. You might make the movement of the wheel speed up and slow down in stages [see Mobile: motor power control].

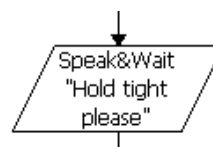
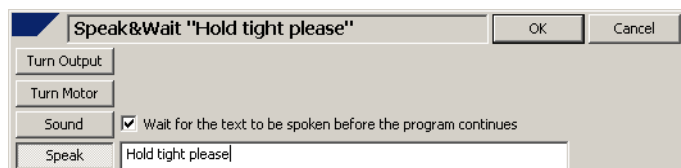
#### **Activity 3**

Modify activity 2 to include the safety feature of the gate: i.e. the gate must be closed before the wheel can be turned on, and the wheel should stop if either input 2 is turned off, or the gate is opened.

#### **Activity 4: Using Speech** [if you have Windows XP, a sound card and speakers]

To increase safety even further use the 'Speak' command to give the passengers an automatic verbal instruction to "Hold tight please" just before the ride begins to move.

- Select an output symbol and insert it in the program just before Motor A is to be turned on.
- Select 'Speak' in the prompt box and type your message in the text box.
- Since we want the message to finish before the wheel starts, tick the check box 'Wait for text to be spoken ...'
- OK.





## Using Variables and the 'Active' Inputs with the Big Wheel

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

Let  $x = 10$

Variables can be added to or subtracted from: (Let  $x = x + 1$ ).

Let  $x = x + 1$

Variables can be subtracted etc. (Let  $x = x - y$ ).

Let  $x = x - y$

A variable can be checked in a Decision symbol.

Is  $x > 20$


With the Big Wheel mimic we can use variables to:

- Count how many times the ride is used.
- Control the length of ride.
- Change the speed of the motor smoothly.

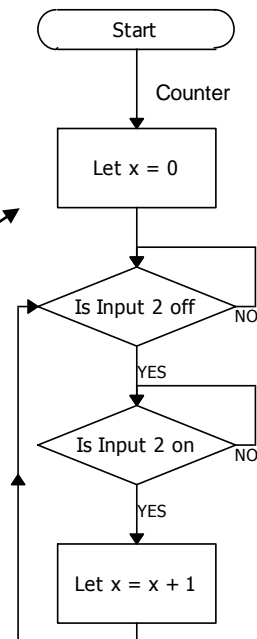
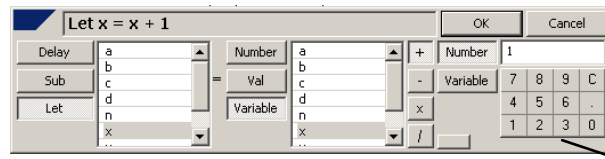
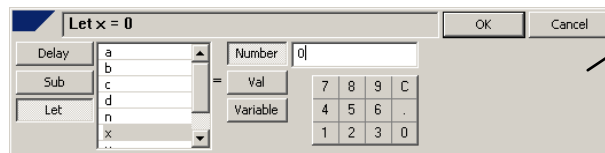


### Activity 4:

Use variable 'x' to count how many times the ride is used. Build this 'Counter' program to run alongside your Wheel program. The counter increases the value of the variable 'x' by one, each time Input 2 goes on.

To open the Variable's window, click on the  icon.

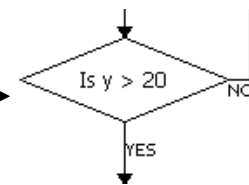
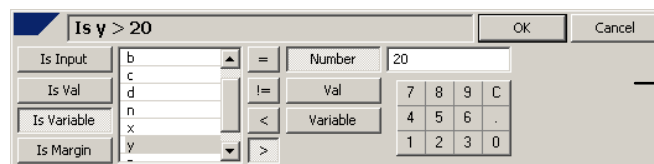
Variable	Value
a	0
b	0
c	0
d	0
n	0
x	12
y	0
z	0



### Activity 5: Stopping the wheel automatically.

Construct a similar counting program to increase the variable 'y' each time a seat passes the stops i.e. each time the 'active' input 4 goes off and on.

Since there are seven seats, each full rotation of the wheel should increase the variable 'y' by 7. Now modify your program, by introducing a decision symbol, to stop the wheel automatically after it has rotated 3 times

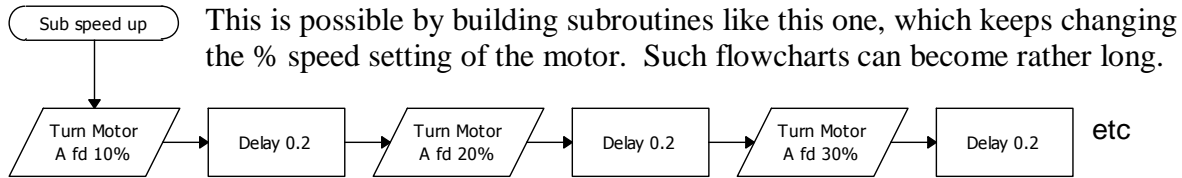


### Activity 6: [Extension]

Now that you have learned how to use Input 4, modify the program so that each of the seven seats stops automatically at the bottom for a short time for the people to get off. [Note a variable is not needed for this solution]

## Changing the speed of a motor with a variable

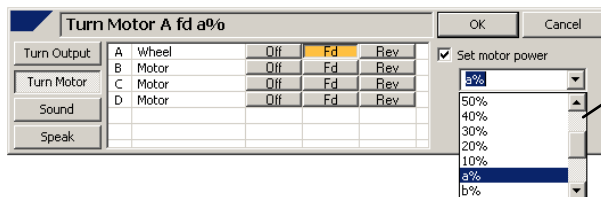
Many fairground rides produce a thrill by the rapid change in movement, but the Big Wheel is not one of these. To keep passengers safe the wheel should speed up and slow down gradually.



### Activity 7:

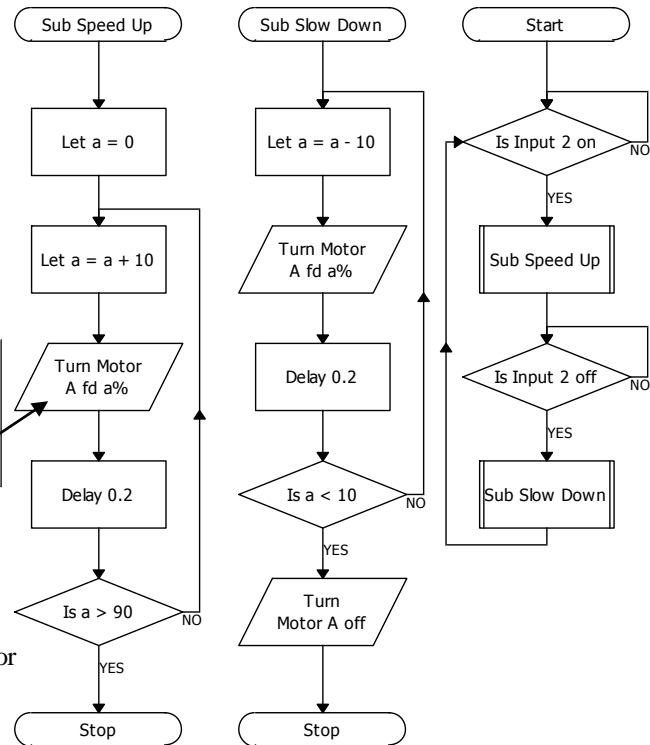
Changing the speed gradually by using a variable gives a more compact procedure. We use the variable 'a' to represent the speed/power of the motor and then change the value of this variable.

Build these two subroutines first, and then the main routine.



Select the Set motor power check box and scroll down to the variable % setting.

**Note:** If configured for FlowGo you can only use motor speed variables if you uncheck the 'Limit features' option in the interface dialogue. FlowGo cannot work remote and only the 'x' or 'y' variable can be used.



When the program is running, look closely at the motor monitor bar at the bottom of the screen. The shaded area of the monitor label indicates the power level of the motor.

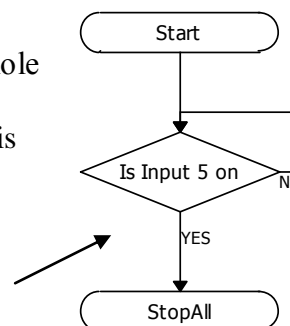


### Using the 'Stop All' in an emergency.

In the wheel Activity 3 earlier, we suggested the use of the gate as a safety feature to turn the ride off if the gate was opened.

Flowol also has a 'Stop All' feature which stops the whole program. The program then has to be re-started by the Start/Stop button on the toolbar; i.e. the whole system is shut down, and can then only be reset by an authorized person.

This routine uses Input 5 as an emergency shutdown button which could be added to the Wheel program. Trigger this by clicking on Input 5 on the monitor bar.

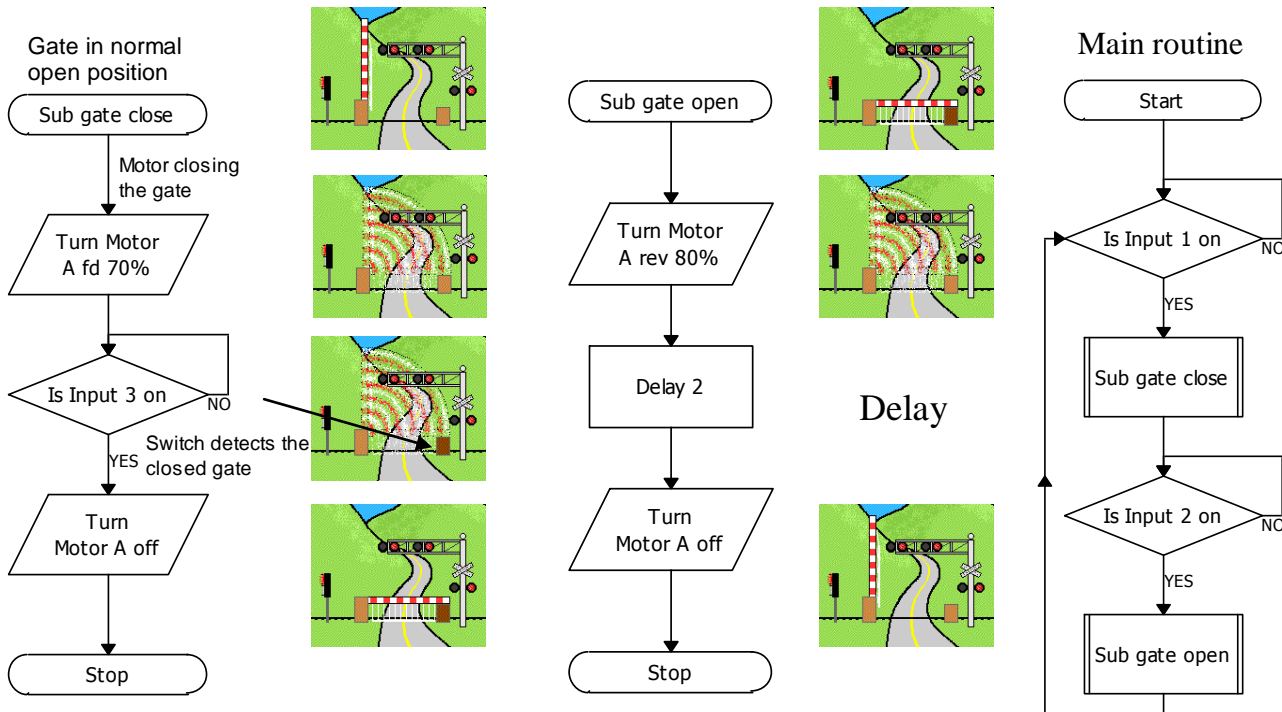


Mimic: Railroad Crossing **Controlling a motorized barrier**

A motorized barrier or garage door moves in one direction for a certain distance and then has to move in the reverse direction by the same amount. Deciding the length of time the motor should be turned on for, can be determined in two ways:

- Either by having a **feedback switch** to turn the motor off when the barrier has reached its final position.
- Or by considering the speed of the motor, the distance the barrier has to move and the delay time needed while the motor is on.

In this example we have two subroutines, one which closes the barrier using a feedback switch and another one which opens the barrier using a delay. These subroutines are then controlled by the main routine.



When using this 2D barrier mimic, you need to click on the gate post ‘hot spot’ to simulate input 3 being turned on. When the barrier opens however, this switch will ‘spring’ off automatically.

A good extension in the ‘Railroad Crossing’ example, is to use this gate switch [Input 3] to control the red and green signal lights which are pointing towards the train. This ensures that the gate is indeed shut before the train is given the green light.

If you have checked all the inputs on this mimic by clicking on the input monitor bar you may have noticed that input 4 is a switch on the hinge post [not labeled on the mimic]. This can be used in a similar way (e.g. as a feedback switch to detect when the barrier is fully open).

**Using Animated 3D Mimics**

Some inputs used on the new 3D mimics are triggered by the animated part of the mimic itself and are not ‘hot spots’ and therefore cannot be ‘clicked on’ by the user (e.g. ‘Big Wheel’ example).

## Controlling the Auto Home

Mimic: Auto Rambler

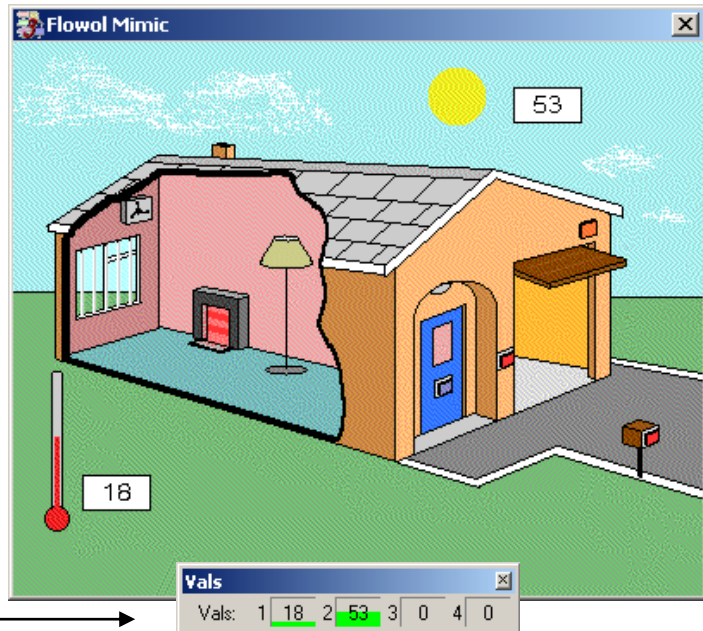
Analogue sensors detect a range of values e.g. a light sensor [LDR] detects variations in brightness and a temperature sensor [thermistor] detects variations in temperature.

When using Flowol in simulation mode we can create simulated changes in analogue readings by:

- Either clicking on the val reading on the mimic with left mouse button to increase the value in steps of 5 and using the right mouse button to decrease the value.
- Or by clicking on the reading on the 'Vals' monitor bar at the bottom of the screen or by dragging the value up or down.

Vals: 1 18 2 53 3 0 4 0

To use the 'Vals bar' more effectively, it can be dragged into the workspace [making it a window] and then placing it just below the mimic.



In the mimic shown: Val 1 is the outside temperature reading and Val 2 the outside brightness.

### Activity 1:

Use the temperature value [Val 1 in the decision prompt box] and build this flowchart to control the electric fire.

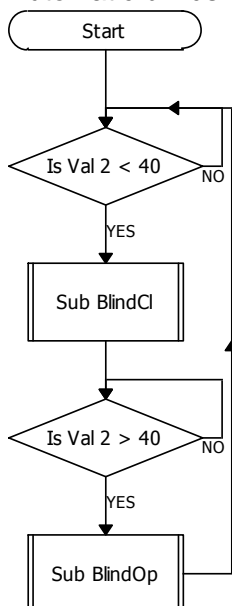
### Activity 2:

Construct another routine to control the fan when it gets too hot.

### Activity 3:

Build yet another similar routine using the outside brightness [Val 2] to control the inside lamp.

### Automatic blinds

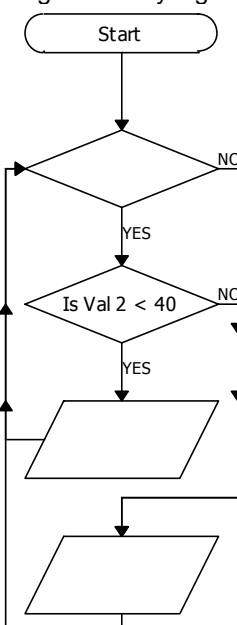


**Activity 4:** First build two subroutines, BlindCl and BlindOp, which make Motor B go forward and reverse [similar to the Barrier example earlier].

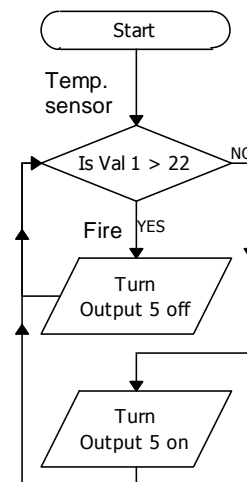
Now build this main routine using the light level from Val 2 to control the blinds.

**Activity 5:** Now try controlling the garage door in a similar way using inputs 1 & 2.

### Night Security Light



### Electric Fire



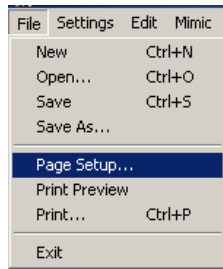
### Activity 6:

#### Outside Security Light

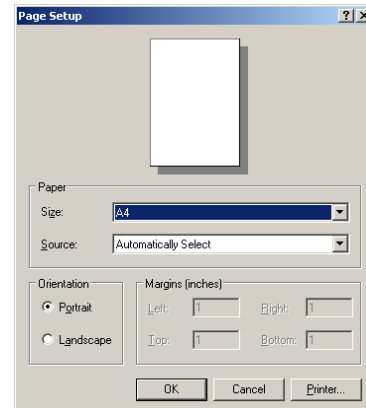
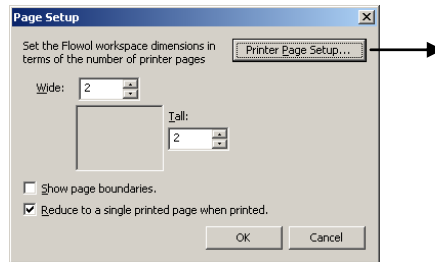
The digital sensor above the garage door can act as a security sensor to detect a person nearby. Use this sensor to control the night security light above the front door.



## Changing the size of the Workspace – Printing multiple pages



The workspace has a default size of four Letter sheets of paper in a portrait block, which can hold about 220 flowchart symbols.

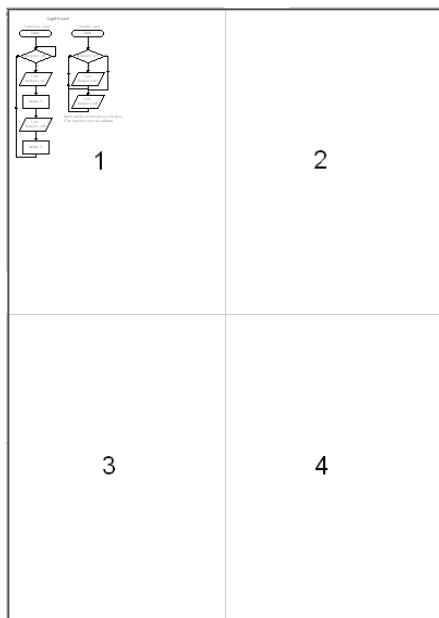


To check the workspace size, open the 'Page Setup' window from the file menu, tick [check] the 'Show page boundaries' box and press OK. Now Zoom the Flowol workspace to 30% to show the pages available.

**To change the workspace size:** open Page Setup. The default workspace size is four pages [2 Wide and 2 Tall]. To change the workspace size, change the dimension settings and press OK.

**Note:** Increasing the workspace might be needed for very large programs particularly when other flowcharts are pasted in from other Flowol applications. The workspace however, should not be increased unnecessarily since printing on a single sheet becomes less effective.

### Printing the Flowchart



The default printer setting reduces the workspace to a single page when printed, in portrait e.g.:

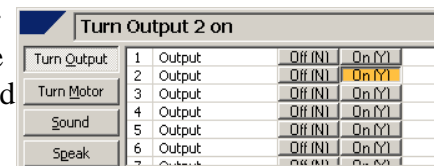
- If the flowchart only occupies sheet 1, then this sheet will be printed on Letter with the flowchart symbols at 100%.
- If the flowchart also occupies part of sheets 2, 3 or 4 then all four sheets will be printed out on a single page with the symbol sizes reduced appropriately.
- If the flowchart only occupies sheets 1 and 2 then it might be useful to open the 'Printer Page Setup' window and change the orientation to Landscape.
- Note: If the workspace size has been increased above 4 pages, single sheet printing might be ineffective as the symbols and text may be too small to read.

**Multiple Page Printing:** To maintain 100% size of the flowchart symbols when printed, print the workspace sheets separately i.e. un-select the 'Reduce to a single printed page when printed' on the Page Setup window.

Pages to be printed can be viewed in the 'Print Preview' opened from the file menu.

**Keyboard shortcuts 'Hot Keys'** can be used to build instructions in the symbols. To label the Hot Keys, select 'Display keyboard shortcuts...' in 'Options...'; Settings menu; OK.

The letters underlined in the prompt boxes e.g. Output, Motor etc, refer to the keyboard keys that can be used instead. Some instructions have different letters e.g. 'off' and 'on' are No and Yes. OK is Enter. [Use Alt & shortcut, to avoid textboxes].




## Monitoring the System and Logging Data

Mimic: Greenhouse

Monitoring a system is more exciting when an interface is connected and the real conditions are being observed, but it is still impressive when the system is being simulated. For either of these modes, however, calibration is needed and therefore we need to set Flowol for an interface.

### To set Flowol for an interface:

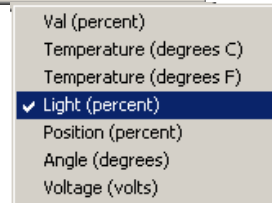
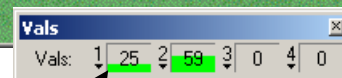
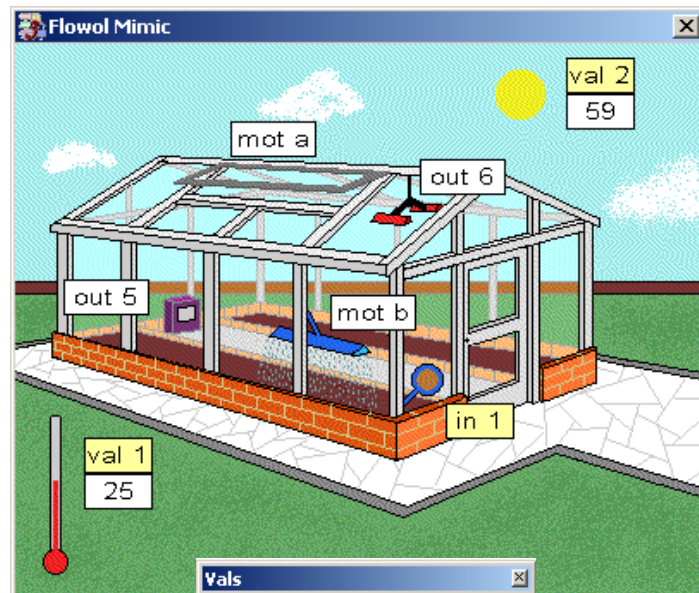
Settings menu – Interfaces – select the interface you are using or choose Contact Controller Plus or Deltronics Serial Interface Plus for the maximum inputs and outputs – COM 1- Save settings and OK.

For simulation mode, keep  the interface connection open.

When configured for an interface, the Val monitor bar [or Val window] gains drop down menus.

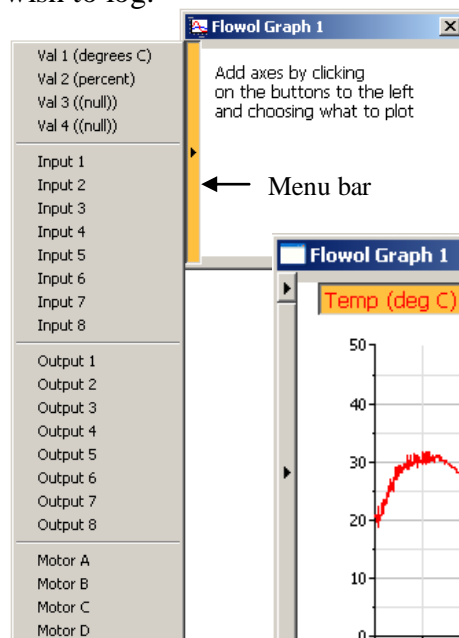
Use these drop down menus to choose the appropriate sensor calibration

(e.g. for the Greenhouse mimic: Val 1 - Temperature and Val 2 - Light). If you now drag the temperature reading in the monitor window you may have a different range.



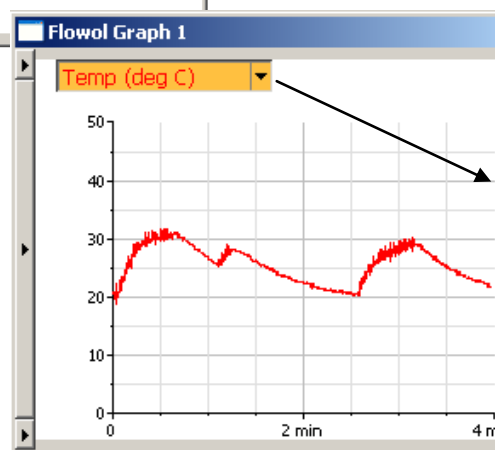
### Showing and Setting up a Graph

Clicking on 'Show graph' icon gives the first graph window. This has a side menu bar allowing you to select the data you wish to log.

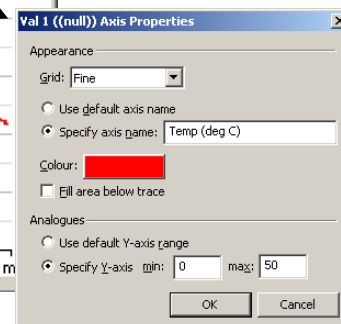


The time axis has the default setting for 2 minutes which keeps doubling up.

When one set of axes have been opened two further side menu buttons appear so other axes can be selected.



The button on the graph title opens the 'Properties' window for those axes.

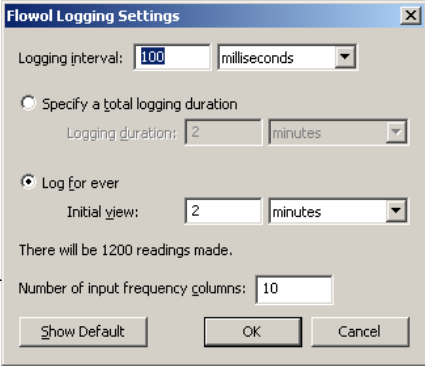


# Detailed Setup of Graph Windows

**Logging Settings.** Open the Logging Settings window .


The time axis default setting starts with a logging duration of 2 minutes which keeps doubling up forever.

To specify your own total logging time: change the logging interval and the logging duration independently. Note however, that Flowol can only log up to 20,000 samples.



The frequency bar chart for inputs is initially set at 10 columns, but this can be changed.

Returning to the default settings can be done by choosing 'Show Default'

**Open a graph window** by selecting  'Show graph' [Note four separate graph windows are available]

Open the left hand side menu and select the data to be logged. When one set of axes have been opened two further side menu buttons appear for other axes to be selected.

This example has two sets of analogue data, one Output [Light] and three Input switch frequencies being logged.

The number of sets of axes and the data displayed on those axes is your choice.

The axes can be removed or the 'Axis Properties' window opened from the dropdown menu by each title.

The name for the temperature axis has been changed.


The range of values to be displayed i.e. the max. and min. has also been specified.

Clicking on a title bar defines the axis to be displayed on the graph.

The Axis Properties of input 1 has been specified to display as a frequency graph and the name/title of input 1 changed to 'Garage Door'

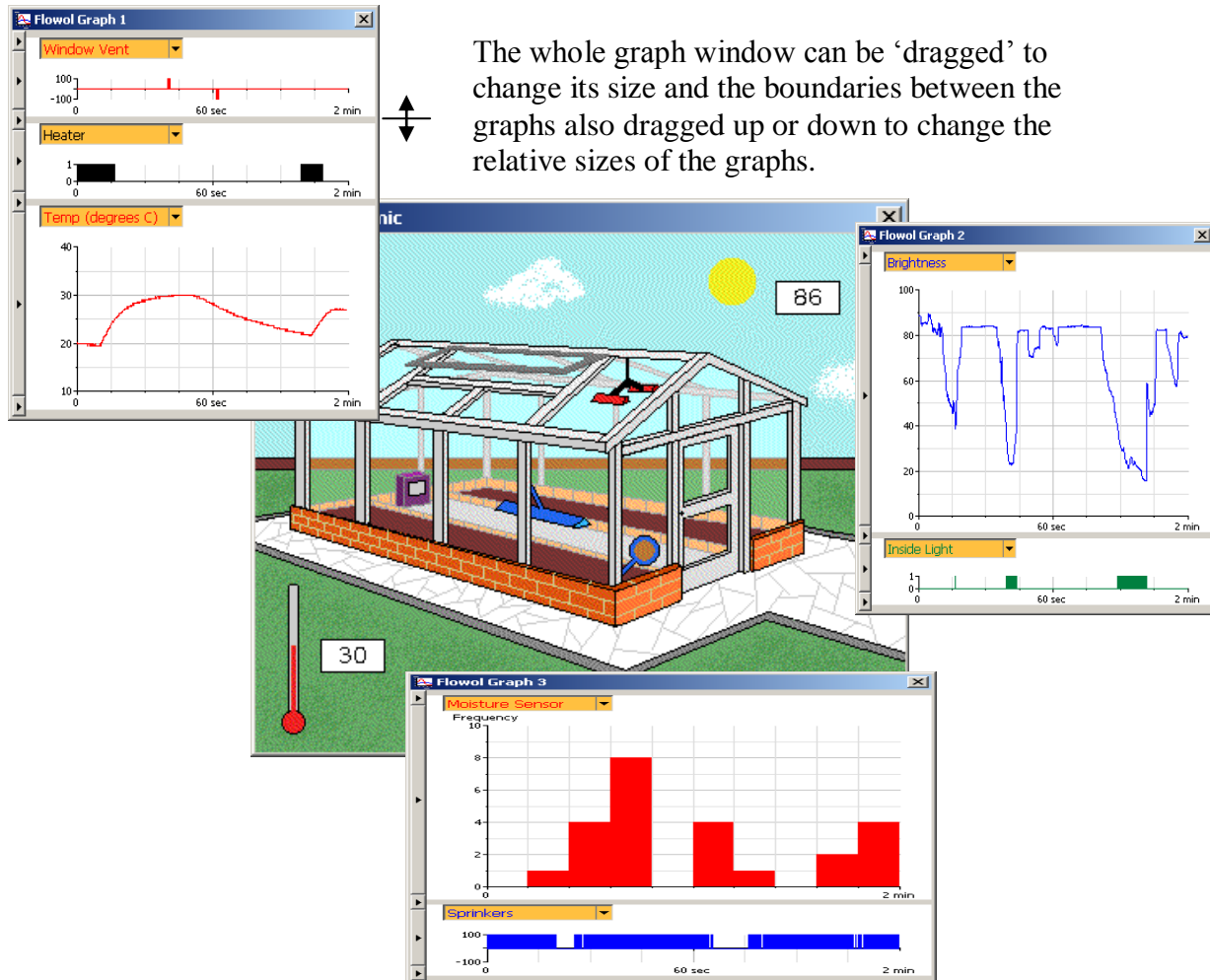
Note the data from the three inputs can be stacked or displayed adjacent [as shown].


## Multiple Graph Windows

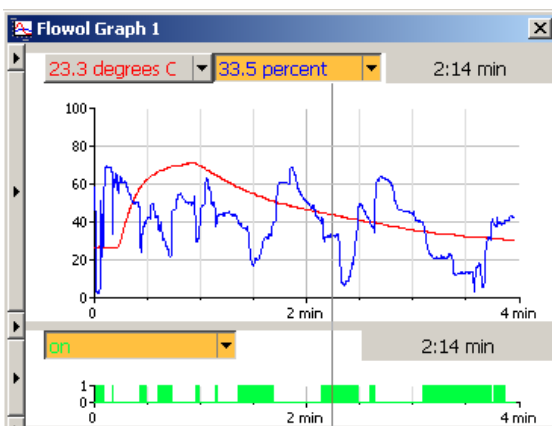
Additional graph windows can be opened from the Graph menu, or by selecting  again from the top toolbar.

**Note:** Up to four graph windows can be opened, each having multiple sets of axes.

When carrying out an investigation it might be appropriate to have the graph windows displayed around the mimic so the visual information is in a realistic context.



**Graph Values.** After opening a graph window click on the Graph Cursor icon .

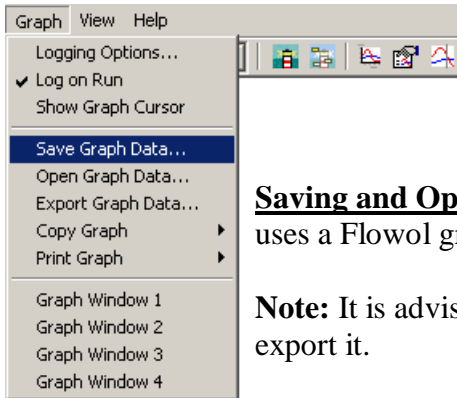


The vertical cursor line can be dragged across the graph to scan the values at the various times.

The corresponding readings are given in the title bars of each graph.

This is particularly useful to identify the maximum and minimum readings for analogue values, or the length of time an output device may have been turned on.

## Transferring Graph Data and the Graph Windows



Open the 'Graph' menu.

**Note:** 'Log on Run' will normally be selected so that graphical data is logged by default. Deselecting this will mean that no data is logged.

**Saving and Opening Graph Data** from Flowol and then back into Flowol uses a Flowol graph data [\*flogdata] file.

**Note:** It is advisable to always save graph data even if you then wish to export it.

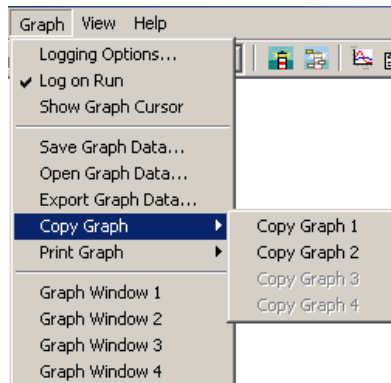
**Exporting Graph Data** for other applications can be saved as either \*.csv, \*.tsv or \*.sid files.

**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.

**SID** - This type of file can be used to export the data to other graphing applications e.g. Insight 2.


**Copy Graph:** to copy the graph window into another application.



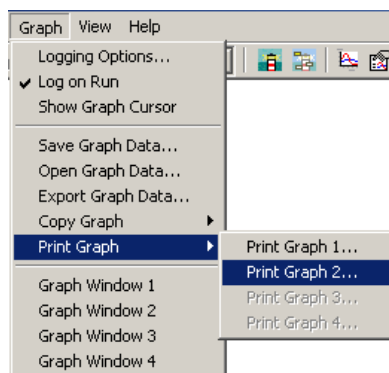
Choose 'Copy Graph' from the Graph menu. Select which graph window you wish to copy.

Open the second application e.g. Word, and paste the graph window.

To re-position the graph window:

- Click on the image; click on the 'Text Wrapping' icon  from the Picture toolbar and select Square.
- Drag the image to the required size and position it.

**Print Graph:** to print the graph window directly.



Choose 'Print Graph' from the Graph menu and select the graph window you wish to print.

- If the graph window only has a single set of axes, it will print on the top half of a sheet of paper in portrait.
- If the graph window has multiple axes, it will print over the whole sheet of paper in portrait.
- To print graphs in landscape choose Properties... on the Print dialogue that opens when using the Print graph option.


[Note: this will also change the page size and orientation of the flowchart printing since Flowol only communicates with one instant of the printer driver].

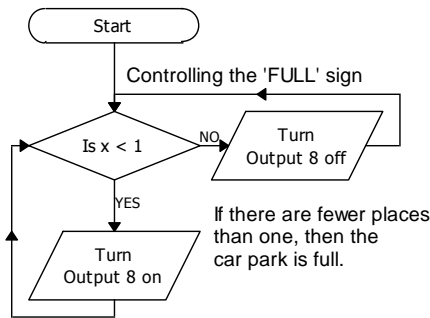
**Note:** It is often more flexible to copy and paste the graph window into Microsoft Word [as above] and print the graph from that application.



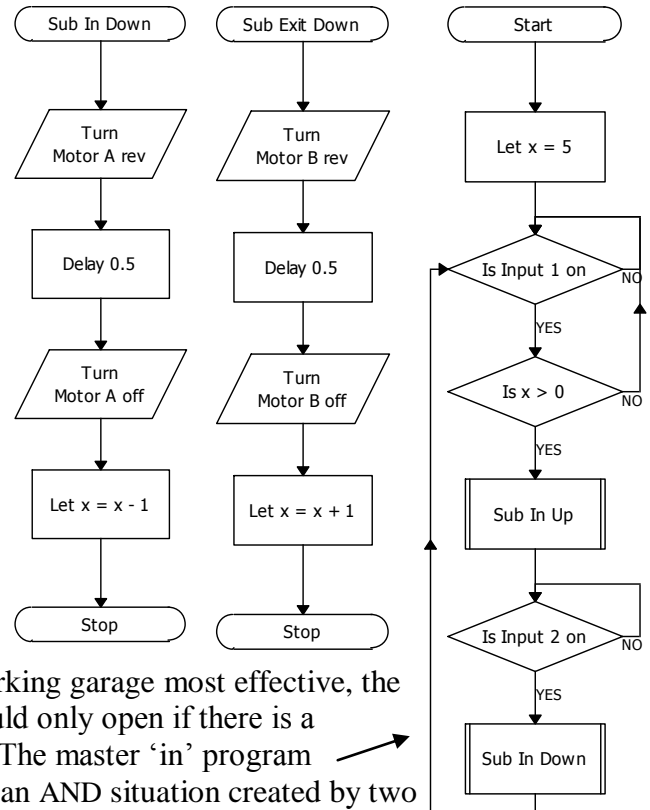
## Other situations using variables

### 1. Counting cars entering and leaving a parking area

- The two barriers of the parking garage are controlled by each having two subroutines and a main routine [see motorized barrier].
- If we assume there are 'x' spaces available [e.g. maximum of 5], we need to count this variable 'x' down when the 'in' barrier closes and use the closing of the 'out' barrier to count 'x' up when cars leave.
- The '**Full**' sign can then be triggered by this variable in a separate flowchart.
- The value of the variable can be observed by clicking on  to open the Variables window.

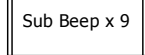


To make the parking garage most effective, the 'in' barrier should only open if there is a parking space. The master 'in' program therefore needs an AND situation created by two decision boxes. (Is input 1 on AND Is x > 0).

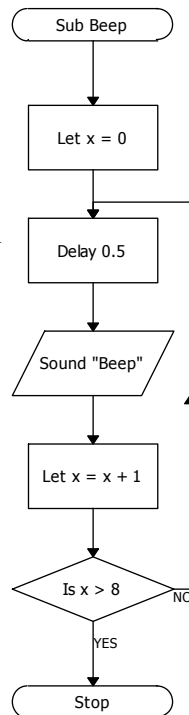


### 2 Repeating a Subroutine Beep at a pedestrian crossing.

Flowol can define the repetition of subroutines from the main procedure e.g.



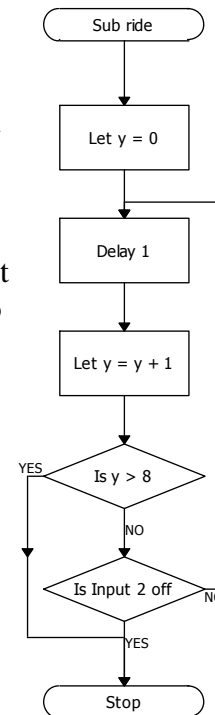
Subroutines can also be repeated by increasing a variable as shown by this flowchart.



### 3 Having a delay which can be interrupted

A fairground ride should have a specific run time, but it should also be possible to stop it at any time.

This subroutine counts up the variable 'y' at one second intervals for 9 seconds [until: Is y > 8]. But if Input 2 goes off then this 9 second delay is interrupted.



**4 Main routines running simultaneously but being interdependent.** A variable set in one main routine can be used to trigger another routine. (e.g. in a conveyor belt process each process must not start until the conveyor has stopped). The separate processes run simultaneously but may take different times. When each process has finished a variable is set and only when all these variables have been set can the conveyor start again.

[E.g. The Jam Factory Mimic example: More Secondary Mimics 1]

# Solar Water Heating Panel

## Resources

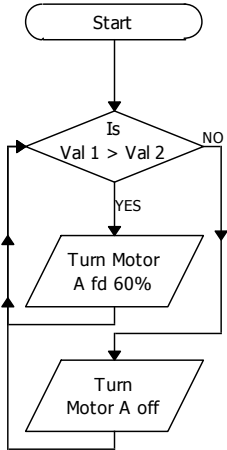
- val 1 and val 2 – temp. sensors
- Motor A – water pump
- val 3 and val 4 – light sensors
- Motor B – 6V motor (turntable)

## Skill:

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

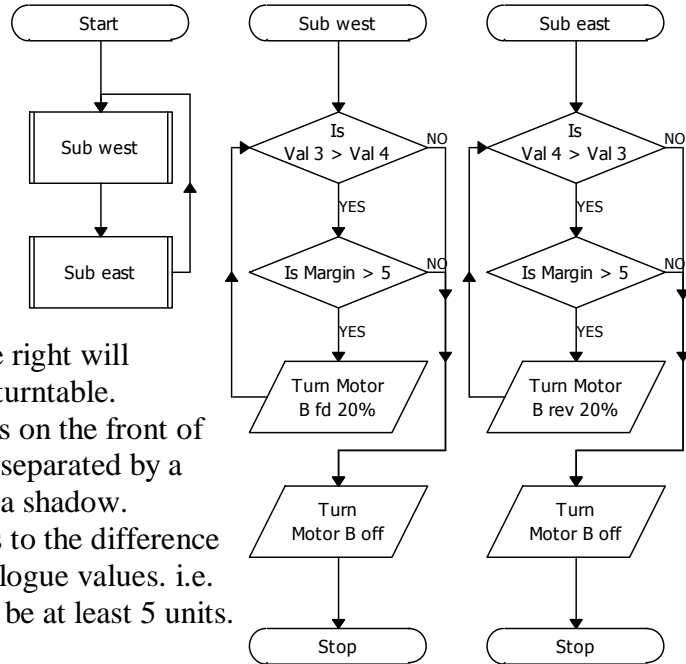
## Temperature Control:

The flowchart below will only pump the water if the panel temperature [val 1] is hotter than the temperature [val 2] of the water in the tank.



## Sun Seeker:

The flowchart on the right will control a motorized 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.



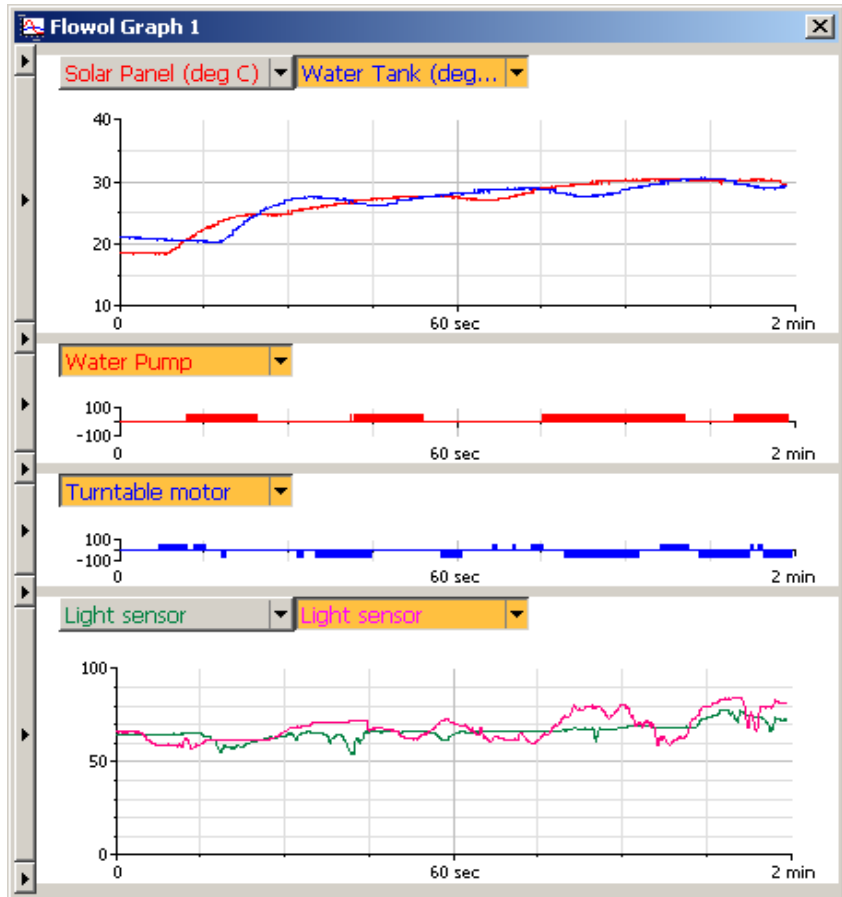
## Data Logging and Control.

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

- The pump motor A responds to the temp. difference.
- 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 changed [i.e. limits between 0 and 40].

## Save your Program



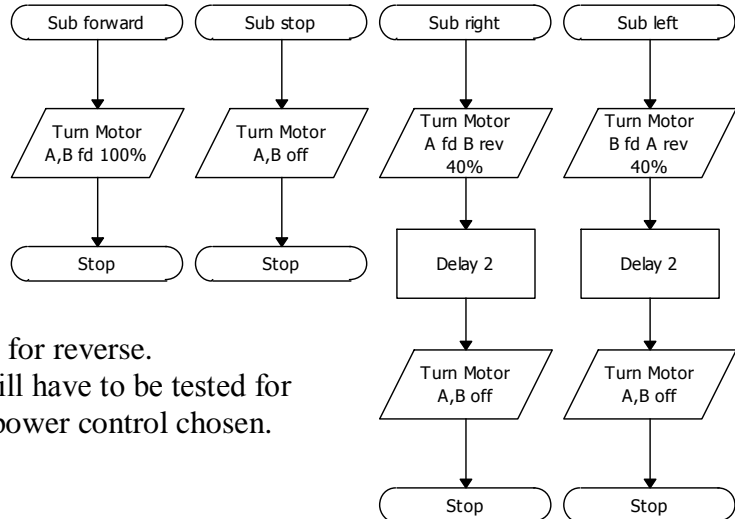
## The Robot Project

### Resources

Robot: which has two wheels each driven by separate motors.  
 Motor A [on the left] – 6V motor  
 Motor B [on the right] - 6V motor  
 Input 1 – ‘buffer’ switch on the front.

**Skill:** Nesting Subroutines.  
 Controlling motors in the same output symbol.

- 1 The movements of a robot can be defined by subroutines.
- 2 Each output box (symbol) can control all the motors if you wish.
- 3 The power control has to be the same for all the motors in the same symbol. Note: if power is 40% in one sub., then it stays at that value until it is re-defined.
- 4 Build these subroutines and also one for reverse.
- 5 The delays in the ‘right’ and ‘left’ will have to be tested for your particular robot and the motor power control chosen.

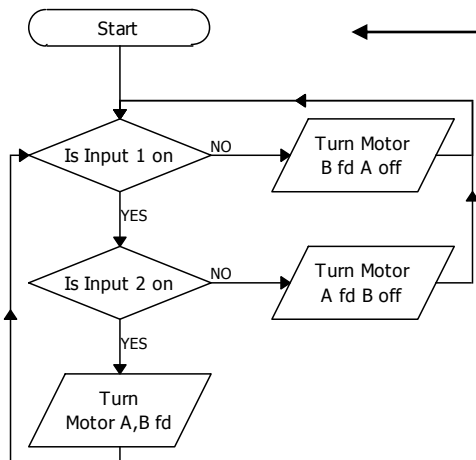


### Obstacle Course:

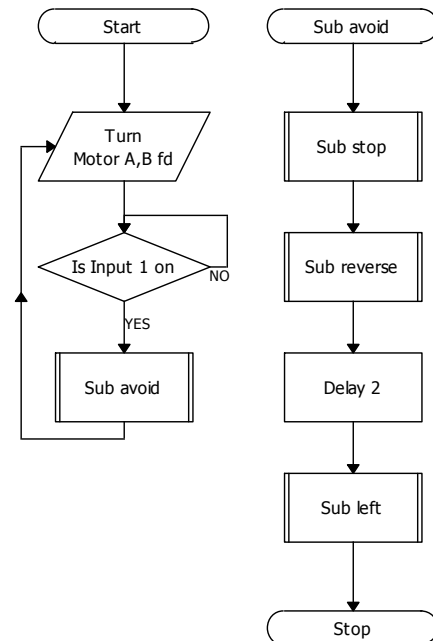
- 1 Build a master program to define the path needed to be taken around a course.
- 2 An emergency stop, similar to that on the Big Wheel ride, could be triggered with a ‘buffer switch’ [Input 1] on the front.

### Random Mover: (Cleaning the rug!)

- 1 Build a subroutine of the movement needed when the buggy hits an obstacle. [The one shown is only one possibility]. **Note:** Sub stop, is nested in Sub avoid.
- 2 Build the master program to trigger this routine.
- 3 You could have two different switches on the front!



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.**



### Installing Flowol 3 on a Windows Network

The Flowol 3 software comes with a Windows Installer on the CD ROM. When you insert the CD ROM into a workstation, most likely the installer will run automatically and the on screen instructions will allow you to install the software onto that machine.

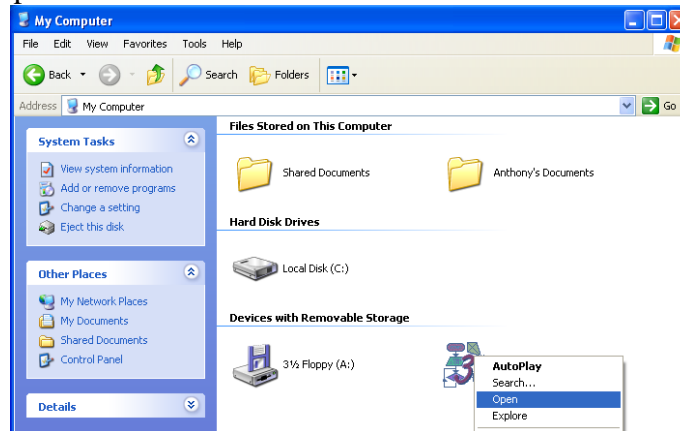
The installer copies the Flowol 3 program to the hard disk of the computer and creates a set of registry entries. Flowol 3 must be installed onto every workstation on which you want to use Flowol 3. It is not possible to run Flowol 3 by copying it to a central server and running it from there.

*You do not need to manually install Flowol 3 on every machine by hand! Read on!*

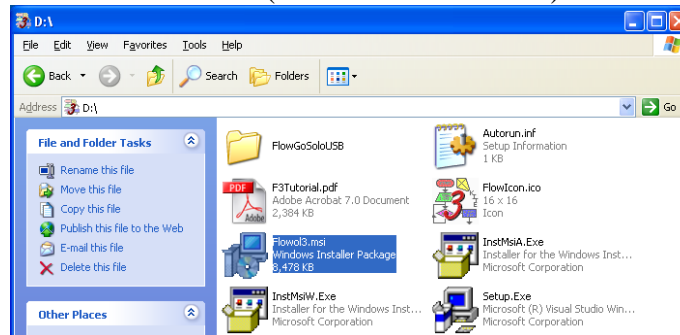
#### **A Windows Installer Package (.msi file)**

We have built the Flowol 3 installer as a Windows Installer 2.0 package (an .msi file). This file is called Flowol310.msi on the CD ROM. To see the Flowol3.msi file:

- Insert the CD ROM into a workstation.
- If the automatic installation starts, cancel it.
- Open My Computer:



- Right click on the CD ROM drive (has the Flowol 3 icon) and choose Open:



- Note the Flowol310.msi file. If you have your workstation configured to hide file extensions, then it may just be listed as Flowol3, but have the same icon as shown above.

#### **Deploying .msi files**

In most cases, networks in schools come with a piece of administration software which will take the Flowol310.msi file and deploy it across the network to your chosen workstations. Check your network documentation for information on deploying Windows Installer Packages. On the following pages are instructions for *RM networks*, and installing with *Windows Group Policy*.

## Installing Flowol3 onto the RM Community Connect 3 network system

Only the site license version of Flowol 3 should be installed onto a network.

For updates and corrections to the information given here, look on the web at

<http://www.flowol.com/Flowol3/RMConnect3.aspx>

[You can follow along in the *Community Connect 3 Reference Manual, Chapter 7, section entitled 'Deploying a Non-Curriculum Choice Windows Installer Package', page 101]*

[*Creating the folder structure on the server*]

1. At a workstation, log on as a system administrator.
2. Browse to Q:\Applications. In the Applications folder, create a new folder and name it Flowol3.
3. In the newly-created Flowol3 folder, create another folder called Shortcuts. In the newly-created Shortcuts folder, create another folder also called Flowol3. Thus you have created the folder structure Q:\Applications\Flowol3\Shortcuts\Flowol3.

[*Copying the Windows Installer package to the server, page 102*]

4. Copy all of the files from the Flowol3 program CD Rom into the first Flowol3 folder you created, i.e. into Q:\Applications\Flowol3.
5. In the RM Management Console, select the Workstations option, right-click Main Site and then choose Update Package List.
6. Right-click on Workstation and choose Properties.
7. Select the Packages tab at the top of the dialog box.
8. In the list of Available Packages, choose Flowol3.
9. Click Allocate and then click on OK.
10. Restart the workstation to install Flowol3 onto it.

[*Copying shortcuts to the server*]

11. Log on again to the same workstation as system administrator.
12. Locate the Flowol 3 shortcut by browsing to C:\Documents and Settings\All Users\Start Menu\Programs\Flowol 3.
13. Copy the Flowol 3 shortcut to the folder you created at Q:\Applications\Flowol3\Shortcuts\Flowol3
14. In the RM Management Console, Resources, Program Sets option double-click on Data Logging & Control.
15. Select the Shortcuts tab at the top of the dialog box.
16. In the Source list, choose Flowol3.
17. In the Available Shortcuts list, choose Flowol 3.
18. Click '>' button and then click on OK.

You can now deploy the Flowol3 package to different workstations on your network.

If you are going to use the FlowGo or SOLO interface via the USB port, when you plug the FlowGo/SOLO into the USB port on the workstation, follow these steps:

1. When asked for the Administrator password, make sure you provide the correct domain.  
E.g. RMTRAINING\SystemAdmin
2. Wait for the Found New Hardware dialog
3. Choose the default option, Install Software Automatically.

## Windows 2000 or 2003 Server Network via Active Directory/Group Policy

Microsoft provides automatic deployment via Group Policy. For information on Group Policy see <http://www.microsoft.com/windowsserver2003/gpmc/default.mspx>

To install Flowol 3:

1. Logon to the Windows 2000, or 2003 server machine as an Administrator.
2. Create a network share on the server and copy the Flowol310.msi from the CD.

Then (without the Group Policy Management Console):

3. Click **Start, Programs, Administrative Tools, Active Directory Users and Computers**.
4. Right-click the organizational unit to which you want to apply the package, and then click **Properties**.
5. Click the **Group Policy** tab.
6. If you have an existing group policy, skip to step 7. If you need to create a group policy, click **New**, type a descriptive name for the group policy, and then press **ENTER**.
7. Click the group policy, and then click **Edit**.

Or (with the Group Policy Management Console):

3. Click **Start, Programs, Administrative Tools, Group Policy Management**.
4. Expand the Forest and Domains tree nodes to show the domain node of your domain.
5. Click on the domain.
6. If you have an existing group policy, skip to step 7. If you need to create a group policy, right click the domain and choose **Create and Link a GPO Here...**, type a descriptive name for the group policy object, and then press **ENTER**.
7. In the right hand pane, right click the group policy object and choose **Edit**.

And finally:

8. To deploy with a computer-based policy, double-click the **Computer Configuration** branch to expand it, double-click **Software Settings**, right-click **Software installation**, point to **New**, and then click **Package...**
9. Browse to the network share that contains the Flowol310.msi package, choose the Flowol310.msi package, and then click **Open**.
10. When asked which deployment method to use, choose **Assigned** and then OK.

### Installation using the msiexec.exe command line [Advanced users only]

If you're familiar with logon scripts and batch files, you can call the Flowol 3 installer from the command line using msiexec.exe. Command line arguments for msiexec.exe can be found at [http://msdn.microsoft.com/library/default.asp?url=/library/en-us/msi/setup/command\\_line\\_options.asp](http://msdn.microsoft.com/library/default.asp?url=/library/en-us/msi/setup/command_line_options.asp)

To run the setup with the user interface call

```
Msiexec.exe /i D:\flowol310.msi
```

To run the setup silently, call

```
Msiexec.exe /i D:\flowol310.msi /qn
```

(Note this will result in the restart happening automatically)



### Flowol 3 Index and Glossary

**Calibrating:** The program needs information about the type of sensors being used on the analogue inputs so that appropriate readings can be displayed. If Flowol has been set/configured for an interface, click on the down menus on the ‘Val’ monitor bar and choose the appropriate sensor [p.26].

**Colors:** The colors of the flowchart symbols and lines can be changed to suit the user. To do this, select the Settings menu - Options... - Colors (Note: strong colors may be useful for demonstrations but strong flashing colors can be hazardous) [p.13]

**Com:** The value of the Com needs to be selected when using the Serial port, so that the computer can communicate with the interface [p.5].

**Configure:** Flowol is normally set/configured assuming it is not connected to an interface. When you wish to use an interface you need to re-configure Flowol [p.4].

**Copy Flowchart:** Highlight the appropriate section of flowchart and click on the copy icon on the top toolbar. To paste the flowchart back into the same application or another Flowol application, click on the paste icon, move the ghost image to the new position on the workspace and place. To paste into a word processor, position the cursor and select the paste icon [p.17].

**Copy Graph:** Choose ‘Copy Graph’ from the Graph menu. Paste.. etc [p.29].

**Data Logging:** Information from sensors can be displayed on graphs, saved and re-opened or exported to other applications [p.26 – 29].

**Decision** symbol refers to information, and decides if ‘Yes do this’ or ‘No do that’. The information might be a switch turning on or off, or the light or temperature levels changing, or a variable reaching a specified value i.e. ‘Is Input 2 on’ or ‘Is Val 1 > 25’ [p.14].

**Digital** inputs can only be off or on e.g. switches, pressure pads etc [p.14].

**Edit** (hand) tool is needed to highlight a symbol, line, label or section of flowchart so it can then be erased, changed or moved. (Note: Using the right mouse button is a shortcut to the edit tool) [p.10].

**Erase** tool, allows a highlighted symbol, line or section of flowchart to be removed [p.10].

**Exporting:** Graph data can be exported as SID, CSV or TSV files for other applications [p.29].

**Feedback** occurs when some change in the controlled system is detected by the inputs, which then alters the behavior of the system. E.g. when a moving barrier hits a switch which then stops the movement [p.23] or a temperature sensor controlling a heater, turns the heater off when it gets too hot [p.24].

**Flogdata** file is the Flowol graph data file for graphs which can be re-opened back into Flowol [p.29].

**Flowchart** is the group of instruction symbols connected in the right order to create the Flowol program [p.9].

**Graphs:** Digital and analogue data from inputs can be logged and displayed as bar charts [p.27] or line graphs [p.26-28] respectively. The response of the outputs and motors can also be displayed on the graphs. The information can be exported as SID, CSV or TSV files [p.29] for other applications or a flogdata file to re-open back into Flowol. The graph window can be opened by selecting the ‘Show graph’ icon [p.26].

**Graph values:** A vertical cursor can be scanned across the graphs to display the values at particular times [p.28].

**Grid** (from Properties.. on graphs window) allows the number of grid lines to be changed on the graph [p.26].

**Hot Keys:** Some letters in the prompt boxes are underlined e.g. Output, Motor etc, which refer to the keyboard shortcuts which can be used instead of using the prompt box. Some instructions have different letters e.g. ‘on’ and ‘off’ are Yes and No. OK is Enter or Return [p. 25].

**Inserting symbols:** Another symbol can be inserted automatically in a vertical flowchart. Place the new symbol on the flowchart line in the correct place [p.10].

**Installation** is needed to get the Flowol program from the CD on to your computer [p.3] or [p.33].

**Interface:** These are the control boxes which transfer the instructions from the Flowol program on the computer to the real devices being controlled. Several different Serial and USB interfaces can be used. The interface window can be opened by choosing the Setting menu and Interfaces... [p.5].

**Labels:** Select the Text Tool ‘T’, position and click the ‘window’ on the flowchart. Write the label in the text window. Use the font toolbar to vary the style [p.10].

**LDR** is a Light Dependent Resistor and is the usual type of light sensor [p.14].

**Lines** are used to link the symbols together to create the flowchart. Select the line from the toolbar. Click on the symbol you want it to start from, and then click on the symbol you want it to go to [p.9]. When a decision symbol is being connected, then both a YES or NO decision has to be made [p.14].

**Log on run** (in Graph menu) will normally be ticked so that graphical data is logged by default. Un-ticking this will mean that no data is logged [p.29].

**Margin** refers to the difference in reading between two analogue sensors e.g. ‘Is Val3 > Val4’ and ‘Is margin > 5’ [p.31].

**Mimics:** These are controllable pictures which allow the control solution to be tested in simulation mode. Parts of the mimic will animate to show the response of the outputs and sensitive areas can be clicked on, to simulate the inputs. Use the ‘Open a mimic’ icon on the top toolbar to select the mimic and the ‘Show mimic labels’ icon to display the labels [p.9].

**Monitor bars** show (monitor) the state of the inputs and outputs. These are normally displayed at the bottom of the workspace [p.11].

**Motors:** These outputs control motors which can go forward and in reverse. Power control of the motor is also possible [p.18].

**Move** individual symbols, labels or a group by selecting the Edit tool (hand). Click on the symbol in the flowchart to be moved, it will highlight. Use the left mouse button to drag the symbol and then release. 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). Select any one of the highlighted symbols to drag the group [p.13].

**New:** Icon on the top toolbar will clear the workspace ready for a new flowchart.

**Open:** Icon on the top toolbar will open a .flo file folder.

**Open Graph data** (from Graph menu) will allow data, in the form of a flogdata file, to be loaded back into the Flowol graph window [p.29].

**Output** symbol is used to turn an output [p.9] or motor [p.18] on or off, or call up a previously recorded sound [p.16]. Note: if needed, all the outputs can be turned on or off in one symbol and all the motors can be turned on or off in the one symbol.

**Page Setup** (File menu) can change the workspace dimensions, alter portrait to landscape and allow you to select single sheet printing [p.25].

**Paste** allows copied sections of flowchart to be pasted back into Flowol or a word processor [p.17].

**Print Graph** (from Graph menu) allows the whole graph to be printed [p.29].

**Print Icon** allows the whole flowchart to be printed directly [p.11].

**Print Preview** (from File menu) allows the flowchart pages to be observed [p.25].

**Process** symbol is most frequently used for a delay [p.9] but is also needed to call up the subroutines [p.15] or set up variables [p.21] e.g. 'Delay 5' or 'Sub flash x 5' or 'Let  $y = x + 1$ ' respectively.

**Prompt boxes:** When a flowchart symbol is placed on the workspace an appropriate 'prompt box' appears at the bottom of the screen. The instructions for that symbol are achieved by clicking on the options made available in the prompt box [p.9].

**Recursive:** This is when a section of flowchart keeps repeating a process e.g. a flashing light [p.10].

**Redo** allows you to step forward again in the flowchart construction if you have used Undo [p.12].

**Remote:** If a remote interface is being used e.g. FlowGo, Solo etc then the 'Remote' button transfers the program to that device.

**Repeating Subroutines:** When calling up a subroutine from the main program, the number of repeats can be defined directly [p.15] or controlled with variables [p.30].

**Run What?** allows a subroutine or selected flowcharts to run on their own [p.15].

**Save:** Use the Save (disc) icon to save the flowchart with its current filename.

**Save As...** (in File menu) will allow the flowchart to be saved as a .flo file with a new filename [p.9].

**Save Graph data** (in the Graph menu) allows the information to be saved as flogdata file [p.29].

**Sensors:** Digital inputs are either off or on, and can be produced by switches, pressure pads etc. Analogue sensors produce a range of input values, e.g. light intensity, temperature, noise level etc. If the program has been configured for an interface, the drop down menus on the val monitor bar allows you to calibrate the sensors [p. 26].

**Scale View:** To change the size of the flowchart, change the 'Zoom' value on the top icon bar [p.12].

**Serial:** The Serial port allows the computer to be connected to some interfaces [p.5].

**Show graph:** Use the icon on the top toolbar to open the graph window [p.26-28].

**Simulate:** [when the connection plug is open on the left hand toolbar] The mimics can then be 'clicked on' to simulate the effect of the inputs being changed. Click on the actual item (switch, Sun etc) on the mimic, not on the label [p.14]. To simulate the change in analogue value from a light or temperature sensor: click on the displayed number on the mimic with the left mouse button to increase the reading in steps of 5, and right mouse button to decrease it [p.19]. The analogue input can also be changed by dragging or clicking on the val reading in the val monitor bar at the bottom of the workspace [p.24]. To operate an interface which is connected, click on the connecting icon, to close it.

**Sound:** Pre-recorded sound files or those recorded on the Windows 'Sound Recorder' (opened with the Sound Recorder icon on top toolbar) can be called up like an output in the flowchart [p.16].

**Speech** can be called up like an output. Type the speech in the window [p.20].

**Speed of Program:** Reducing the speed of the flowchart is sometimes useful when demonstrating or checking for errors. Select the 'Speed' from 'Toolbars' in the View menu and adjust the slider [p.12].

**Start** symbol is needed at the beginning of a flowchart program. Many separate flowcharts can be created (each with their own 'Start' symbol). This number of Starts available may be less when configured for some interfaces e.g. FlowGo & Solo [p.9].

**Stepping through the program:** Select the 'Speed' bar, from 'Toolbars' in the View menu. Pause the flowchart by clicking on the icon on the Speed toolbar, then step from one symbol to the next using the Spacebar or step icon [p.12].

**Stop** symbol is needed at the end of a subroutine, and at the end of a program that is not recursive (repeating) [p.9].

**Stop all** (in the Start/Stop prompt box) allows all the routines to be turned off from within the control procedure [p.22].

**Subroutine** is a piece of program (a flowchart) which can be called up by a main routine. Note: Subroutines must be defined before the main program [p.15].

**Symbols** represent the different types of commands which can be used to build up the flowchart program [p.8]. To use a symbol, click on the symbol to select it; click again on the workspace to position it [p.9].

**Testing the mimic:** Click on the input or output number or motor letter in the monitor bars [p.18]. For motor, use left mouse button for forward and right button for reverse [p.18]. With some mimics you can click on the actual item (not the label) on the mimic [p.12]. To test the change in an analogue reading from a sensor: click on the displayed value on the mimic with the left mouse button to increase in steps of 5, and right mouse button to decrease the value [p.19].

**Testing the interface:** Configure the program for an interface ('Interface..' in the Settings menu) [p.5]. Check that the connecting plug icon on the left hand toolbar is closed. Click on the outputs on the monitor bars or mimic to change the state of the outputs. The output on the interface should also change. Change the inputs on the interface and the input monitor bars should also respond.

**Text 'T'** symbol allows headings or comments to be added to the flowchart [p.10].

**Time interval** and logging options of graph axes can be changed by selecting the 'Logging Options' icon on the top toolbar. The time axis has a default setting of 2 minutes which keeps doubling up indefinitely. This setting can be changed [p.27].

**Toolbars** on the left-hand side and top of the workspace allow you to select the symbols/tools or icons to help you build and process the program [p.8].

**Tooltips** are provided next to the flowchart symbols, so you can read them more easily when Zoom<80% [p.12].

**Tutorial:** As you progress through the tutorial, examples of control are introduced progressively. The features of Flowol are introduced and explained at each stage to achieve the control solutions [p.6].

**Undo** allows you to go back to an earlier stage of your flowchart construction [p.12]

**USB:** The USB (Universal Serial Bus) can be used to connect the computer to some types of interfaces [p.5].

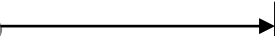
**Vals** are the values of the reading from analogue sensors [p.19 & p.24-27].

**Variables** are letters that can be assigned a value (Let  $n = 10$ ). These variables can then be mathematically manipulated. These are useful when counting, repeating subroutines and linking separate flowcharts. The variable window can be opened by choosing the 'xy' icon on the toolbar [p.21-22 & p.30].

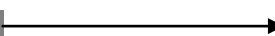
**Workspace** is the area on the screen where the flowchart can be built up [p.7].

**Zoom:** When the flowchart becomes too large to be seen in one frame, use the zoom (Scale view) to observe more symbols on the monitor screen [p.12].

*Flowol*



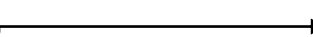
*Primary/Secondary*



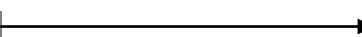
*Tutorial*

**Notes**

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