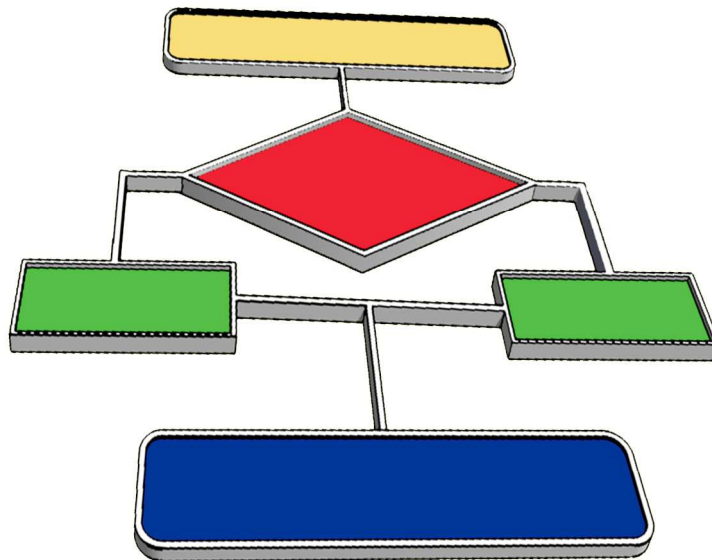


# LOGICATOR



## A guide to using Logicator flowchart control software

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# Contents

|   |     |
|---|-----|
| Overview.....                               | 4   |
| The main work area in Logicator .....       | 4   |
| Connecting an Interface .....               | 5   |
| Selecting the Interface Type .....          | 5   |
| Selecting the COM number .....              | 6   |
| The Toolbar menu .....                      | 7   |
| Menu Options.....                           | 7-8 |
| Creating a flowsheet.....                   | 9   |
| The Command menu.....                       | 9   |
| The Flowsheet work area .....               | 9   |
| The Map .....                               | 9   |
| Adding a command cell .....                 | 9   |
| Cell Details Dialogue Box.....              | 9   |
| Labelling a command .....                   | 9   |
| Deleting a command .....                    | 9   |
| Moving commands.....                        | 9   |
| Cutting, Copying and Pasting.....           | 10  |
| Selecting a block of commands .....         | 10  |
| Moving a selected block.....                | 10  |
| Routes .....                                | 10  |
| Drawing Routes .....                        | 10  |
| Deleting Routes .....                       | 11  |
| Inserting Commands .....                    | 11  |
| Inserting Rows .....                        | 11  |
| Deleting Rows.....                          | 11  |
| Inserting Columns.....                      | 11  |
| Deleting Columns .....                      | 11  |
| Decision commands and their routes.....     | 11  |
| Drawing routes from a Decision command..... | 11  |
| <br>Instrument Panels                       |     |
| The Digital Panel.....                      | 12  |
| The Analogue Panel.....                     | 12  |
| The Variables Panel .....                   | 12  |
| The Time Panel.....                         | 12  |
| The Graph Window .....                      | 13  |
| Log command.....                            | 13  |
| <br>Common commands                         |     |
| Start command.....                          | 14  |
| Stop command. ....                          | 14  |
| Outputs command .....                       | 14  |
| Motor command .....                         | 14  |
| Wait command.....                           | 14  |
| Decision command.....                       | 15  |

|                              |    |
|------------------------------|----|
| Comment command.....         | 14 |
| Sound command .....          | 14 |
| Count command.....           | 14 |
| Log command .....            | 14 |
| Decision command.....        | 15 |
| Variables                    |    |
| Compare command.....         | 16 |
| Expression command. ....     | 16 |
| Inc command.....             | 16 |
| Dec command .....            | 16 |
| Input command .....          | 17 |
| In command.....              | 17 |
| Out command.....             | 17 |
| Procedures                   |    |
| DoProc command.....          | 18 |
| Procedure command.....       | 18 |
| End command .....            | 18 |
| Interrupt command.....       | 19 |
| Interrupt Setup command..... | 19 |
| Animation                    |    |
| Play command .....           | 20 |
| Message command. ....        | 20 |
| Hide Message command .....   | 20 |
| Picture command .....        | 20 |
| Hide Picture command.....    | 20 |

## Overview

Logicator provides a graphical environment for designing, testing, editing and downloading control algorithms in the form of a stylised flowchart. A flowchart can be run as a program to control electrical circuits, robots and model systems via an interface, or simulated on-screen systems.

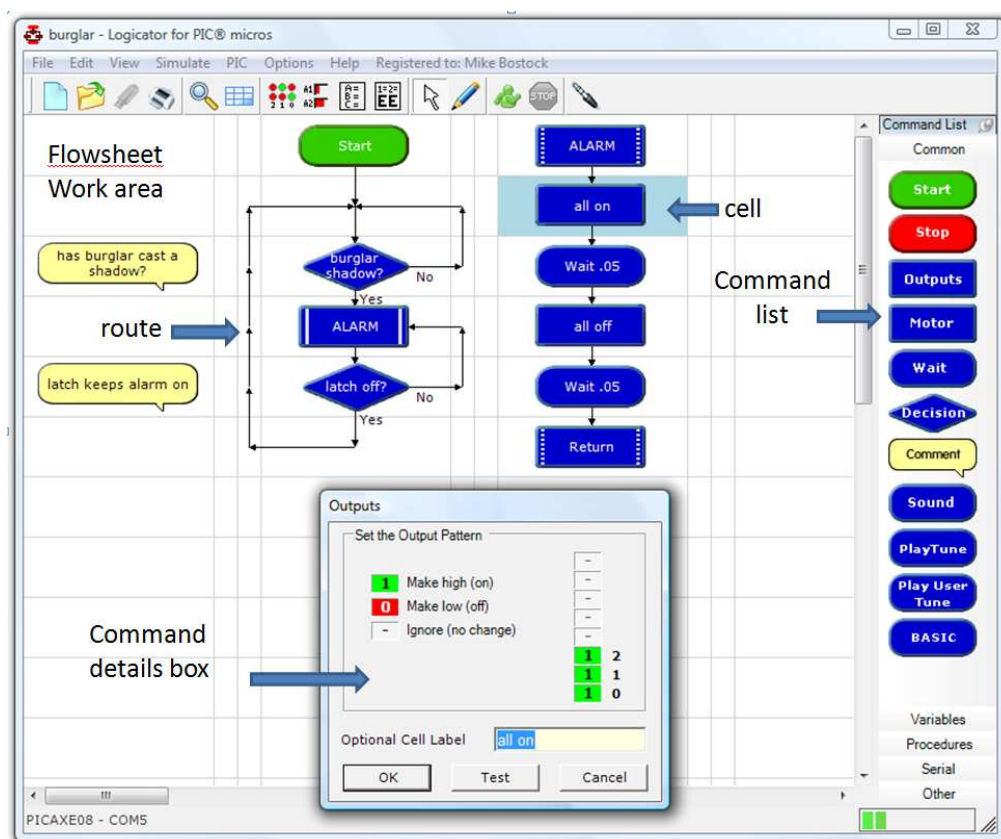
The range of Logicator commands supports a range of control functions to provide function to output devices, such as motors and lamps. We can switch devices on or off in sequences using: timing, counting, repetition, and decisions based on signals from digital and analogue sensors.

Programming using Logicator can take either a top-down (system-level design) approach or a bottom-up (experimental) approach. The ease with which sections of tested code can be moved to form procedures, or sub-programs, supports these approaches.

For up-to-date information about Logicator please visit [www.logicator.net](http://www.logicator.net)

Please note that *Junior Logicator* uses a smaller set of commands to those described in this guide.

## The main work area in Logicator



Logicator provides a cellular work area, like a spreadsheet. Commands can be dragged from a menu into a cell. A command can then be double clicked to enter additional data related to the command. Program flow from one cell to the next is via routes, which can be drawn in the direction of flow by chosen the drawing (pencil) tool.

## Connecting an interface

### Interface Types

The following Interfaces or control boxes can be used with Logicator:

|  |   |
|--|---|
| Economatics Smart Box                      | Deltronics Junior Interface                 |
| Economatics Control Station                | Deltronics Control IT (& Serial Adapter)    |
| Economatics Discovery                      | Deltronics Control IT (& Extra Sense)       |
| Fischertechnik Intelligent Interface 30402 | Commotion Coco USB Interface (plastic case) |
| Fischertechnik Robo Interface 93293        | Commotion Coco USB Interface (metal case)   |
| Lego Interface B                           | Commotion Coco Serial Interface             |
| Lego Mindstorms RCX                        | Commotion Coco Junior Interface             |
| Lego Mindstorms Scout                      | Data Harvest FlowGo                         |
| Lego Mindstorms NXT                        | Data Harvest Contact Controller             |
| Deltronics Control and Datacapture         | Data Harvest Contact Controller Plus        |
| Deltronics Serial Interface                | Unilab Serial Computer Module 540.027       |

Please contact the publisher for information about any interfaces not mentioned above.

Please note that some of the above interface choices will work with other control boxes not on this list. For example, the Deltronics control boxes have been supplied under a range of other names.

### Selecting the Interface Type

To select an Interface type for a Logicator flowsheet to control choose Options > Setup Interface.

The following dialogue window will appear:

The screenshot shows the 'Interface Setup' dialog box with the following details:

- Step 1:** 'Select the interface:' with a list box containing: Economatics Smart Box, Economatics Control Station, Economatics Discovery, Fischertechnik Intelligent Interface 30402, Fischertechnik Robo Interface 93293, and Lego Interface B. 'Economatics Smart Box' is selected.
- Step 2:** 'Select the cable type:' with radio buttons for: Serial (9 pin D shape), Serial (with external USB adapter) (selected), USB, and Bluetooth / Radio.
- Step 3:** 'Select the COM port:' with a list box containing: COM 1, COM 2, and COM 3. 'COM 1' is selected. A 'Setup' button is next to the list.
- Step 4:** 'Select interface option' with checkboxes for 'Number 1-8 (not 0-7)' and 'Invert Input Polarity', both of which are unchecked. Below this is a 'Sensors:' section with four dropdown menus, all set to 'Analogue'. Buttons for 'Cancel', 'Save', and 'Save and Connect' are on the right.

In Step 1 choose the required Interface or control box from the drop-down list.

In Step 2 choose the cable type that connects the interface to the computer.

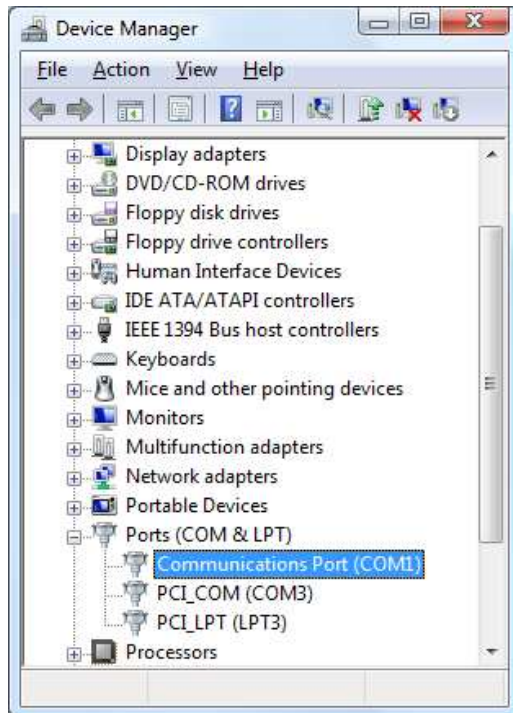
In Step 3 choose the COM (communication port) number used by your computer.

In Step 4 (if not greyed out) choose the required numbering of the input and output bits (either 0-7 or 1-8) and identify the names of the sensors attached to the four analogue inputs.

Then choose 'Save', or 'Save and Connect' to immediately connect the control box.


## Selecting the COM number (port ID)

















In Step 3 of the Interface Setup dialogue the COM number can be determined by clicking the 'Setup' button. If you have administrator permissions to make this change on your computer the Device Manager window will open. In the Device Manager click 'Ports (COM and LPT)' Click [+]. Note the COM number (X) in the line that says 'Communications Port (COM X)'. Apply this number in Step 3. i.e. Choose 'COM X' from the drop down menu.



## The Toolbar menu

The commonly-used menu options appear as icons in the toolbar at the top of the flowsheet.



|   |   |   |   |
|---|---|---|---|
|    | File New - creates a new blank flowsheet            |    | Analogue Panel - displays or hides the analogue panel   |
|    | File Open - shows the file open dialog              |    | Variables Panel - displays or hides the variables panel |
|    | Save - saves the current flowsheet                  |    | Graph Panel - displays the graph of analogue channels   |
|    | Print - prints the current flowsheet                |    | Select Mode - switches to select mode                   |
|    | Zoom - shows the flowsheet zoom dialog              |    | Line Draw Mode - switches to line drawing mode          |
|    | Map - shows the map window                          |    | Connects to an interface                                |
|    | Soft Systems - shows the available Soft Systems     |    | Run - runs the flowsheet                                |
|  | Digital Panel - displays or hides the digital panel |  | Stop - stops the flowsheet running                      |

## Menu Options The available Menu Options are:

|      |                      |   |
|------|----------------------|---|
| File | New                  | Clears the current flowsheet and starts a new one               |
|      | Open...              | Opens a saved flowsheet file                                    |
|      | Import               | Imports a flowsheet from an earlier version of Logicator        |
|      | Save                 | Saves a flowsheet, updating the saved version                   |
|      | Save As...           | Opens a dialogue to select a directory and choose a filename    |
|      | Page Setup...        | Opens a dialogue to choose the size of paper for printing       |
|      | Print Options...     | Opens a dialogue to choose the header and footer text           |
|      | Print Area           | Makes the selected area of the flowsheet the area to be printed |
|      | Print Preview        | Shows how the printout will look                                |
|      | Print                | Opens the standard print dialogue                               |
| Edit | Exit                 | Closes the Logicator application                                |
|      | Undo                 | Undo the last change  |
|      | Redo                 | Redo the last change that was undone                            |
|      | Cut                  | Cut the command or area of flowchart selected                   |
|      | Copy                 | Copy the command or area of the flowchart selected              |
|      | Paste                | Pastes the command or area that has been copied or cut          |
|      | Delete Cell Contents | Deletes the command data stored in a cell                       |
|      | Insert Row           | Inserts a row in the flowchart at the position selected         |
|      | Delete Row           | Deletes a row in the flowchart at the position selected         |
|      | Insert Column        | Inserts a column in the flowchart at the position selected      |

|                   |                            |   |
|-------------------|----------------------------|---|
|                   | Delete Column              | Deletes a column in the flowchart at the position selected          |
|                   | Swap yes and no            | Swaps the 'yes' and 'no' routes from a decision command             |
| <b>View</b>       | Digital Panel              | Shows or hides the Digital Panel                                    |
|                   | Analogue Panel             | Shows or hides the Analogue Panel                                   |
|                   | Variables Panel            | Shows or hides the Variables Panel                                  |
|                   | Graph Panel                | Shows or hides the Graph Panel                                      |
|                   | Time Panel                 | Shows or hides the Time Panel                                       |
|                   | Map Window                 | Shows or hides the Map Window                                       |
|                   | Show Grid                  | Shows or hides the grid which shows cell positions                  |
|                   | Status Bar Display         | Shows the status bar display below the flowsheet window             |
|                   | Zoom...                    | Displays the flowsheet at 50% 75% 100% or 125% of its size          |
|                   | Refresh                    | Updates the screen and settings                                     |
|                   |                            |   |
| <b>Simulation</b> | Run                        | Runs the flowsheet as a program                                     |
|                   | Remote Run                 | Runs the flowsheet remotely (for remote-operating interfaces)       |
|                   | Stop                       | Stops the running of the flowsheet                                  |
|                   | Set Run Speed...           | Sets the delay time between each command                            |
|                   | Interface                  | Connects or disconnect the selected interface                       |
|                   | Soft Systems               | Lists the available Soft System simulations                         |
|                   |                            |   |
| <b>Options</b>    |                            |   |
|                   | Setup Interface...         | Allows an interface to be selected and interface settings selected. |
|                   | Show COM ports...          | Shows the active communications ports on this computer              |
|                   | Language                   | Changes the language that is used by the program                    |
|                   | Grid Size                  | Allows the size of the Flowsheet grid to be changed                 |
|                   | Hide Panels Whilst Drawing | Changes the language that is used by the program                    |
|                   | Drawing Guide Lines        | Provides a guide line whilst drawing routes                         |
|                   | Line Drawing Tooltips      | Provides tooltips when drawing routes                               |
|                   |                            |   |
| <b>Help</b>       | Contents                   | Displays these online help pages                                    |
|                   | Soft System Help           | Shows the help Guide for each of the available Soft Systems         |
|                   | Soft Systems Guide         | Shows a general guide to the Soft Systems teaching materials        |
|                   | Register                   | Register your copy of Logicator (if unregistered)                   |
|                   | About                      | Provides details of this application                                |



## Creating a flowsheet

### The Command menu



The command menu can be set to 'autohide' by clicking the thumb pin icon.

Commands are grouped into four categories in the command list menu.

The commonly-used commands are shown in the 'Common' menu. Click the other menu headers to reveal the other categories of command.

Commands are used by dragging them onto an unoccupied cell on the flowsheet grid.

### The Flowsheet work area

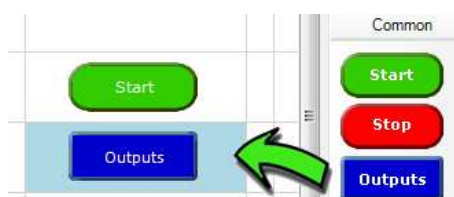
Cells are arranged in rows and columns. Each flowsheet has 22 columns and 25 rows. The default screen shows just 12 columns and 12 rows. Use the View>Zoom menu if you want to change the number of cells visible on the screen.

### The Map

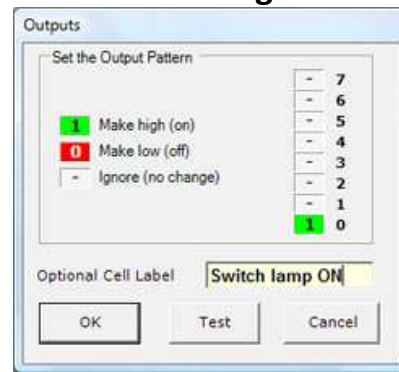
The Map option allows you to view the whole of the flowsheet at once. The red square marks the area currently displayed on the screen.

### Adding a Command cell

To add a command cell to a flowsheet, drag the required command from the Commands List and place it in an unoccupied cell.



### Cell Details Dialogue Box



*An Output cell details dialogue box*

Most commands have a cell details dialog box which allows you to enter more information for the command. Double click on the command to open its cell details dialog box, and set the details of the command as required. When you have set the necessary details, click OK to close the dialog box.

### Labelling a command

It can be useful to give a command a label which identifies what it is used for, e.g. "Switch lamp ON". When you open a Cell Details box, the text in the yellow "label" box will be highlighted, so just type your label in here and click OK. This text does not affect the operation of a command; it is only a label.

### Deleting a command

Click on the command to select it. Selected commands are coloured light blue. Press the Delete key to delete the selected command. To delete a block of commands, select the block and press the Delete key.

Unwanted commands can also be removed by dragging them back to the command list.

### Moving commands

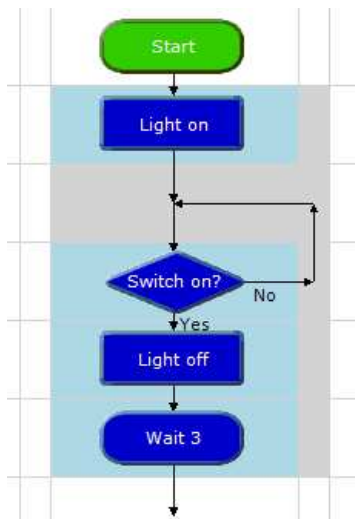
To move a single command select the command and drag it to its new position.

## Cutting, Copying and Pasting

Use the Cut, Copy and Paste options from the Edit menu to cut or copy selected commands, or blocks of commands, and paste them either into another part of the flowsheet. Alternatively, you can **copy** commands, or blocks of commands, within a flowsheet by first selecting them and then holding down the **Ctrl** key as you drag them to their new position. Remember that copied commands will retain their existing cell details.

## Selecting a block of commands

Click on the top left corner of the block of cells. Hold down the Control Key (CTRL) and click on the lower right corner of the range of cells.



*A block of commands in the selection frame*

Selected commands are coloured light blue. To deselect commands, click on another part of the flowsheet.

## Moving a selected block

To move the block of selected commands, drag the top command to the top position in the new area. Once placed, move the pointer away to have them placed and redrawn.

## Routes

Routes can be drawn through the middle of a cell, or in either one of the two rails between cells. Routes must be drawn in the direction that you want flow to take when the flowsheet runs.

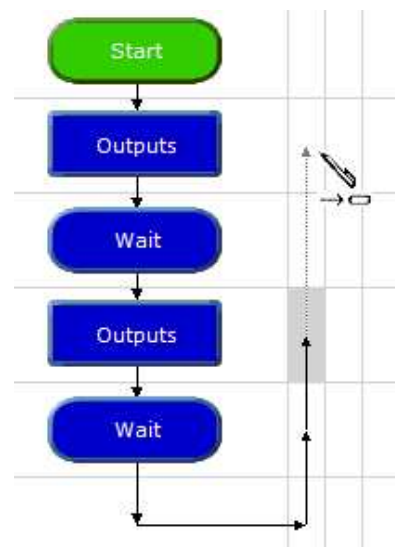
## Drawing Routes



Click on the Line Drawing icon on the toolbar to select drawing mode.

The mouse cursor changes to a pen icon.

Click at a command cell where the line should start. Now move the pointer along the route you wish to draw. A dotted line will show where the route will be drawn. At a corner click again and continue moving the pointer until you reach the end of the desired route.



*Routes can be drawn through cells or between rails.*

Click to complete the route, then Right Click to end drawing mode.



Drawing mode can also be deselected by clicking the arrow icon.

Drawing mode can also be selected by right clicking a command and choosing Start Line from the submenu.

Routes can only be drawn vertically or horizontally. Always draw the route in the direction of the flow, as indicated by the arrows.

### Hot tip

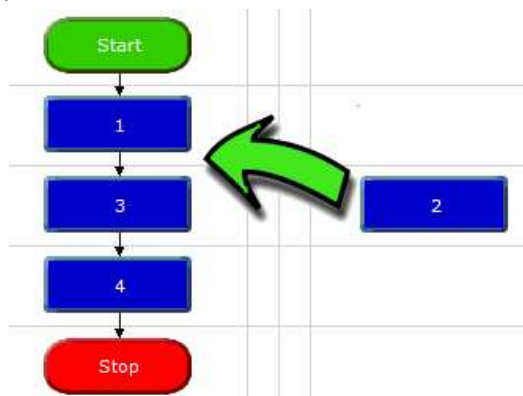
By holding down the Control key, the arrow keys can also be used to draw lines.

## Deleting Routes

Click at the beginning of the route to be deleted, and press the Delete key. When you draw a new route from a command, the existing route from the command will automatically be deleted. To delete a route without deleting the command in which it starts: first click on the command to select it. Then hold down the Ctrl key as you press the Delete key.

## Inserting Commands

To insert a command into a block of commands, simply drag the command and place it in the desired position in the block of commands. A new row will be inserted in the flowchart at this point and the commands will move down to allow the new command to be positioned.



## Inserting Rows

To insert a new row in your flowchart, click a cell in that row and either choose Edit > Insert Row, or Right Click > Insert Row. Routes will be connected across the new row.

## Deleting Rows

To delete a row in your flowchart, click a cell in that row and either choose Edit > Delete Row, or Right Click > Delete Row. Any commands in that row will be deleted.

## Inserting Columns

To insert a new column in your flowchart, click a cell in that column and either choose Edit > Insert Column, or Right Click > Insert Column. Routes will be connected across the new column.

## Deleting Columns

To delete a column in your flowchart, click a cell in that column and either choose Edit > Delete Column, or Right Click > Delete Column. Any commands in that column will be deleted.

## Decision command and their routes

When program flow reaches a Decision cell, it continues in either the Yes or No direction depending on the result of the decision test.



The two types of Decision in Logicator are a test of the digital input state, and a test of the value of a variable (Compare command).

## Drawing routes from a Decision command

The first line that you draw from a Decision command is the “Yes” direction, and the second line is the “No” direction.

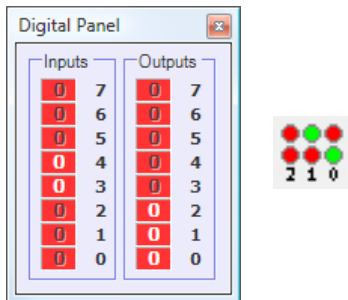
### Hot Tip

You can swap the “Yes” and “No” routes by right clicking on the Decision and choosing “Swap Yes/No”.

## Instrument Panels

### The Digital Panel

As a flowsheet runs, the Digital Panel shows the changing state of outputs, motors and inputs as they would be if the flowsheet had been downloaded to a PIC microcontroller. To display the Digital Panel, select the View>Digital Panel menu. Alternatively, click the toolbar icon shown below.



Digital Panel and its toolbar icon

### Simulating digital inputs

The function keys on the computer keyboard are used to simulate inputs from digital sensors while a flowsheet is running.

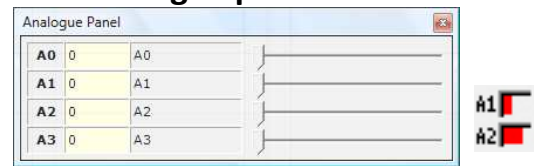


Function keys F2 to F9 will simulate digital sensors connected to inputs 0 to 7 on a PIC microcontroller. Key F2 simulates input 0; key F9 simulates input 7.

Pressing the function key is equivalent to the sensor being "on" (1). When the key is not pressed, it is equivalent to the sensor being "off" (0).

Clicking on the corresponding input or output on the digital panel will also have the same effect.

### The Analogue panel



Analogue Panel and its toolbar icon

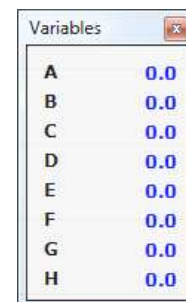
The Analogue Panel allows you to simulate the changing reading from analogue sensors while a flowsheet is running.

Identify the sensor (A0 to A3) which you wish to simulate, and use the slider in the panel to vary the simulated reading from 0 to 255.

To display the Analogue Panel, select the View>Analogue Panel menu. Alternatively, click the toolbar icon.

### The Variables Panel

If your flowsheet uses variables, it is useful to display the Variables window when you run it. The changing values of any of the variables A to H that are used in the flowsheet will be displayed as the flowsheet runs.



The Variables window

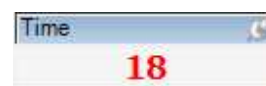
#### Examples:

A = A1 will store the numerical value of the Analogue port A1.

'In A' will read the input port bit values in the variable A

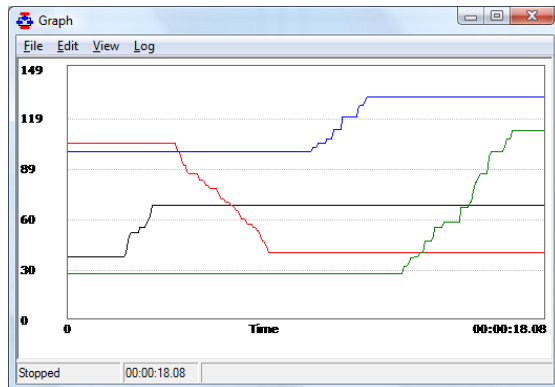
### The Time Panel

The Time window sits below the command window. It shows the value of the variable 'Time' during the run of the flowsheet. The variable 'Time' can be used in an expression command, e.g. A = Time, or it can be reset with the expression Time = 0.



## The Graph Window

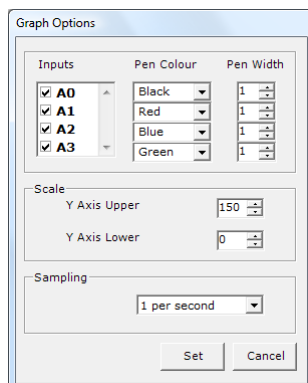
The graph window will plot the current values of analogue variables A0 – A3. It is a self-contained data logger with menu items that allow data logging to be started and stopped, the data recorded shown and saved, and statistics of the log viewed.



The Graph Window can be turned on from its window menu: Log > Start, and turned off with: Log > Stop. Log > Settings will open a dialogue box to allow the inputs, scale and sample rate to be selected.

The graph window can be resized to become the dominant window in Logicator. The main Logicator window can be minimised so that the application appears to operate singly as a data-logger.

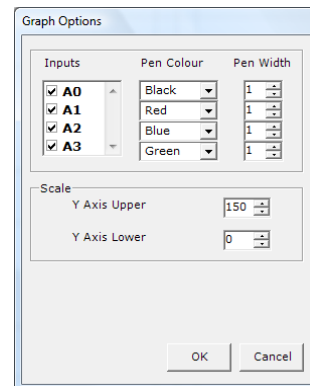
The menu item Log > Settings provides the following window. This allows inputs to be selected, pen colours and line width to be changed and the rate of sampling selected.



## Log command



The Graph Window is usually used with the Log command. The cell details box for this command is similar to the Settings dialogue, except that the sample rate corresponds to readings being taken each time program flow passes through the Log command.



The graph produced can be copied with the Edit > Copy Graph menu option, and then pasted into a document.

The menu item View > Data will show, in a new window, the data logged.

| Time        | Sample Number | A0    | A1     | A2     | A3     |
|-------------|---------------|-------|--------|--------|--------|
| 00:00:00.00 | 1             | 67.00 | 150.00 | 192.00 | 218.00 |
| 00:00:00.30 | 2             | 67.00 | 150.00 | 192.00 | 218.00 |
| 00:00:00.61 | 3             | 67.00 | 150.00 | 192.00 | 218.00 |
| 00:00:00.92 | 4             | 67.00 | 150.00 | 192.00 | 218.00 |
| 00:00:01.23 | 5             | 67.00 | 150.00 | 192.00 | 218.00 |
| 00:00:01.54 | 6             | 67.00 | 150.00 | 192.00 | 218.00 |
| 00:00:01.86 | 7             | 57.00 | 150.00 | 192.00 | 218.00 |

The menu item View > Statistics will show, in a new window, the statistics for each channel logged.

| Channel | Maximum Value | Minimum Value | Mean Average |
|---------|---------------|---------------|--------------|
| A0 = A0 | 88.00         | 38.00         | 62.49        |
| A1 = A1 | 150.00        | 70.00         | 126.31       |
| A2 = A2 | 195.00        | 42.00         | 160.65       |
| A3 = A3 | 255.00        | 205.00        | 245.54       |

## Common commands

### Start command



A START command marks the point where the flowsheet starts running.

When the Start icon is clicked the flowsheet starts at the START command. Every flowsheet must have a START command.

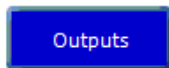
### Stop command



A flowsheet will stop running whenever a STOP command is reached.

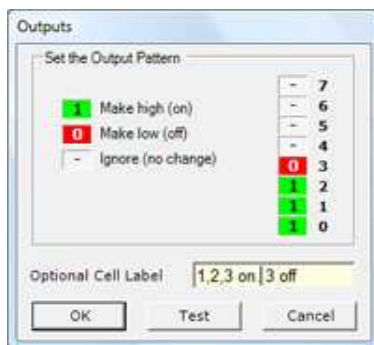
Only use one Start and one Stop command in any flowsheet.

### Outputs command



An Outputs command is used to switch on or off any output devices that are connected to the interface or control box.

The Output Pattern line of its Cell Details box shows how this command will set the 8 bits on the output port.

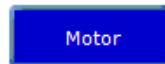


Outputs command Cell Details box

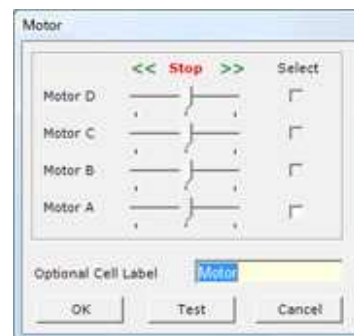
Each bit labelled 0-7 can be set to switch an output bit on or off, or to leave it in the state it has already been set to.

- 1** This means: switch this output on.
- 0** This means: switch this output off.
- This means: ignore this output, i.e. leave it in the state in which it was set by the previous Outputs command.

### Motor command



The Motor command allows up to 4 motors to be controlled at a time. Each motor can have their speed set and their direction of rotation forward, or backward, or off. If a control box is used which doesn't provide separate motor driver ports the motor command will drive the outputs as four pairs, 0+1, 2+3, 4+5, 6+7.

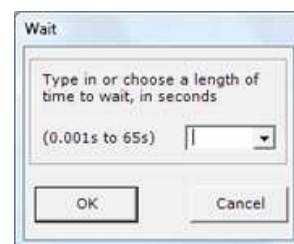


Motors command Cell Details box

### Wait command



A Wait command makes a running flowsheet pause for the number of seconds specified before the next command is carried out. You can use it to keep output devices switched on or off for a set time. Use its Cell Details box to enter a number of seconds or a variable A-H.



Wait command Cell Details box



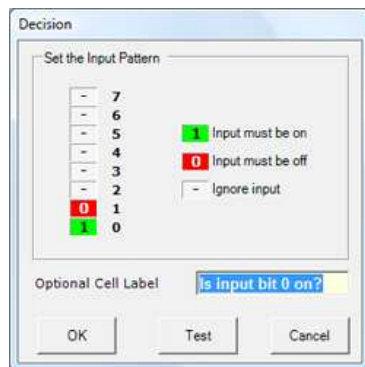
## Decision command

The Decision command is used to test the state of a digital sensor connected to a digital input.

When flow reaches a Decision cell, it continues in either the Yes or No direction depending on the result of the decision test.



*This Decision command is testing the state of a switch. If the switch is pressed, flow will go in the Yes route; if it is not pressed, flow will go in the No route.*



*This Decision tests that bit 0 is on and bit 1 is off*

An input bit can be clicked to set it to one of three states:

- 1 This means is this sensor ON?
- 0 This means is this sensor OFF?
- This means ignore this sensor.

## Comment command



Comment commands allow you to add short explanatory notes to a flowsheet.

Although you can type up to 34 characters into the text box in the Cell Details box, the number of characters actually appearing in a Comment will depend on the Zoom setting and screen setting.

Comments have no effect on the operation of a flowsheet.



*Explanatory information can be added to the flowsheet by using command labels and Comment commands.*

## Sound Command

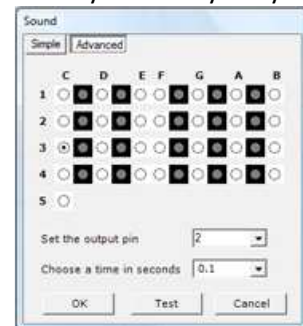


The Sound command will play a musical note. There are two ways to view the cell details for the Sound command. 'Simple' allows the setting of note, and the time the note will play. The notes used in Logicator are true sampled .wav files.



*In this example, C3 corresponds to middle C*

The 'Advanced' option allows the selection of note via a 'keyboard' style layout .

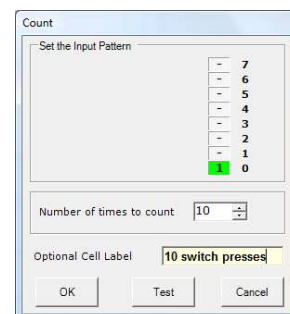


## Count command



The Count command will pause until a set number of pulses have been counted.

After counting, program flow will move to the next command.



*This count command will count pulses on input 0*

## Log command

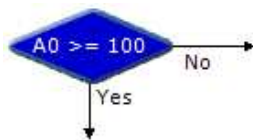


The Log command will record the values of selected analogue channels each time program flow passes through this command. See 'The Graph Window' for further details.

## Variables

### Compare command

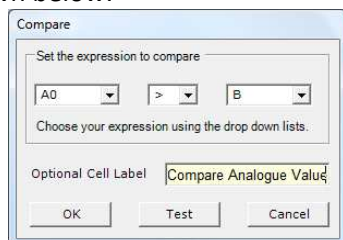
The compare command is used to check the value of a variable, elapsed time, or a reading from an analogue sensor connected to an



analogue input.

When flow reaches a Compare cell, the software checks the current reading from the specified sensor, and compares it with the threshold that you have set. Flow will continue in either the "Yes" or "No" direction depending on the result of the comparison.

The Cell Details box of the Compare command is shown below.



Cell Details box of the Compare command

Use box one to select the variable or sensor that you want the command to check.

Use boxes two and three to complete the comparison. The drop-down list in box two contains a list of operators such as "greater than" (>), "less than" (<), and "equals" (=). Select the one that you require. NOTE: It is usually better to use an operator such as "greater than or equals" (>=) instead of "equals", because analogue sensor readings can fluctuate rapidly, the sensor reading may never actually coincide with the exact threshold level.

Use box three to set the threshold level.

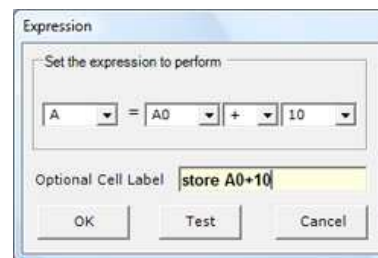
Type in a number between 0 and 255, or select it from the drop-down list.

Note that the value to be compared can also be another analogue reading, the value of a variable A-H, the value of elapsed time, or a randomly generated value.

### Expression command



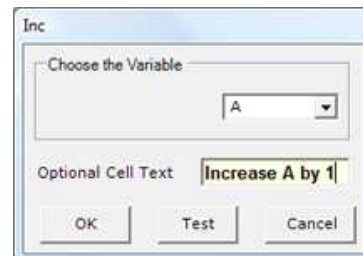
The Expression command is used to set a value of a variable A-H, or the value of elapsed time. e.g. A=0, A=A0, A=B-C, Time=0



### Inc command



Each time flow passes through an Inc command, 1 is added to the value of the selected variable (Inc is short for increment). This is the same as using an Expression command to make A = A + 1.



In the Cell Details box, select which variable to use, and click OK.

### Dec command



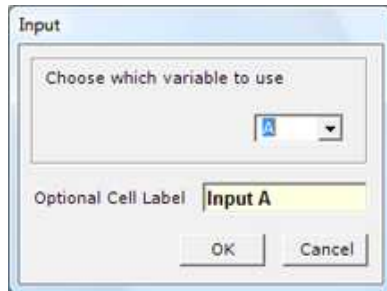
Each time flow passes through a Dec command, 1 is subtracted from the value of the selected variable (Dec is short for Decrement).



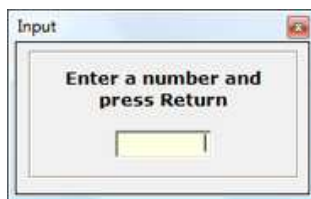
## Input command



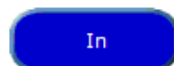
The input command provides a way for the user to enter a value using the keyboard when the flowchart is running. The dialogue allows a variable to be chosen in which to store the value that is input.



When program flow arrives at the input command a dialogue opens to allow a value to be entered into the selected variable.



## In command



The in command reads the value of the input port bits and stores this value in a selected variable. The value stored corresponds to the state of each bit on the input port according to the selection values in the following table:

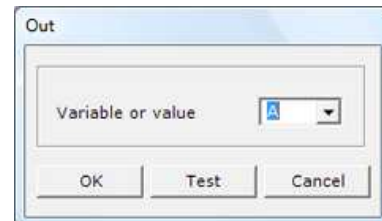
| bit   | 7   | 6  | 5  | 4  | 3 | 2 | 1 | 0 |
|-------|-----|----|----|----|---|---|---|---|
| value | 128 | 64 | 32 | 16 | 8 | 4 | 2 | 1 |

To calculate the selection value, add up the values for all bits that are on. e.g. if bits 0 and 2 are on the selection value would be 5.

## Out Command



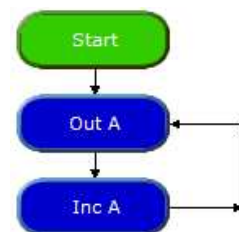
When flow passes through an Out command, the output port is set to the binary value of the number or variable entered in the command.



The binary pattern displayed on the output port will correspond to the bits selected by the value in the table below.

| bit   | 7   | 6  | 5  | 4  | 3 | 2 | 1 | 0 |
|-------|-----|----|----|----|---|---|---|---|
| value | 128 | 64 | 32 | 16 | 8 | 4 | 2 | 1 |

For example, if the value to be output is 16, then bit 4 would be turned on. If the value to be output was 17 then bits 4 and 0 would be turned on.



*This flowsheet would cause the output port lights to count up in binary*

## Procedures

### DoProc command



The DoProc command is short for 'Do Procedure'. On meeting a DoProc command, program flow will jump to the procedure definition (which should be already defined). On executing the commands in the procedure it will return to the DoProc command. The command End marks the end of the procedure definition.



In the cell details box for the Do Procedure command it is also possible to set the number of times to run the Procedure. This will simply repeat the Do Procedure for the set number and then continue as normal.

### Procedure command

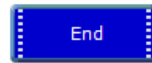


The Procedure command marks the start of a subroutine. A subroutine is a self-contained mini program top and tailed by the procedure command and the End command.



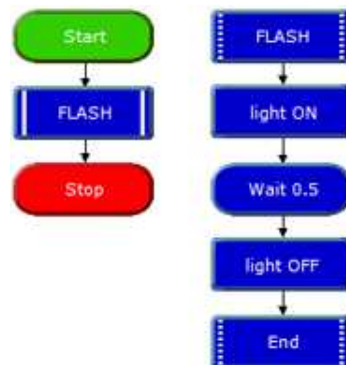
The cell details box invites the entry of a name for the procedure, e.g FLASH. The Procedure name will be displayed in capital letters to emphasise that it is effectively a new command word.

### End command



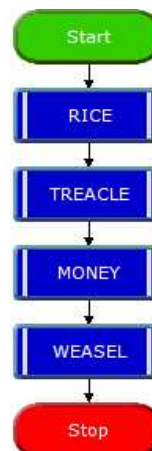
The End command marks the end of the procedure definition. Upon meeting this command program flow will transfer back to the Do Proc command.

Note that all the procedures that have been built in a flowsheet are automatically listed in the drop-down box in the DoProc cell details box. When flow reaches a DoProc command, it jumps to the Procedure command with the same name. When the flow of control reaches a Return command, the flow jumps back to the Do Procedure command that called the procedure.



*The DoProc command FLASH calls the FLASH procedure*

New commands can be created using procedures. If required their procedure definitions can be 'hidden' at the bottom of the flowsheet to encourage 'top down' development.

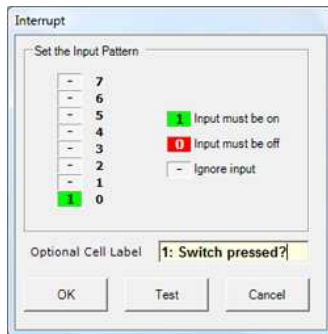


*In this example there are four procedures defined elsewhere in the flowsheet as a series of sounds. The four keywords need to be placed in the correct order to correctly hear the tune to 'Pop goes the weasel'.*

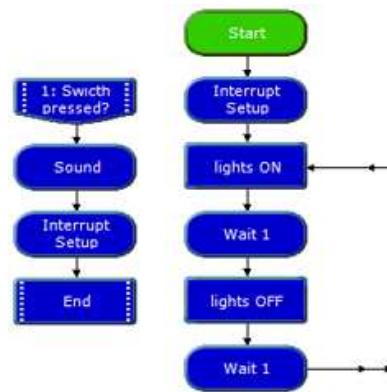
## Interrupt command



An Interrupt instantly captures the flow of control whenever a preset digital input condition occurs to trigger it e.g. when a switch is pressed.



*This Interrupt will trigger when a switch on bit 0 is pressed.*



*This Interrupt will capture program flow and play a sound. The interrupt is then enabled once again before returning to the point at which it left the main flow.*

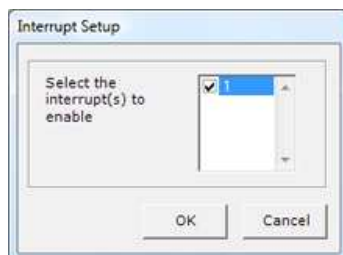
When the interrupt is triggered flow jumps immediately to the Interrupt command and then carries out any commands which follow until it reaches an End command. It then returns to the point which it was at when the Interrupt occurred.

## Interrupt Setup command



In order to use an Interrupt, the interrupt must be 'enabled'. This is done through the Interrupt Setup command.

There are two options in the command – Enable or Disable.



To prevent the Interrupt retriggering itself, the Interrupt is automatically disabled once it is triggered. To re-enable it another Interrupt Setup command is required.

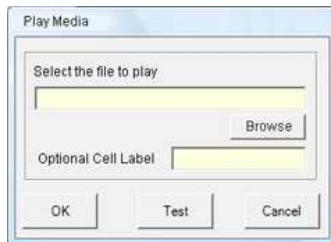
## Animation

### Play command

Play

The Play command will cause sound or video files to be played as a flowsheet runs.

Click the Browse button to find the file you wish to play, or type in the path to the file in the text box.



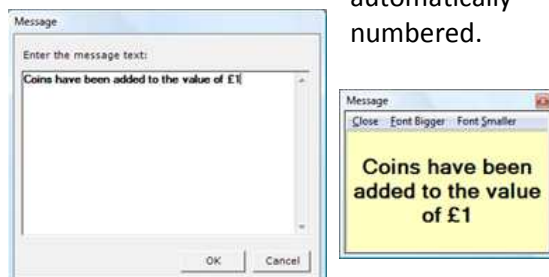
Click Test to display the play file. At this point you can set the size and position of the playback window before you click OK. Video sequences or animations will be displayed in a window on the flowsheet (not in the Windows Media Player). Once the file starts to play the flowsheet will continue. The play command will accept most Window media player type files.

### Message command

Message 1

The Message command will display a text message on the screen as a flowsheet runs.

The message is displayed when program flow passes through the MESSAGE command. It stays on the screen until it is removed by a HIDE MESSAGE command. Messages are automatically numbered.



The Message window can be positioned on the screen during edit mode. The font sized can also be changed.

### Hide Message command

Hide Message

The Hide Message command removes a specified Message from the screen, or all messages.

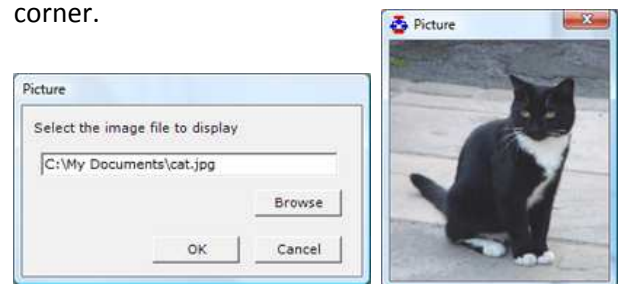


Choose which message that you want to hide from the drop-down list

### Picture command

Picture 1

The Picture command will display a picture on the screen as the flowsheet runs. The picture will stay on the screen until it is removed by a Hide Picture command. Pictures are automatically numbered. The picture box can be placed anywhere on the screen, and its shape can be changed by dragging from a corner.



### Hide Picture command

The Hide Picture command removes a specified Picture from the screen. The picture to be hid is chosen by selecting it from the drop down box.

