CX-Supervisor
User Manual

Software Release 1.1

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Notice

OMRON products are manufactured for use according to proper procedures by a qualified operator and only for the purposes described in this manual.

The following conventions are used to indicate and classify precautions in this manual. Always heed the information provided in them. Failure to heed precautions can result in injury to people or damage to the product.

DANGER!	Indicates information that, if not heeded, is likely to result in loss of life or serious injury.
WARNING	Indicates information that, if not heeded, could possibly result in loss of life or serious injury.
Caution	Indicates information that, if not heeded, could result in relatively serious or minor injury, damage to the product, or faulty operation.

OMRON Product References

All OMRON products are capitalised in this manual. The word “Unit” is also capitalised when it refers to an OMRON product, regardless of whether or not it appears in the proper name of the product.

The abbreviation “PLC” means Programmable Logic Controller and is not used as an abbreviation for anything else.

Visual Aids

The following headings appear in the left column of the manual to help you locate different types of information.

Indicates information of particular interest for efficient and convenient operation of the product.

1, 2, 3… Indicates lists of one sort or another, such as procedures, checklists etc.

 Represents a shortcut on the Toolbar to one of the options available on the menu of the same window.

About this Manual

This manual describes the CX-Supervisor application and its ability to create, modify and run SCADA applications.

This manual contains the following:

Chapter 1 - Working with CX-Supervisor. This chapter provides a simple and complex tutorial when using CX-Supervisor for the first time.

Chapter 2 - Graphics Editor. This describes the Graphics Editor and its various tools and controls.

Chapter 3 - Pages. This chapter describes the procedures involved in the creation and amendment of pages.

Chapter 4 - Points. This chapter describes the procedures involved in the creation, amendment and removal of points. The use of PLCs with points is also described.

Chapter 5 - Objects. This chapter describes procedures involved in the creation, amendment and removal of objects.

Chapter 6 – ActiveX and OLE Objects. This chapter provides an overview of embedding and linking to object's external to CX-Supervisor.

Chapter 7 - Projects. This chapter describes procedures involved in the creation, amendment and removal of projects.

Chapter 8 - Graphics Library. This chapter describes the library of graphic objects and how to create and amend new libraries.

Chapter 9 - Alarms. This chapter describes the procedures involved in the creation and amendment of alarms.

Chapter 10 - Animation. This chapter describes the use of animations and how they can be applied to a CX-Supervisor project.

Chapter 11 - Recipes. This chapter describes the creation of recipes, and how they can be used.

Chapter 12 - Data Logging. This chapter describes the data logging facilities, including setting up, viewing and exporting.

Chapter 13 - Data Bases. This chapter describes the Database facilities, including connections, reading and writing data.

Chapter 14 - OPC Client. This chapter introduces OPC Server to a new user, and explains how the use CX-Supervisor as an OPC Client.

Chapter 15 - Connecting to a Remote CX-Supervisor application. This chapter explains how to connect multiple CX-Supervisor applications together to form a distributed solution.

Chapter 16 - Connecting to Omron Industrial Components This chapter details connecting CX-Supervisor to Omron's Industrial Components,

Appendix A - Configuring a PC for remote connection. This appendix explains how to configure a PC for remote connection.

A ***Glossary of Terms*** and ***Index*** are also provided.

Warning:	Failure to read and understand the information provided in this manual may result in personal injury or death, damage to the product, or product failure. Please read each section in its entirety and be sure you understand the information provided in the section and related sections before attempting any of the procedures or operations given.

TABLE OF CONTENTS

CX-Supervisor ..... Page

Chapter 1 - Working with CX-Supervisor 9

Introduction 9
The First Step 9
A Simple Tutorial 10
Advanced Tutorial 18
Communicating with PLCs 25
Moving On 29
Getting Help 30

Chapter 2 - Graphics Editor 31

About the Graphics Editor 31
Palette 31
Graphic Object Bar 34
Control Bar 34
Status Bar 38
Text Bar 39
Grid 41

Chapter 3 - Pages 42

Creating a Page 42
Amending a Page 43
Defining the Properties of a Page 44
Printing a Page 46
Saving a Page to a Project 49
CX-Supervisor Preferences 50

Chapter 4 - Points 52

What is a Point? 52
About the Point Editor 52
Viewing Points via the Point Editor 53
Creating a Point 56
Amending an Existing Point 62
Deleting an Existing Point 63

Table of Contents continued Page

Runtime Point Maintenance 64
Device Configuration 64
Point Import 70
System Points 71
Printing Points 74
DDE 74
OLE Automation 81

Chapter 5 - Objects 82
Objects 82
Editing Objects 82
Creating and Editing Graphic Objects 83
Creating and Editing Control Objects 85
Web Browser Object 100
Manipulating Objects 100

Chapter 6 - ActiveX and OLE Objects 106
Overview 106
Object Packager 106

Chapter 7 - Projects 114
Overview 114
Creating a Project 114
Amending a Project 115
Saving a Project 116
Settings 116
Runtime Security 126
Exit Level 130
Compiling and Running a Project 130
Save Runtime As 130
Create Runtime Install Disc 131
Project Information 131
Alias Definitions 132
Find Points 132
Navigating Projects with the Workspace 133
Project Editor 134
Printing from the Project Editor 136

Table of Contents continued Page

Chapter 8 - Graphics Library 137
Overview 137
Graphics Library 137
Manipulating Objects 139
Printing the Graphics Library 141

Chapter 9 - Alarms 142
What is an Alarm? 142
Alarm Settings 142
Viewing the Contents of the Alarm Database 144
Creating a New Alarm 145
Updating an Existing Alarm 149
Copying an Existing Alarm Definition 150
Deleting an Existing Alarm 150
Printing Alarms 150
Alarm Reporting In Runtime 151

Chapter 10 - Animation 154
Associating Points with Actions and Events 154
Animation Editor 154
Runtime Actions 160

Chapter 11 - Recipes 186
What is a Recipe? 186
Recipe Components 186
Viewing Recipes in the Recipe Editor 187
Creating a New Recipe 188
Updating an Existing Recipe 192
Copying an Existing Recipe Definition 193
Deleting an Existing Recipe 193
Recipe Security Levels 193
Printing Recipes 193
Using Recipes in Runtime 193

Table of Contents continued Page

Chapter 12 - Data Logging 200
What is Data Logging? 200
Data Log Editor 200
Data Logging at Runtime 204
Data Log View Component 208
Remote Data Log Viewer 210
Data Log Export Facilities 210
Data Logging 213

Chapter 13 - Databases 216
Overview 216
Database Connection Editor 216
Configuring a connection 217
Configuring Recordsets 223
Configuring Field Associates 225
Configuring Parameter Associates 227
Configuring Schemas 229
Using Transactions 233
Saving Recordsets as XML 233
Datashaping 234

Chapter 14 – Using CX-Supervisor as an OPC Client 238
What is OPC 238
Using CX-Supervisor with Omrons OPC Server 238
Using the Third Party OPC Servers 243

Chapter 15 – Connecting to remote applications 244
Two Tier, Client –Server or Master-Slave 244
Peer to Peer 244
Distributed Server 245
Redundant Server 246
Creating a CX-Supervisor Server application 246
Creating a CX-Supervisor Client application 247

Table of Contents continued Page

Chapter 16 – Connecting to Omron Industrial Components 249
Adding a point linked to a parameter 249

Appendix A – Configuring a PC for remote connection 252
Configurating a Client PC running Windows NT or 2000 252
Configurating a Client PC running Windows 95, 98 or Me 252
Configurating a Server PC running Windows NT or 2000 253
Configurating a Server PC running Windows 95, 98 or Me 253

Glossary of Terms 255

Index 261

CHAPTER 1
Working with CX-Supervisor

This chapter illustrates how to create a simple application using CX-Supervisor.

Introduction

This chapter consists of three tutorials, each of a differing degree of complexity. It is recommended that these be reviewed before proceeding in order to gain an overview of the product, and to become familiar with basic aspects of CX-Supervisor functionality.

The first tutorial describes how a simple traffic signal is drawn using the Graphics Editor and how it is animated via the Animation Editor so that it changes colour – just as if it were a real traffic signal controlling a road or rail junction.

As the first tutorial proceeds, important concepts about CX-Supervisor are introduced by this symbol.

The second tutorial describes how to create an instrument panel, which allows the setting and adjustment of a frequency level, and displays the value on a gauge. Construction of the instrument panel requires sliders, a gauge and a trend graph.

By the end of the first tutorial, sufficient understanding of CX-Supervisor should have been gained to allow progression to the second, more advanced tutorial which demonstrates some features of advanced CX-Supervisor graphics objects.

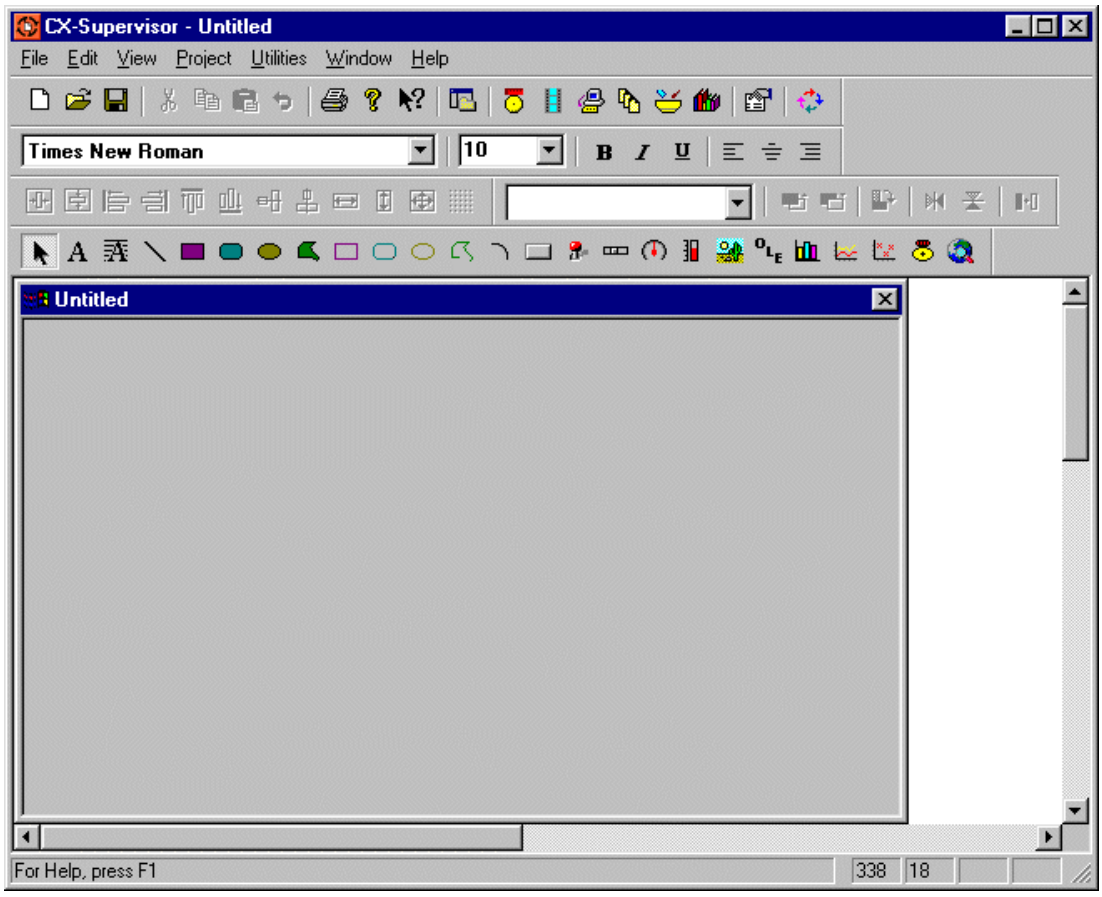
The third tutorial introduces important communication information to the user.

Note: CX-Supervisor uses standard Microsoft Windows dialogs and conventions wherever possible so that experienced Windows users should immediately feel comfortable. Inexperienced Windows users should refer to standard Windows documentation.

The First Step

Before the tutorial can be started, the development version of CX-Supervisor must have been installed on a suitable machine, as described in the *CX-Supervisor Getting Started Manual*. When this has been done, invoke CX-Supervisor from the **Start** pushbutton.

When CX-Supervisor has initialised, the following screen (or similar) is displayed:



A Simple Tutorial

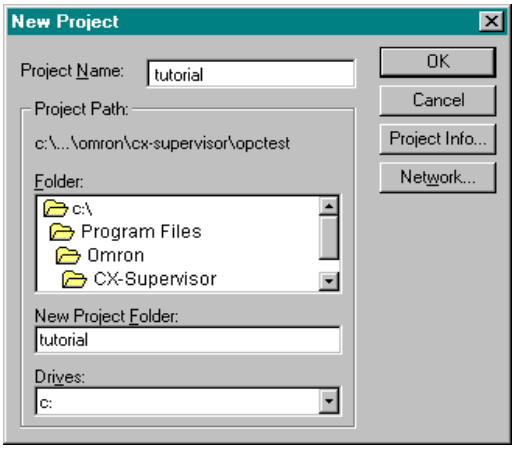
The Concept of Projects

A project is the set of objects associated with one application. This includes Reports, Graphics, Alarms, Point configuration, Point values, Recipes and all other information.

Only one project can be opened by one application at a time.

A project must be created in which to conduct the tutorial; for simplicity, a separate sub-directory should be created for each project.

1, 2, 3... 1. Select *New* from the *Project* menu.



2. Enter the project name as “tutor”.
3. Use the Folder: field to determine the path to the new project directory (for example, there may be a directory path similar to “c:\work\CX-Supervisor” on the machine).
4. Specify the name of the new sub-directory that CX-Supervisor is to create; for example, “tutorial”.
5. Click on the OK pushbutton. A project called “tutor” and the specified sub-directory is created by CX-Supervisor. The project file is actually called “tutor.scs”.

A blank page is displayed on the screen. If a blank page is not displayed, click on the **New Page** button from the toolbar or select *New Page* from the *File* menu to create a new, blank page.

CX-Supervisor Pages

A CX-Supervisor project usually consists of a number of separate pages. Each page normally presents information relating to one particular topic, process, or activity. The application designer uses the facilities of the graphics editor to draw and animate objects on the page.

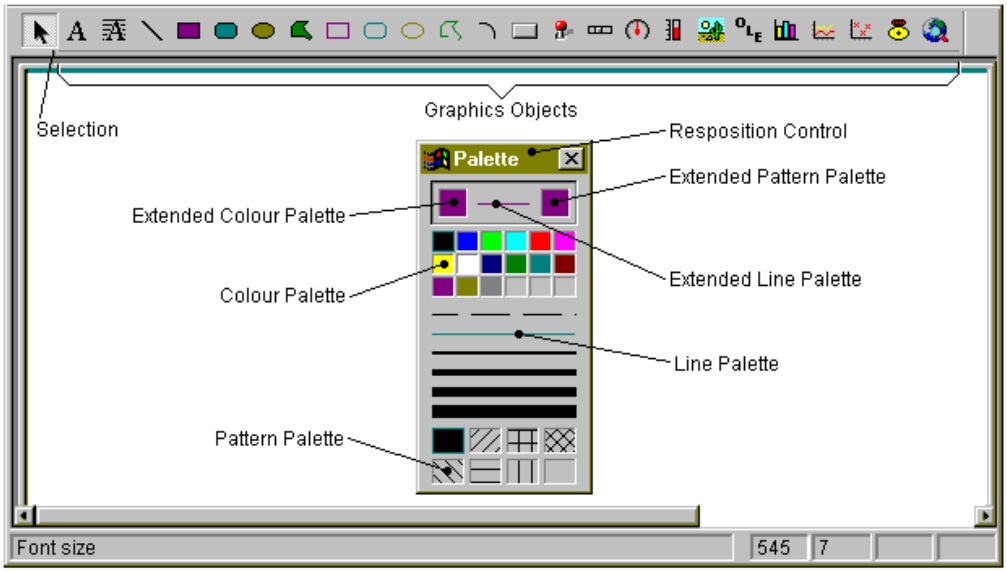
This tutor project consists of only one page.

1, 2, 3... 1. Name the page as “tutor.pag” using *Save Page As* from the *File* menu. The page displayed on screen should still be empty.
2. Click on the **Yes** pushbutton when prompted to add the page to the project.

Using the Graphics Editor

Now that the project exists with its own page, the graphic objects can be constructed and added to the page.

The graphics editor uses a Graphic Object toolbar and a floating window known as the Palette to construct and control objects on the page. These are very easy to use.



Several small pictures are visible on the Graphic Object toolbar – each one representing one of the graphical objects with which an application can be constructed. Some of the objects are primitives – straight lines, ellipses, rectangles; some are rather more advanced – such as the gauge object, which has built-in functionality.

On the Palette is a colour palette, line-style palette and fill-pattern palette. These selections control the way in which objects appear.

Experiment with the Palette at this stage and create examples of each of the various graphic objects; when finished with these objects, delete them by clicking on them and then hitting the <Delete> key or clicking on the **Cut** button from the toolbar.

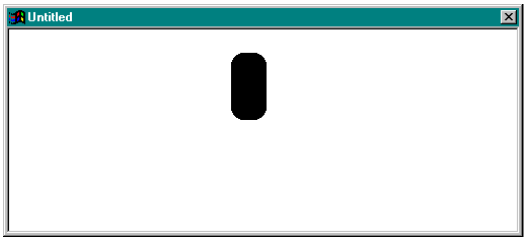
This tutorial uses graphics primitives only.

1, 2, 3…

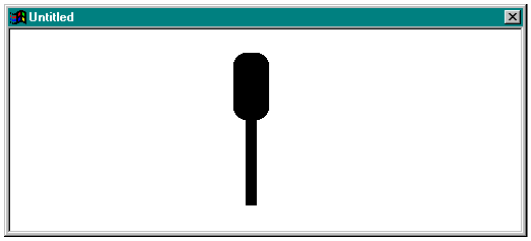
1. Select the **Select Mode** button from the Graphic Object toolbar. Notice that when the cursor is over an icon on the palette information about it is displayed on the status bar. Similarly, if the cursor is left stationary over a button then a small help message appears after a short while.

2. Ensure that the selected colour from the palette is black, by clicking on the colour black. Select the **Round-Rectangle** button from the Graphic Object toolbar.

3. Click the left mouse button and move the mouse pointer to near the top of the page and drag the pointer downward. As this happens, the outline of a round-rectangle appears on the screen to form the housing of the traffic signal as shown below. Notice that the position, height and width of the object being edited are displayed on the status bar.



4. Select the **Rectangle** button from the Graphic Object toolbar and draw the support leg of the traffic signal.

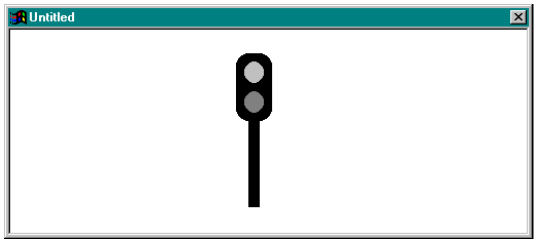


3. Now that the main structure of the traffic signal is complete (although rather basic), work can begin on the coloured lights. Only two lights are needed – one red and one green; this is best achieved by selecting the **Ellipse** button from the Graphic Object toolbar and drawing a circle of appropriate size to represent the light.

Note: Holding the CTRL key down while drawing an ellipse ensures that a true circle is drawn.

4. Select the colour red and then position the light at the top of the traffic signal.

5. Repeat the process for the green light and position this at the bottom of the traffic signal.

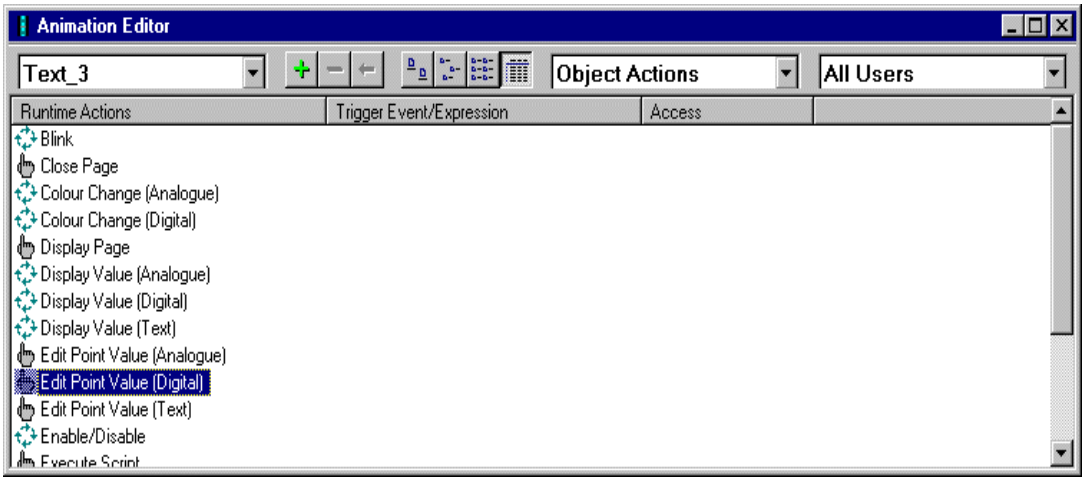


Animation

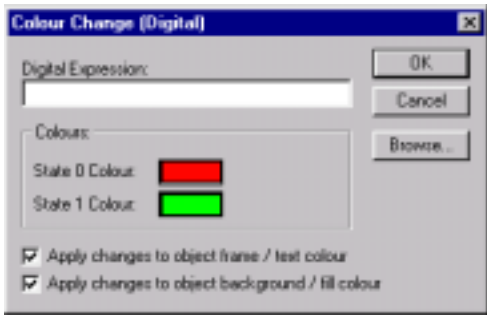
This simple traffic signal has only two states, 'STOP' and 'GO'. If the signal is 'STOP', then the red light must illuminate. If the signal is 'GO' the green light must illuminate. There are a number of ways this animation can be achieved using CX-Supervisor.

1, 2, 3...

1. Select the red light.
2. Click on the **Animation Editor** button from the toolbar.



3. There are a number of actions available for each particular object. With suitable configuration, each of these actions may be applied to each object; for example, the red light can be given the following actions:
4. Blink.
5. Close Page.
6. Colour Change, etc.
7. By double-clicking the left mouse button, choose *Colour Change (Digital).* The Colour Change dialog appears:



By selecting this action, CX-Supervisor is informed that the colour of the red light (an ellipse) is to be changed according to the value of some variable.

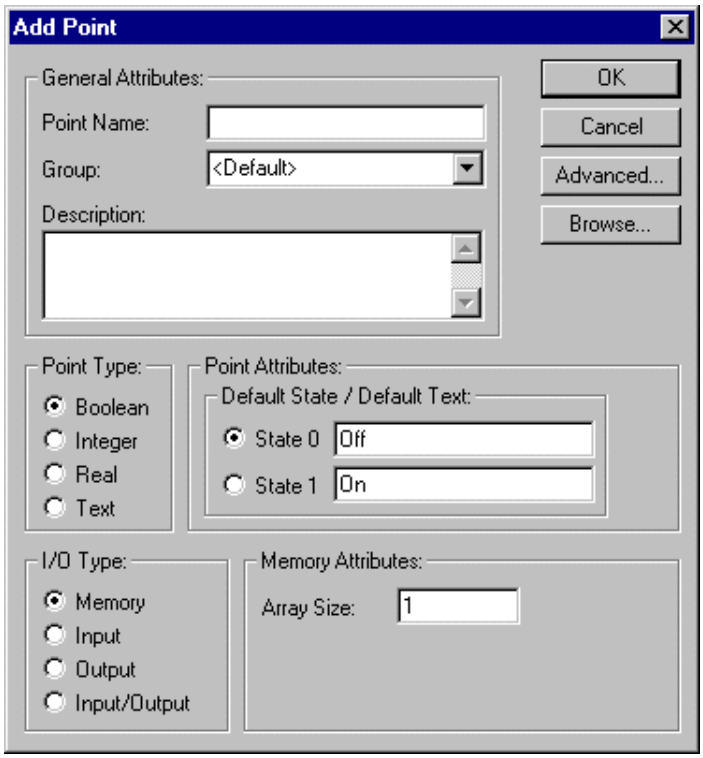
The Colour Change dialog shows the two colours between which the light changes. The colours need to be selected so that when the traffic signal is 'STOP', the red light is bright-red; and when it is 'GO', the red light is dark-red (indicating that the bulb is not illuminated). The colours can be changed by clicking on the colour preview box, and then using the Colour Palette dialog which subsequently appears to choose the appropriate colour tones.

Adding a Point

The tutorial cannot continue without defining the variable by which the traffic signal is to be controlled. The Colour Change dialog needs a "digital expression" – something that evaluates only to 'TRUE' or 'FALSE', or 0 or 1.

1, 2, 3…

1. Click on the **Browse** pushbutton on the Colour Change dialog. The Select Required Item dialog is displayed; however, there are currently no suitable system (i.e. pre-configured) points available to choose from.
2. Click on the **Add Point** pushbutton. The Add Point dialog is displayed.



3. This is exactly the same as if the **Point Editor** button had been selected from the main toolbar, followed by the **Add Point** pushbutton.

4. Now the variable, or point, can be defined to control the traffic signal; in this instance a simple Boolean point is used.
5. At the *Point Name* field, type "GO", the name of the point.
6. Check that the *Point Type* is "Boolean" and that "Memory Resident" is selected as the *I/O Type*.
7. Click on the **OK** pushbutton. The point is added to the points database.
8. Select the new point and click on the **OK** pushbutton.
9. In the Colour Change (Digital) dialog, ensure that "GO" is entered as the digital expression.
10. Click on the **OK** pushbutton.

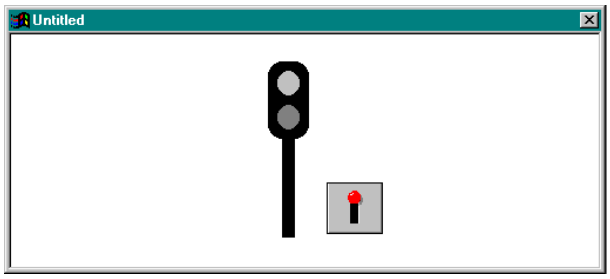
The animation of the red light has now been defined.

The application now needs to be tested to ensure that the light is operating correctly. Although the green light could also be animated at this stage, it is probably worth performing a runtime test on the tutor application just to see how it operates. Before this can be done however, a means of testing the light is needed, i.e. changing the value of the "GO" point.

The simplest method is to use a "toggle button", a two-state button which changes from one state to the other each time the button is pressed.

1, 2, 3...

1. Select the **Toggle Button** button from the Graphic Object toolbar and draw out a button of a suitable size in relation to the traffic signal.



1, 2, 3...

1. Double-click on the newly-created **Toggle** pushbutton to bring up the Toggle Button Wizard dialog.
2. Enter the name "GO" in the *Boolean Point* field in the *Configuration Attributes*.
3. Click on the **OK** pushbutton.

Testing the Project

Now the project can be tested in the runtime environment. There are two methods of invoking the runtime system from the development environment.

1, 2, 3...

1. Click on the **Run** button from the toolbar. CX-Supervisor first saves the current project and asks for confirmation to save the latest changes to "tutor.pag".
2. Click on the **Yes** pushbutton. The runtime system starts with the page just created shown inside a frame window.
3. Click on the **Toggle** pushbutton and observe the pushbutton change state. The red light should change colour. When the pushbutton is clicked again, the red light should revert to its previous colour. Repeat this test a few more times to observe the project in action. Notice that it really doesn't matter how quickly or slowly the pushbutton is selected; the light can always keep up with the changes.

Be sure to check the colour of the red light. Is it changing correctly between the two states? If not, check the colour definitions back in the development environment.

Refining the Project

To refine the project:

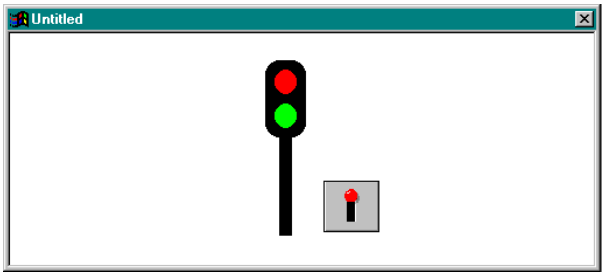
1, 2, 3...

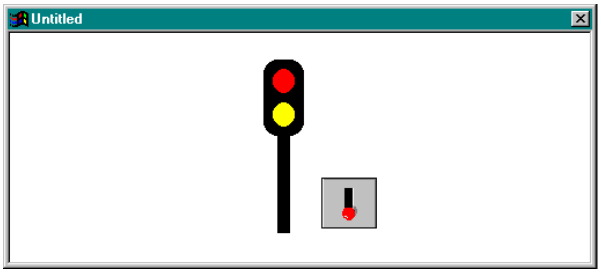
1. Exit the runtime environment by selecting *Close* from the *Control* menu.
2. In the development environment, select the red light and then bring up the Animation Editor dialog.
3. Once again, choose the Colour Change (Digital) dialog. The two colours are shown at the bottom of the dialog. If necessary, select the colour and change its tone by using the Colour Palette dialog.
4. Select the green light and animate this in the same manner as for the red light.
5. Bring up the Animation Editor and enter "GO" as the digital expression. Choose two shades of green as the on- and off-state of the light.

Remember that with the traffic signal, the red light needs to be 'ON' when the green light is 'OFF', and vice-versa. As one Boolean point is being used to control two lights, it must be ensured that the 'TRUE' (or 'ON') state of one light, is the 'FALSE' (or 'OFF') state of the other. This is achieved by means of the "State 0" and "State 1" colour definitions. If, for example, the 'State 0 colour' of the green light represents 'green light off', then the 'State 0 colour' of the red light should represent 'red light on'.

Now try runtime once again. Click on the **Run** button from the toolbar and try out the new tutor application; this time both lights should change colour as the pushbutton is selected. If both lights go on and off together then check, and possibly, change the colour definitions as described above.

Otherwise the traffic signal should be working as expected - changing from red to green as the pushbutton is pressed. On alternate selections, the signal should change from green to red.



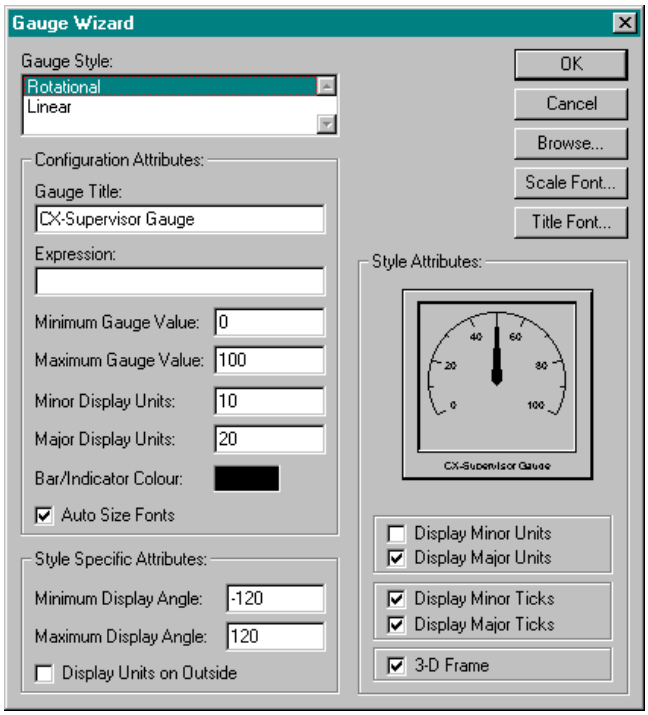


Advanced Tutorial

The second tutorial application is intended to demonstrate some of the more advanced CX-Supervisor graphics objects. The creation of a simple light which can change colour according to the value of a point has already been demonstrated.

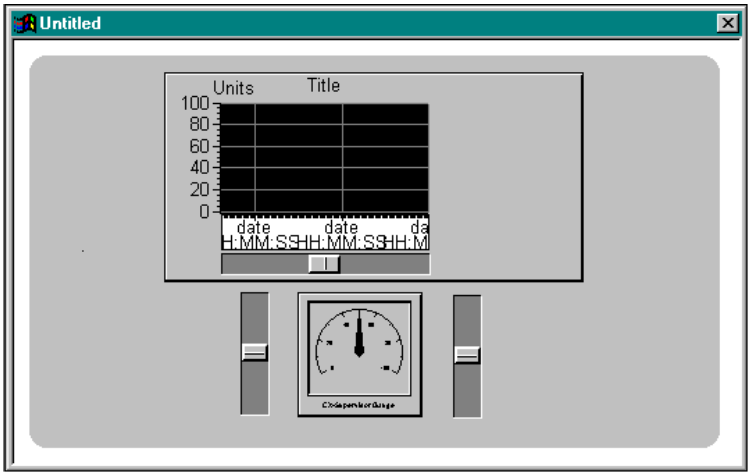
Suppose the value of a point is to be shown on a dial with a needle which rotates as the point changes value; this can be achieved using graphics primitives. The dial could be constructed using an ellipse and the needle could be a line with the “rotate” animation function driven by some expression. The units marked around the perimeter of the dial could be text objects.

Constructing a gauge from graphics primitives in this manner is entirely possible but there is a much easier way – the Gauge Wizard. With the Gauge Wizard, the style of the gauge is automatically drawn according to the selections made. Simply specify the major units and the range of the gauge, for example, and the animation is automatically done.



A Simulated Instrument Panel

In this second tutorial, two sliders, a gauge and a trend graph are used to simulate an instrument panel which allows the setting and adjustment of a frequency level and display the value on a gauge. A trend graph shows the frequency changes over a period of time.



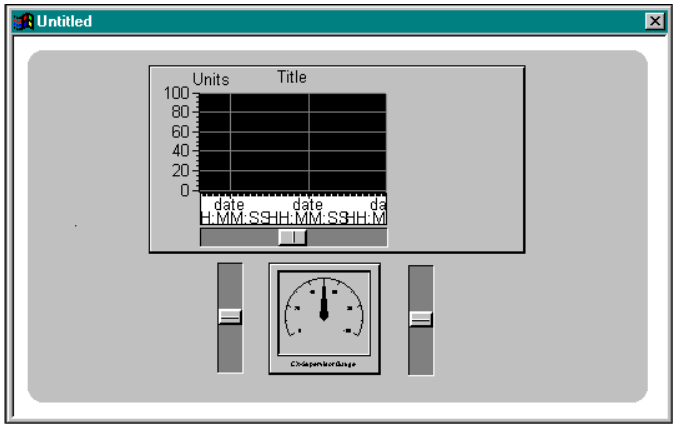
1, 2, 3...

1. From within the CX-Supervisor development environment, create a new project for the tutorial by selecting *New* from the *Project* menu.
2. Specify a new sub-directory called “wizard” and use the same name for the title of the project.
3. As with the earlier tutorial, immediately save the (new and empty) page, again use the name “wizard”. When prompted, ensure that the page is added to the project.

4. Select a round rectangle with a selected fill colour. Use this to draw the panel fascia as follows:

The next stage of the project is to draw the key instruments on the panel. This is likely to require more than one attempt and the use of the grid may be helpful in drawing and aligning the objects on the screen. The grid settings are available by selecting *Grid* from the *View* menu. All the available grid sizes are shown along with a *Snap to Grid* option which forces graphical objects selected by the user to align according to the current grid setting.

Refer to the following diagram:



1, 2, 3…

1. Select the **Trend Graph** button from the Graphic Object toolbar and draw a rectangle on the fascia. The rectangle defines the bounds of the graph; the graph should occupy the upper half of the panel.

2. Select the **Gauge** button and draw a rectangle in the lower half of the panel, centred under the graph. Allow room either side of the gauge to position the two sliders. Leave room between the top of the gauge and the bottom of the graph for some text.

3. Now select the **Slider** button and draw a slider to the left of the gauge. The slider should be the same height as the gauge and aligned with the left edge of the graph. Repeat the process for the other slider to the right of the gauge.

4. There is more work to do with these objects later. Now is a good time to add some text to the panel. First, select a dark-green filled rectangle and draw a small area in the middle of the panel – this is a readout of the current frequency.

5. Select the **Text** button with a colour of light-green. Position the cursor in the middle of the readout area and type the single character '**#**' (hash sign). The '**#**' has special meaning in a text object. With the '**#**' sign selected, bring up the Animation Editor dialog and choose *Display Value (Analogue)*. The Display Value (Analogue) dialog is displayed.

6. Click on the **Browse** pushbutton and then the **Add Point** pushbutton. Add two memory resident points to the project as follows:

Name	Type	Range	Purpose
Coarse	Real	0..1,000	'Coarse' component of the frequency.
Fine	Real	-25..25	'Fine' component of the frequency.

7. Back in the Display Value (Analogue) dialog, enter "coarse+fine" in the *Expression:* field. This ensures that if either slider is used to change the frequency, the readout is immediately updated with the new value.

8. Click on the **OK** pushbutton.

9. Now select the **Text** button with the colour white. Position the cursor above the left slider and type the text "coarse". Repeat for the right slider and enter the text "fine".

Slider Wizard

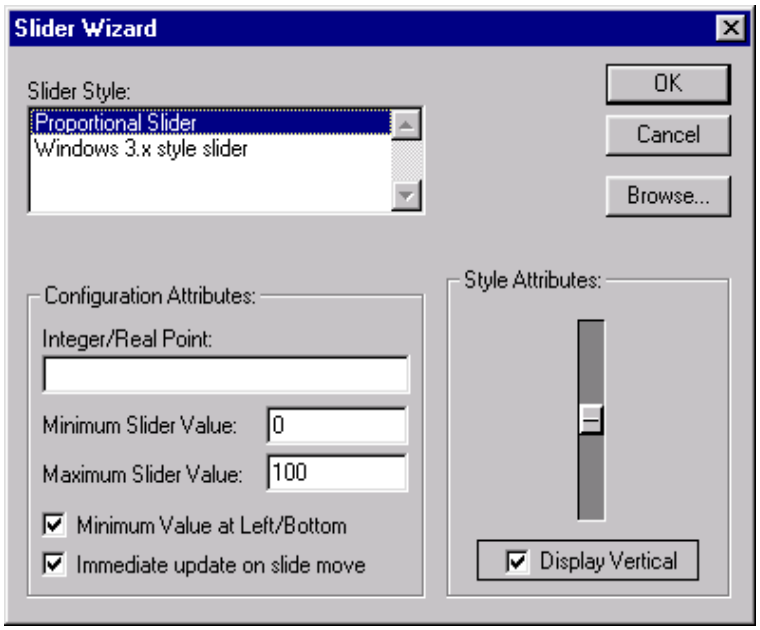
To use the slider wizard:

1, 2, 3…

1. Double-click on the left slider to invoke the Slider Wizard dialog.

2. Type "coarse" as in the *Integer/Real Point:* field.

3. Set the *Minimum Slider Value:* field to 0 and the *Maximum Slider Value:* field to 1,000.



4. Invoke the wizard for the right slider.
5. Type “fine” in the *Integer/Real Point:* field.
6. Set the *Minimum Slider Value:* field to -25 and the *Maximum Slider Value:* field to 25.

Gauge Wizard

To use the Gauge Wizard:

1, 2, 3…

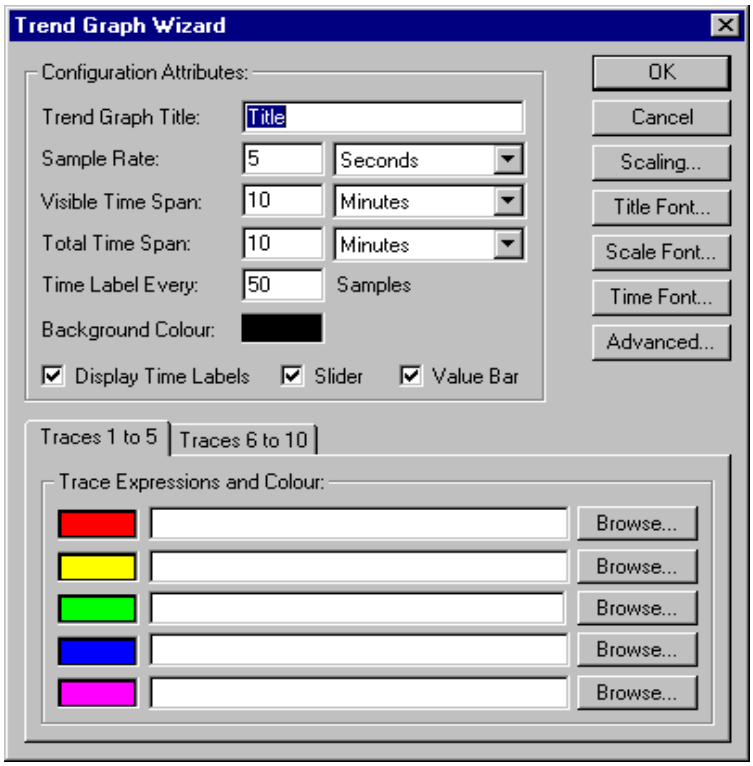
1. Double-click on the gauge to invoke the Gauge Wizard dialog.
2. Type “coarse+fine” in the *Expression:* field.
3. Set the *Minimum Gauge Value:* field to 0 and the *Maximum Gauge Value:* field to 1,000.
4. Set *Minor Display Units:* to 50 and *Major Display Units:* to 100.
5. Change the *Gauge Title:* to “Frequency (MHz)”.
6. In the *Style Attributes:* area, click on *Display Units on Outside.* As these changes are made in the Gauge Wizard dialog, the preview gauge change is shown reflecting the new selections.
7. Click on the **OK** pushbutton when all the changes have been made.

Trend Graph Wizard

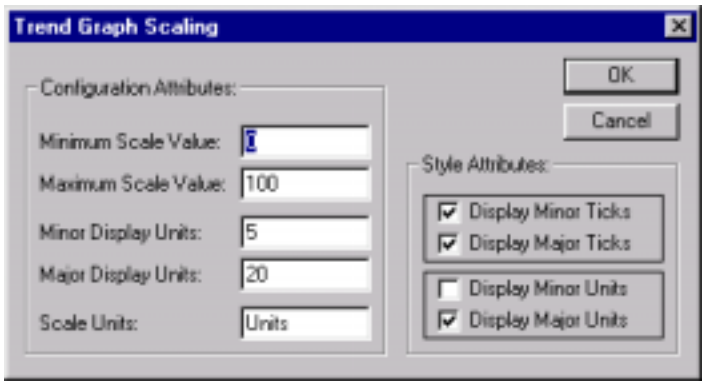
To use the Trend Graph Wizard:

1, 2, 3...

1. Double-click on the graph to invoke the Trend Wizard dialog.
2. Change the *Visible Time Span:* field to 1 minute and the *Total Time Span:* to 10 minutes.
3. Change the *Trend Graph Title:* field to “Frequency”.
4. Type “coarse+fine” in the *Expression:* field for the first trace plot.



5. Select the **Scaling** pushbutton to display the Trend Graph Scaling dialog.
6. Set the *Minimum Scale Value:* to 0 and the *Maximum Scale:* to 1,000.
7. Set *Minor Display Units:* to 50 and *Major Display Units:* to 100.
8. Change the *Scale Units:* to “MHz”.
9. Click on the **OK** pushbutton, and then click on the **OK** pushbutton again to close down the Trend Wizard dialog.



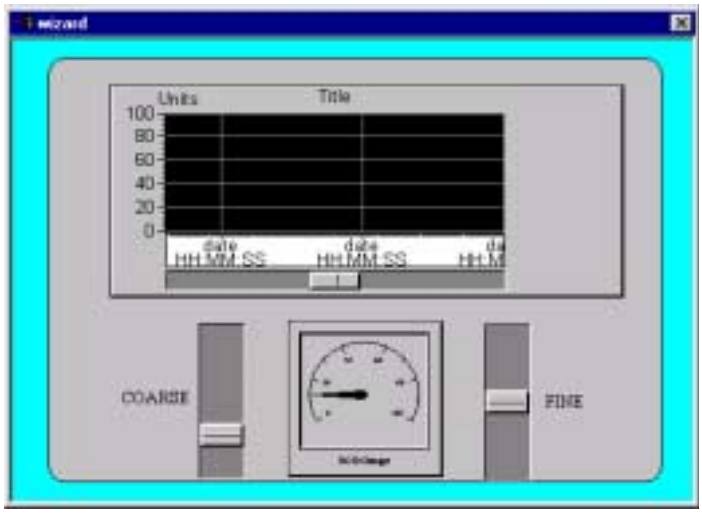
Test the Instrument Panel

The Instrument Panel can now be tested.

1, 2, 3...

1. Select the **Run** button from the toolbar.

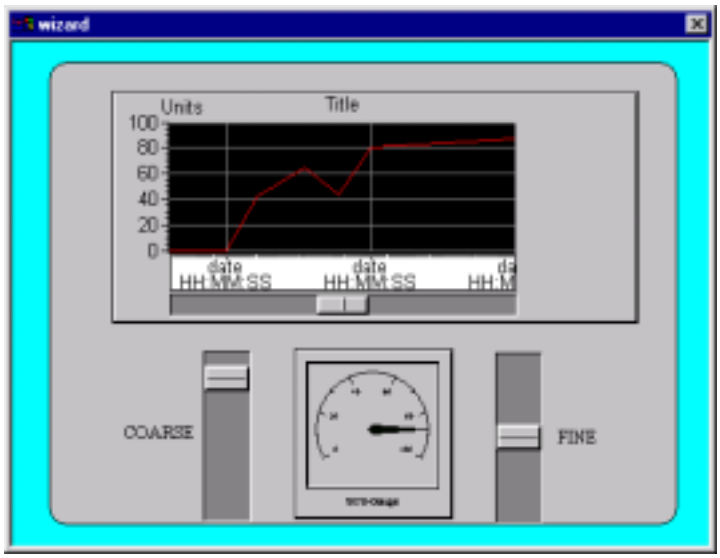
2. The runtime environment starts with the instrument panel displayed in the page.



3. Move the mouse pointer over the “coarse” adjustment slider and press and hold down the left mouse button.

4. As the slider is moved around, notice the gauge pointer swivel to reflect the new value; a numerical representation of the frequency is also displayed in the green readout area. The “fine” adjustment slider causes a similar change in frequency, although rather less pronounced.

5. Notice a trend graph being continuously updated which shows the change in frequency over time; once the trend graph has filled with data the built-in slider can be used on the graph to pan back and forth along the plot.



Communicating with PLCs

This chapter describes how to send and receive point values to or from a PLC. CX-Supervisor can communicate with any OMRON PLC supported by communication drivers such as CX-Server or SYSMAC-CDM. In order to communicate with a PLC, software protection **must** be installed – CX-Supervisor does not communicate in Demo mode. It is assumed that the user has sufficient knowledge of the PLC hardware to correctly configure it and connect it. Ensure that the PLC to be used for this test is a spare, i.e. it is **not** in operational use.

1, 2, 3...

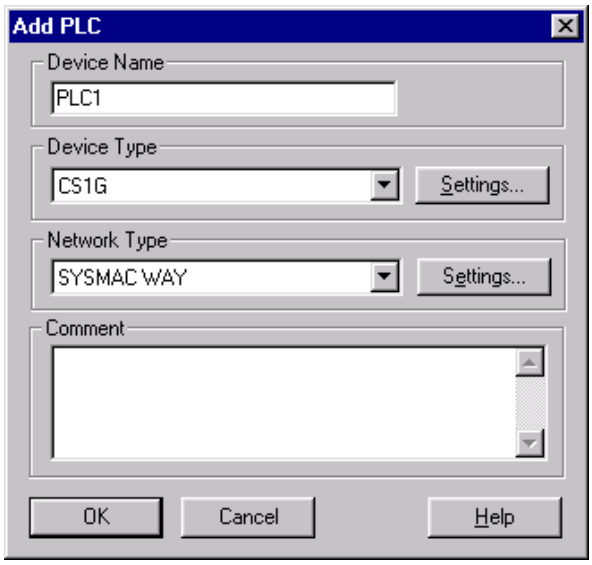
1. With the PLC connected and ready, run CX-Supervisor and start a new project.
2. Bring up the Point Editor and click on the **Add Point** pushbutton.
3. Add a *Point Name:* of “tank_value” with a *Point Type:* of “Integer” and an *I/O Type:* of “Input/Output”.
4. Set the *I/O Update Rate:* to “On Change” and *I/O Connection:* to “PLC”.

These actions define the point automatically; now CX-Supervisor must be configured so that it can communicate with the PLC hardware. This is achieved by invoking another software application, or communications driver.

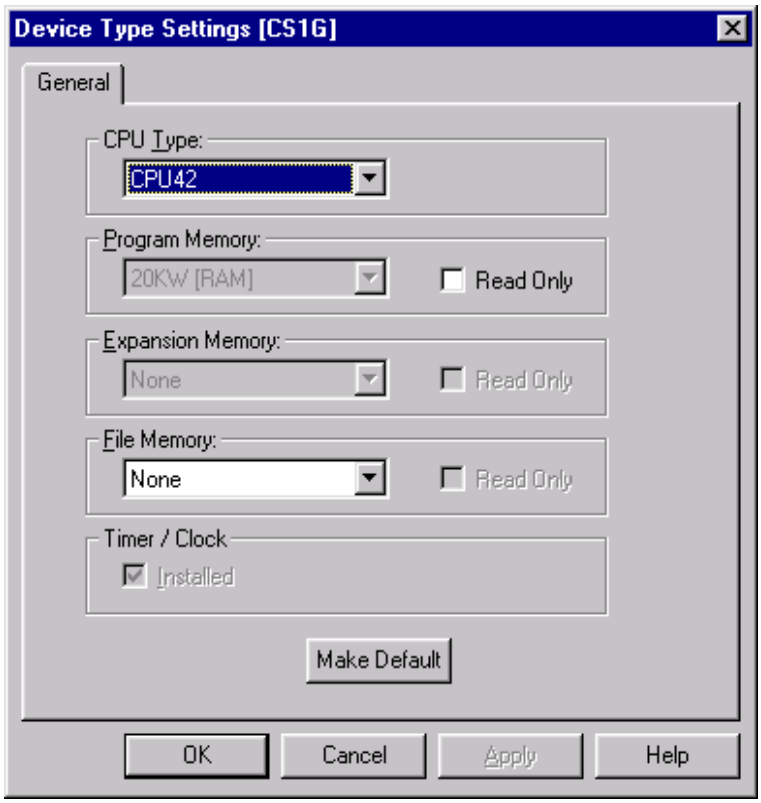
Note: The actions associated with the following paragraphs may differ based on the invoked communication driver.

1, 2, 3…

1. Click on the **Setup** pushbutton. The Setup PLC Connection [Integer] dialog is displayed.
2. Unless a PLC has previously been configured, click on the **Setup PLCs** pushbutton. The PLC List - <project>.CDM dialog is displayed.
3. A PLC definition needs to be added to the list (empty unless a PLC has previously been configured).
4. Click on the **Add** pushbutton and enter the name; for example, “PLC1”. The Add PLC dialog is displayed.

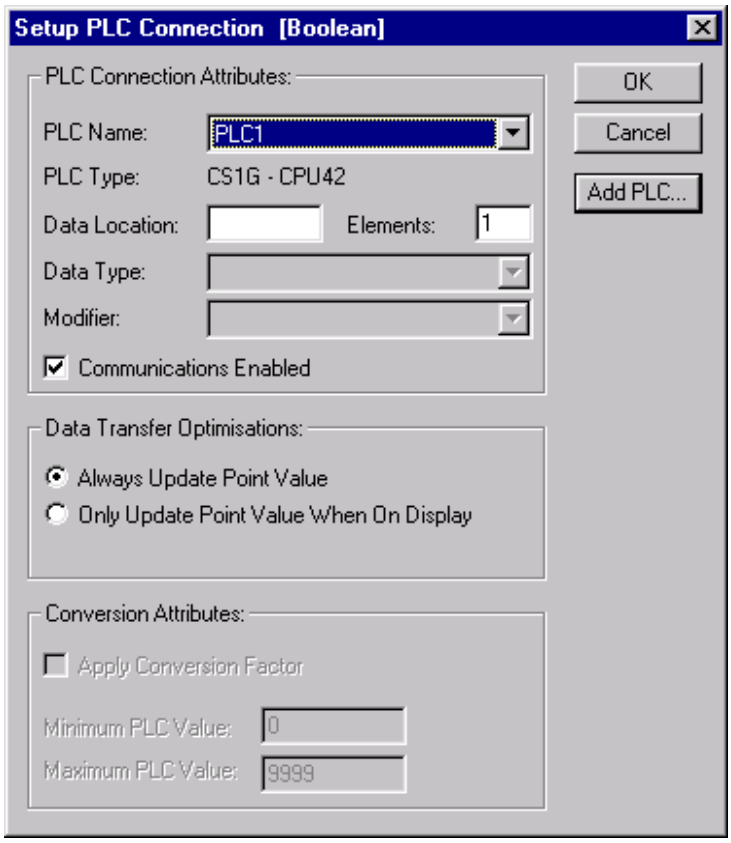


5. Select the appropriate *Device Type* from the available list; for example, the ‘SYSMAC CQM1’ OMRON PLC has a type of “CQM1” in the list.
6. Click on the **Setup** pushbutton next to *Device Type.* The Device Type Settings dialog is displayed. These settings should be configured according to the particular device being used; for example, the “CPU Type” for a “CQM1” device is “CPU41”.



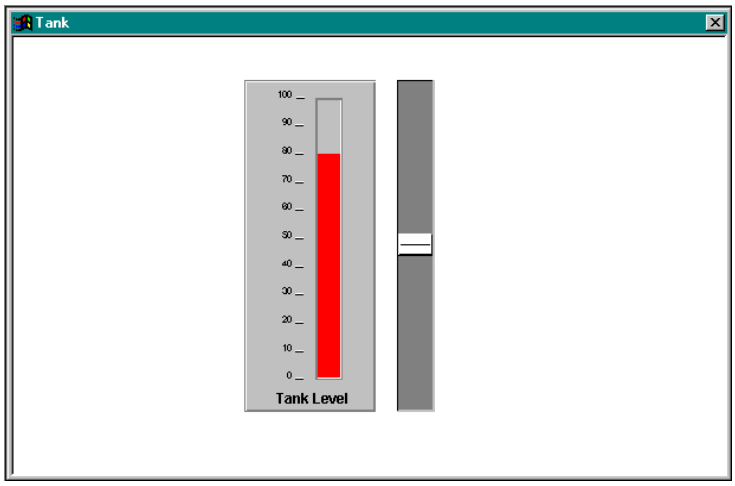
1, 2, 3…

1. Click on the **OK** pushbutton when the PLC is configured correctly.
2. Back in the PLC List dialog, choose “SYSMAC WAY” in the *Network Type:* field. Check the network settings using the **Setup** pushbutton; this allows the baud rate and communications port to be specified.
3. Click on the **OK** pushbutton when complete.
4. Back in the Setup PLC Connection [Integer] dialog, the appropriate PLC Name and Type are displayed at the top of the dialog.
5. Specify the *Data Location:* for the connected device – if necessary, refer to the manual for the particular PLC being used; for example, “dm10” is a valid location for a CQM1 PLC. Ensure that the location specified is not already being changed by a program running in the PLC. The *Data Type:* field is automatically filled in according to the selection made.



6. The *Conversion Attributes:* chapter of the dialog allows the application of a conversion factor to the PLC point.
7. Select the **OK** pushbutton when the PLC definition is complete to return to the Add Point dialog.
8. Select the **OK** pushbutton to complete the point specification.

To test that PLC communication is working, a test page can be created with a slider object that sets the value of the point 'tank_value' and a linear gauge object that displays the value of the point 'tank_value'.



1, 2, 3…

1. Select the **Slider Object** button and draw a slider as shown above.
2. Double-click on the new slider to bring up the Slider Wizard dialog.
3. Set the *Integer/Real Point* to ‘tank_value’. Ensure that the range of the slider is 0..100.

4. Select the **Linear Gauge Object** button and draw a gauge.
5. Double-click on the new gauge to bring up the Gauge Wizard dialog and set the *Expression:* to ‘tank_value’. Ensure that the range of the gauge is 0..100.
6. Save the page and add it to the project.
7. Finally, check that PLC communication is enabled in runtime by selecting *Start Up Conditions* from *Runtime Settings* (from the *Project* menu) and set *PLC Connections enabled* to ‘TRUE’.

8. Run the project and select the slider object on the test page and change its position.

Assuming that the PLC is correctly connected, this action causes the value of the point in the PLC to change accordingly. As the point changes in the PLC, it causes an update to the value displayed by the gauge on the page, thereby proving that PLC communications are working satisfactorily.

Moving On

Having completed the demonstration tutorials, genuine applications may now be created. The above exercises employed the Graphics Editor, Animation Editor and the Point Editor but, as familiarity with CX-Supervisor increases, future applications can take advantage of any (or all) of the various features within CX-Supervisor.

In particular, considerable benefit can be gained from experimentation with the following aspects of CX-Supervisor:

- Alarm Monitoring and Reporting.
- Security.
- OLE Access.
- Advanced Script Language.
- Recipes.

Getting Help

CX-Supervisor comes with a detailed context-sensitive help system: at any time while using the software, help can be obtained on the particular point currently being worked on, or on general aspects of CX-Supervisor. This system is intended to complement the manual, by providing on-line reference to specific functions of the software and how to use them. Refer to the *CX-Supervisor Getting Started Manual* for further information.

CHAPTER 2
Graphics Editor

This chapter describes the Graphics Editor and the various tools and controls available. It also provides instructions for using these tools and controls and is supported with suitable screen displays.

About the Graphics Editor

The Graphics Editor enables a variety of objects to be created on a page. Supported objects are:

- Graphical objects.
- Control objects.
- Embedded objects.

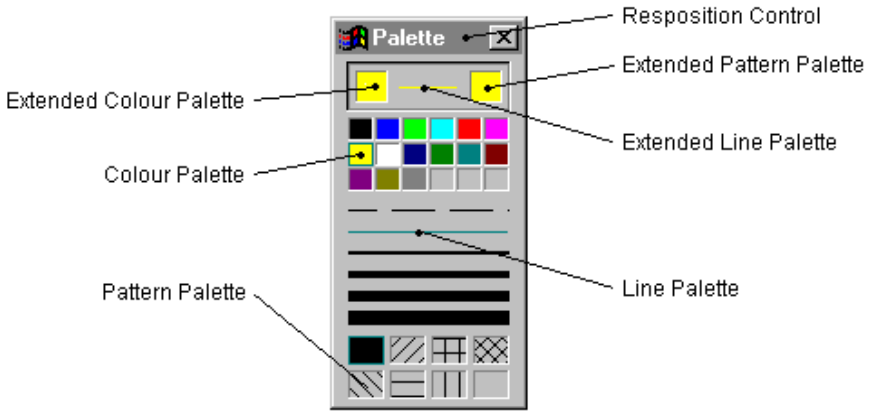
Graphical objects are geometric shapes, for example ellipses and polygons, but also include Text objects. Control objects allow information to be displayed and entered in clear way through the use of Wizards. Examples of control objects include Pushbuttons and Trend Graphs. Embedded objects are captured from sources external to CX-Supervisor. Examples of embedded objects are bitmaps and OLE objects.

Refer to chapter 5, Objects for further information regarding control objects and bitmap embedded objects. Refer to chapter 6, Embedding and Linking Objects for information on OLE embedded objects.

The tools are contained on a Control Bar, and within palettes. The palettes allow all similar types of tool to be kept together, and are contained within a free floating window. The various tools and palettes are discussed in the following chapters. Status and help information is presented in a Status Bar located at the bottom of the main CX-Supervisor window.

Palette

The Palette is always displayed on top of any pages created within CX-Supervisor. If no pages are open, the Palette is not displayed, and if there are no currently active pages, the Palette is rendered inactive. An example of the Palette illustrating the position of various palettes and controls is shown below:



The Palette can be removed or re-displayed at any time by selecting *Palette* from the *View* menu.

A tick next to the name indicates the Palette is currently displayed. CX-Supervisor saves the settings when it is exited and restores them when it is next run.

Each of the palettes and controls is discussed in more detail in the following paragraphs.

Colour Palette

To create an object in a particular colour: before selecting the object's tool from the Graphic Object bar, first select the colour by clicking in the appropriate square in the Colour Palette.

Note: It is not strictly necessary to select a colour for an object before creating it, however if no colour selection is made, the object retains the same colour as the last object.

To apply a colour to a previously created object, select the object on the page and click with the left mouse button in the appropriate square in the Colour Palette.

Note: Colour may only be applied to some graphic objects. It cannot be applied to embedded objects or bitmap graphics.

Line Style Palette

The Line Style Palette is located in the Palette just below the Colour Palette.

To create an object with a particular line style: before selecting the object from the Tool Palette, first select the line style by clicking on the appropriate line in the Line Style Palette.

Note: It is not strictly necessary to select a line style for an object before creating it, however if no line style selection is made, the object retains the default style of thin solid.

To apply a line style to a previously created object, select the object on the page and click on the appropriate line in the Line Style Palette.

Note: Line styles may only be applied to some graphic objects. They cannot be applied to text, embedded objects, controls or bitmap graphics.

Fill Pattern Palette

The Fill Pattern Palette is located at the bottom of the Palette.

To create an object with a particular fill pattern: before selecting the object's tool from the Tool Palette, first select the fill pattern by clicking in the appropriate square in the Fill Pattern Palette.

Note: It is not strictly necessary to select a fill pattern for an object before creating it, however if no fill pattern selection is made, the object retains the default of no pattern.

To apply a fill pattern to a previously created object, select the object on the page and click in the appropriate square in the Fill Pattern Palette. With a fill pattern applied to an object, clicking in the Colour Palette with the left mouse button allows the foreground colour of the chosen fill pattern to be changed. Clicking in the Colour Palette with the right mouse button allows the background colour of the chosen fill pattern to be changed.

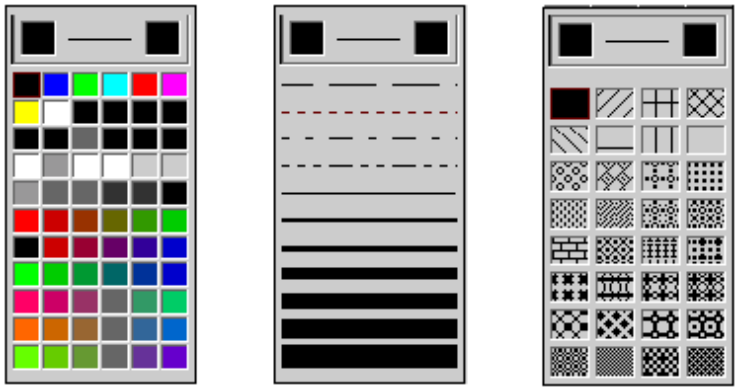
Note: Fill patterns may only be applied to solid graphic objects. They cannot be applied to unfilled graphic objects, text objects, embedded objects, controls or bitmap graphics.

Extended Colour, Line Style and Fill Pattern Palette

Each of the Colour, Line Style and Fill Pattern Palettes may be extended to allow access to more choices. Only one palette may be extended at any one time. The Extended Selection tools are located at the top of the Palette and are illustrated as follows:

The left hand square controls the extension of the Colour Palette; the line between the two squares controls the Line Style Palette extension, and the right hand square control the Fill Pattern Palette extension.

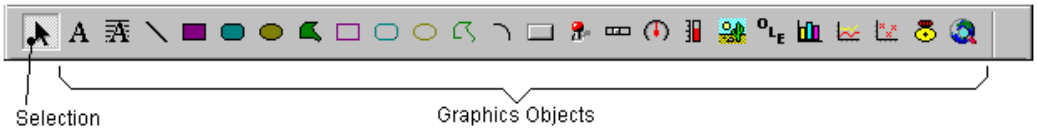
An example of the Extended Colour, Line Style, and Fill Pattern Palettes is shown below:



The operation of each of the extended palettes is identical to that of the non-extended palettes.

Graphic Object bar

The Graphic Object bar contains the tools to create the graphic objects which can be placed on pages within CX-Supervisor.



In general terms, the operation of the Graphic Object bar is simple. With a page active the Graphic Object bar is active, and operation involves merely clicking on the desired tool to select it, and then clicking and dragging to the appropriate point in the page. This is not the case with the text, polygon or polyline tools, however the operation of these tools is fully discussed in chapter 5, Objects.

Moving the mouse pointer over any of the tools causes CX-Supervisor to display a tool to describe the tool.

By default, the cursor returns to Selection mode (an arrow) after drawing an object. If you would prefer it to remain in its current state, clear the *Return to select mode* checkbox in the Editing Preferences dialog, which is found on the CX-Supervisor file menu.

For further details concerning the tools contained within the Graphic Object bar refer to chapter 5, Objects.

Control Bar

CX-Supervisor provides a Control Bar containing formatting and object manipulation tools. The Control Bar can be activated or de-activated from the *View* menu. To activate the Control Bar, select *Control Bar* from the *View* menu; CX-Supervisor places a check mark next to it signifying its active status. To de-activate it, repeat the procedure (the check mark is removed), and the Control Bar is no longer displayed. The various tools on the control bar allow the properties of objects to be modified.

A control may be activated with more than one object selected to change a particular attribute of all of the selected objects, e.g. when all graphical objects on a page are selected and the **Rotate** button is pushed in and the desired angle specified, all selected objects are rotated.

An illustration of the Control Bar is as follows:

The Control Bar may vary slightly from this according to the display resolution currently in use - the number of buttons displayed depends on the available space - at higher resolutions more buttons are displayed.

The Control Bar can be removed from the display at any time by selecting *Control Bar* from the *View* menu.

A tick next to the name indicates that it is currently displayed. CX-Supervisor saves the settings when it is exited and restores them when it is next run.

The specific operation of the controls on the Control Bar is described in the following paragraphs.

Object Identification

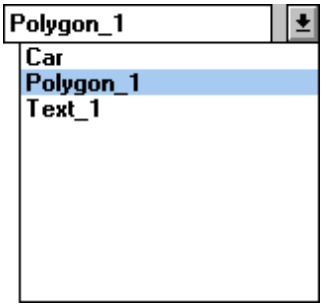
When an object is created, CX-Supervisor gives it a unique identifier. This identifier consists of the object type and a sequential number (starting at 1). For example, a text object could have an identifier of TEXT_1, a polygon object could have an identifier of POLYGON_3 etc. The *Object Identification* field displays a list of all current objects on a page.

The identification of an object can be changed by clicking on the entry in the Object Identification control, typing over the entry and pressing <Return>. A confirmation box is provided to double check the operation, click the **OK** pushbutton to proceed with the name change or the ***Cancel*** pushbutton to abort the operation.

It can at times be difficult to select a particular object if it is mostly obscured by other graphic objects. The Object Identification control allows an object to be selected by simply selecting its name from the presented list. Click on the arrow button to display the list and select the desired object. On selection the object is highlighted.

The following illustration shows the Object Identification control in de-selected state:

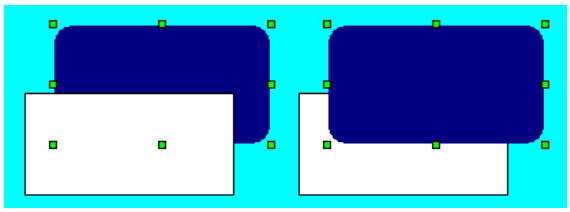
The following illustration shows the Object Identification control in selected state:



Raise Up One

The **Raise Up One** button allows an object which forms part of an overlapping group of objects to be moved nearer the top of the group, one layer at a time. With an object selected, clicking the pushbutton once moves the object up one layer. This continues until the object is at the top. Clicking the pushbutton with the object at the top of a group has no effect.

The following example illustrates the state of a group of two objects before and after clicking the **Raise Up One** button with the black round rectangle selected:

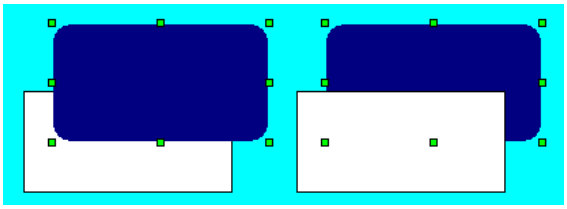


Before **After**

Lower Down One

The **Lower Down One** button allows an object which forms part of an overlapping group of objects to be moved nearer the bottom of the group, one layer at a time. With an object selected, clicking the button once moves the object down one layer. This continues until the object is at the bottom. Clicking the button with the object at the bottom of a group has no effect.

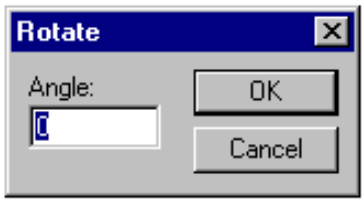
The following example illustrates the state of a group of two objects before and after clicking the **Lower Down One** button with the grey polygon selected:



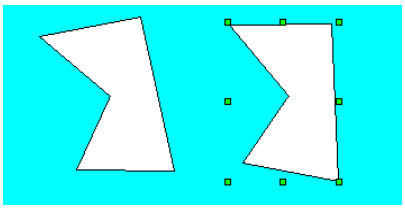
Before **After**

Rotate

The **Rotate** button allows graphical and bitmap objects to be rotated. With an object selected, clicking the button once opens the Rotate dialog box. Set the desired angle and click the **OK** pushbutton to rotate the object.



The following example illustrates the state of an object before and after clicking the **Rotate** button and defining a 10° rotation with the object selected:

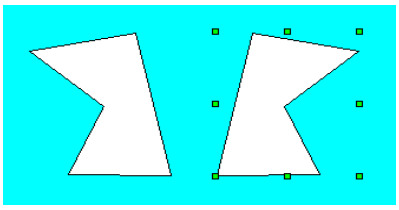


Before **Rotated 10°**

Horizontal Mirror

The **Mirror Horizontal** button on the Control Bar allows graphical and bitmap objects to be mirrored in the horizontal plane. With an object selected, clicking the button once “flips” the object producing a horizontal mirror image.

The following example illustrates the state of an object before and after clicking the **Mirror Horizontal** button with the object selected:

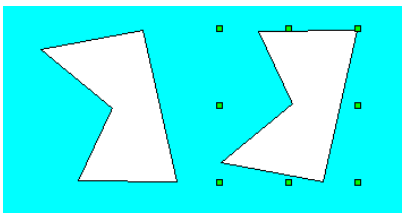


Before **After**

Vertical Mirror

The **Mirror Vertical** button allows graphical and bitmap objects to be mirrored in the vertical plane. With an object selected, clicking the button once “flips” the object producing a vertical mirror image.

The following example illustrates the state of an object before and after clicking the **Mirror Vertical** button with the object selected:

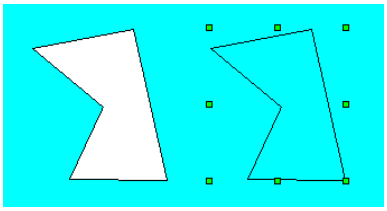


Before **After**

Transparency On/Off

The **Transparency** button changes an object from solid to outline and from outline to solid. With an object selected, click the button and the object toggles from solid to outline (or vice-versa).

The following example illustrates the state of an object before and after clicking the **Transparency** button with the object selected:



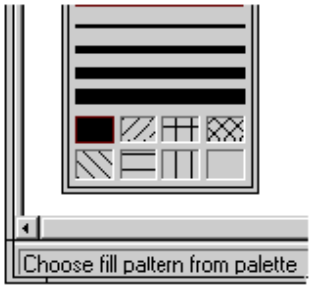
Before **After**

Status Bar

CX-Supervisor provides help and status information in a Status Bar located at the bottom of the main window.

The Status Bar has two main active areas: the Help Message area, and the Cursor Co-ordinates area.

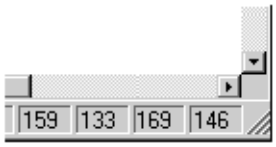
The Help Message area is used by CX-Supervisor to display helpful information concerning menu selections and controls. It is located at the left hand end of the Status Bar, and can display messages similar to the following:



The Cursor Co-ordinates area provides position information for the current location of the mouse pointer as it tracks around the active page within the CX-Supervisor window. If an object on a page is selected, the status area displays the co-ordinates of the location of that object An example of the system status area is illustrated as follows:

The first two display panels show the current x and y co-ordinates of the mouse pointer within the currently active page. As the mouse pointer leaves the confines of a page and moves into the client area of the main CX-Supervisor window, the last recorded co-ordinates are held in these panels.

If an object is clicked on, all four panels are used by CX-Supervisor to display the co-ordinates of that object, as follows:

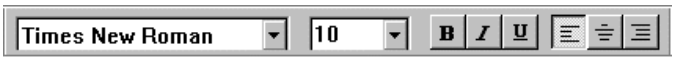


x y Width Height

The first two panels contain the distance of the top left corner of the object from the top left of the page in pixels. The second two panels show the extent of the object in pixels.

Text Bar

An illustration of the CX-Supervisor Text Bar is as follows:

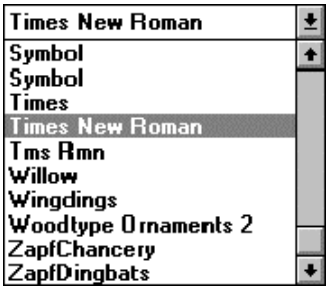


Font Name

The *Font Name* field contains a list of fonts which are available on the host version of Windows. The list is presented in alphabetical order, and only details typeface families. This does not include bold or italic variants as this attribute is set by using the appropriate button.

The following illustration shows the control in de-selected state:

The following illustration shows the control in selected state:



The *Font Name* field displays the current font attribute for the selected object(s). To change the font for a block of text, highlight it and click either: the down arrow adjacent to the edit part of the control, or into the edit part of the control itself, for the *Font Name* field. The control then displays a list of available fonts, from which the desired typeface may be selected.

If more than one block of text is selected with each having different font attributes, the edit part of the control is empty. However, selecting a font from the supplied list still sets the font attribute for all the selected group of text blocks.

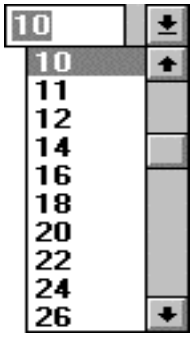
Fonts and font families are printer dependent, therefore changing the printer within the Printer Setup dialog (accessed from the *File* menu) changes the fonts which are available within the *Font Name* field.

Font Size

The *Font Size* field contains a list of point sizes available on the host version of Windows for the selected font. The list is presented in numerical order.

The following illustration shows the control in de-selected state:

The following illustration shows the control in selected state:



Either click the cursor into the editable area of the control and enter a new point size, or click the down arrow and select a new point size from the presented list.

The control displays the current point size for the selected block of text. If more than one block of text is selected having different point sizes, the edit part of the control is empty. However, selecting a font from the supplied list (or typing in a new point size) still sets the point size for all the selected blocks of text.

Text Bold On/Off

The **Text Bold** button allows any selected text objects to be set to bold when the **Text Bold** button is pushed in, or normal when the **Text Bold** button is released. Text Bold only applies to text, block text, and to text on buttons, other controls and graphics cannot be emboldened.

Text Italic On/Off

The **Text Italic** button allows any selected text object(s) to be set to italic when the **Text Italic** button is pushed in, or normal when the **Text Italic** button is released. Text Italic only applies to text, block text, and to text on buttons, other controls and graphics cannot be italicised.

Text Underline On/Off

The **Text Underline** button allows any selected text object(s) to be set to underline when the **Text Underline** button is pushed in, or normal when the **Text Underline** button is released. Text Underline only applies to text, block text, and to text on buttons, other controls and graphics cannot be underlined.

Text Left Aligned

The **Text Left Aligned** button aligns any selected text object(s) to the left edge of the bounding box. Text Left Justified only applies to text, block text, and to text on buttons, other controls and graphics cannot be left justified.

Text Centred

The **Text Centred** button aligns any selected text object(s) to the centre of the bounding box. Text Centre Justified only applies to text, block text, and to text on buttons, other controls and graphics cannot be centre justified.

Text Right Aligned

The **Text Right Aligned** button aligns any selected text object(s) to the right edge of the bounding box. Text Right Justified only applies to text, block text, and to text on buttons, other controls and graphics cannot be right justified.

Grid

The use of the grid may be helpful in drawing and aligning the objects on the screen. Select the Grid button from the toolbar to enable the grid.

The grid settings are available by selecting *Grid* from the *View* menu. All the available grid sizes are shown along with a *Snap to Grid* option which forces graphical objects selected by the user to align according to the current grid setting.

CHAPTER 3
Pages

This chapter explains the concept of pages. The chapter covers creating, amending, printing and saving pages.

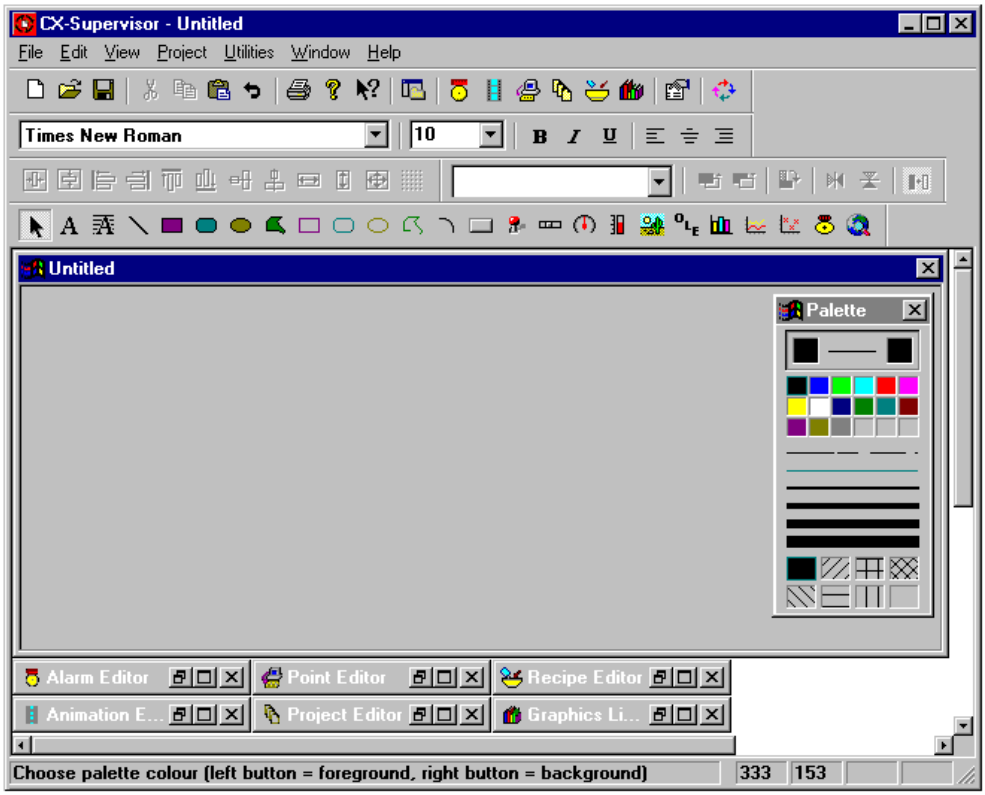
Creating a Page

A project may consist of several pages, but must contain at least one.

To create a new page, CX-Supervisor must currently have a project open. If no project is currently open, either click on the **Open** button from the toolbar to open a previously saved project, or select *New* from the *Project* menu to create a new project.

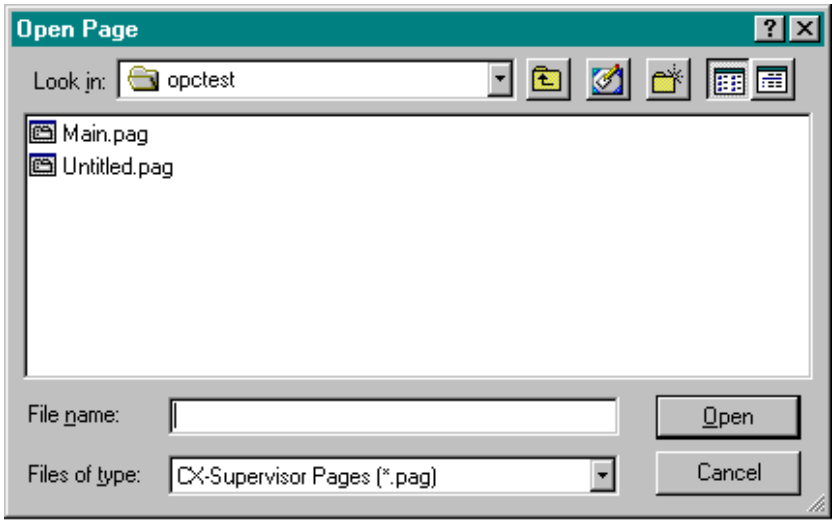
Note: When you first create a project, CX-Supervisor creates a new page for you automatically. For more details concerning projects, refer to chapter 7, Projects.

With a project open, click the **New Page** button from the toolbar to create a new blank page. An example of a new blank page is shown as follows:



Amending a Page

To amend a page, it must first be open. If no pages are open click the **Open Page** button from the toolbar. An Open Page dialog is displayed, similar to the following:



Any files of the type specified in the *Files of Type:* field and resident in the current folder, are listed in this dialog. This list can provide simple or comprehensive file details as follows:

To view file name(s) only click the **List** button in this dialog.

To view file name(s), file size, file type and modification date click the **Details** button from this dialog. The file name(s) can be sorted in ascending order by clicking once in the *Name* field, *Date* field, *Type* field or *Modification* field. Click twice in the appropriate field to sort in descending order.

1, 2, 3…

1. Locate the drive and directory where the desired page is stored using the *Look in*: field.
2. Select the desired page from the list presented.
3. Click the **Open** pushbutton to load the page.

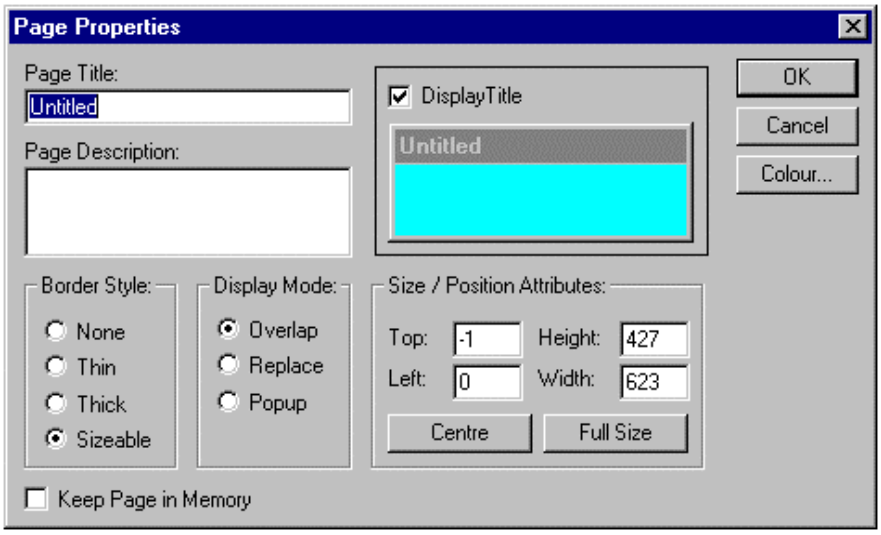
Note: Loading a page does not automatically make it part of a project. It is therefore perfectly feasible to load and edit pages from other projects. Use the Project Editor to attach a page to a project. For more details concerning projects, refer to chapter 7, Projects.

The loaded page may now be edited as required using the CX-Supervisor editing tools.

Defining the Properties of a Page

A page has certain attributes, or properties. These properties may be viewed and edited in two ways. The simplest way to access the properties of a page is to double click with the left mouse button in the background area of the page.

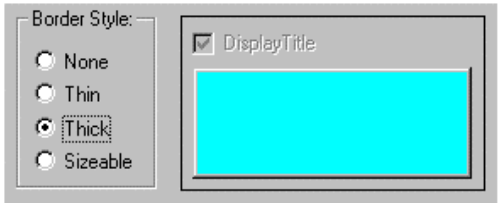
This causes CX-Supervisor to display the following Page Properties dialog:



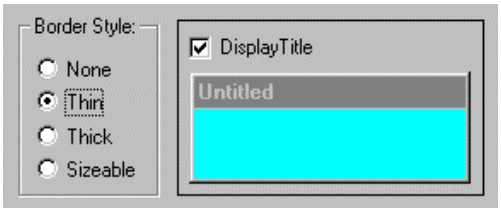
The Page Properties dialog allows the viewing and editing of various attributes.

1, 2, 3...

1. Enter a title for the page in the *Page Title:* field up to a maximum of 32 characters.
2. Add a description (if required) in the *Page Description* field.
3. Enter the co-ordinates for the top-left corner of the page in the *Top* and *Left* field. This value must be in pixels, and must be a positive integer between 0 and 2000. Alternatively, click on the **Full Size** pushbutton to fill the runtime environment workspace.
4. Enter the height and width measurements for the page in the *Height* and *Width* fields. These values must be in pixels, and must be a positive integer between 0 and 2000. Click on the **Centre** pushbutton to centre the page to the graphics workspace.
5. Select the border style for the page from the *Border Style* settings. The default for this is *Sizeable*, as shown on the Page Properties dialog. Clicking on the *Thick* setting results in the following change to the dialog:

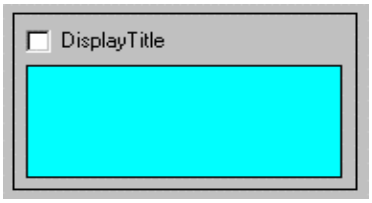


Clicking on the *Thin* setting results in the following change to the dialog:



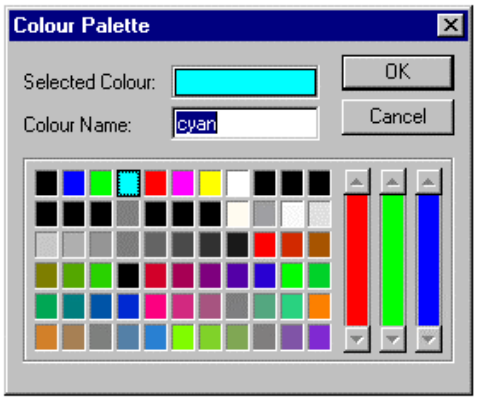
Clicking on the *None* setting results in the following change to the dialog:

6. To prevent the title from being displayed, whilst still retaining it, click the *Display Title* setting to remove the check mark. The following change occurs in the dialog:



7. To change the display mode, select either *Overlap, Replace* or *Popup* in the *Display Mode* setting. 'Popup' pages appear above all other page types, 'Overlap' pages can lie on top of other pages, and 'Replace' pages closes any pages that overlap.

8. To alter the colour of the page, click in the *Demo Page Window* area or click on the **Colour** pushbutton. CX-Supervisor displays the Colour Palette dialog:



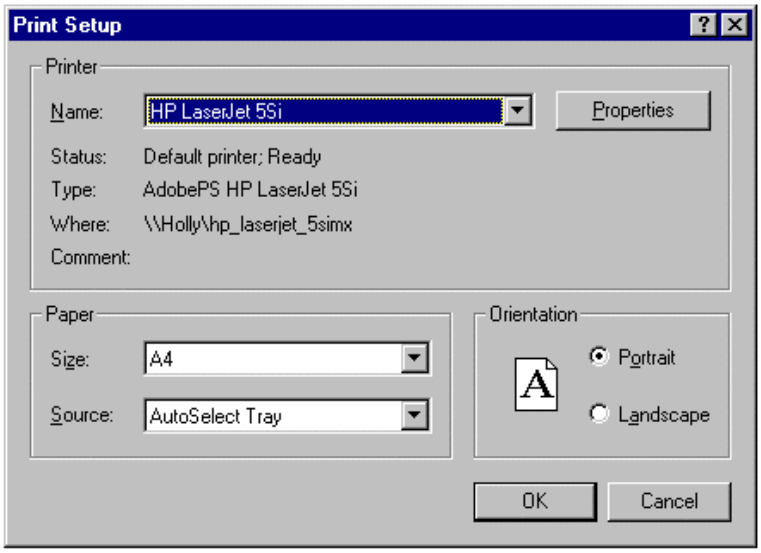
9. Either select a colour from the palette area or click on a palette colour and edit it using the three colour sliders. When the desired colour is displayed, click the **OK** pushbutton to return to the Page Properties dialog.

Printing a Page

Print Setup

Before printing a page, ensure that the printer has been set up correctly. To check the printer settings, select *Print Setup* from the *File* menu.

CX-Supervisor displays the Print Setup dialog in response:



The current printer selection is defined in the *Name:* control box. To alter the settings, proceed as follows:

1, 2, 3...

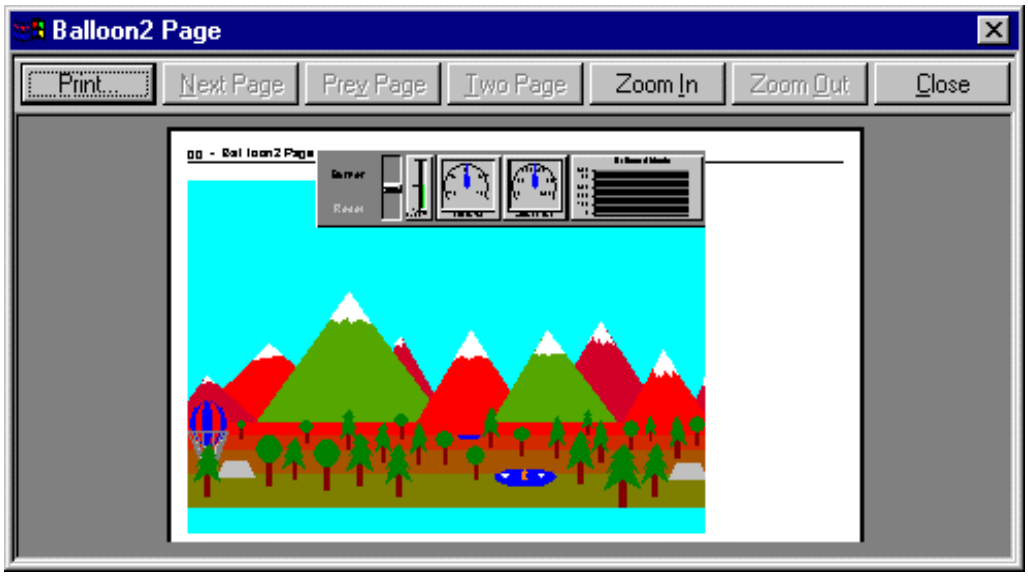
1. To change the current printer selection, click the *Name:* field and select from the list presented.
2. To change the page orientation from portrait to landscape click the *Landscape* setting, (or vice-versa).
3. To change the paper size, click the *Size:* field, and select the desired paper size from the list presented.
4. To change the paper source, click the *Source:* field, and select the desired paper source from the list presented.
5. Click the **OK** pushbutton to exit from the Print Setup dialog when the settings are correct.

Note: The **Properties** pushbutton gives access to advanced printer configuration functions for the selected printer. For details of these functions, refer to the *Windows User Manual*, *On-line Help*, or the appropriate Manufacturer's handbook.

Print Preview

To preview the page before printing, select *Print Preview* from the *File* menu.

This results in a screen display similar to the following:



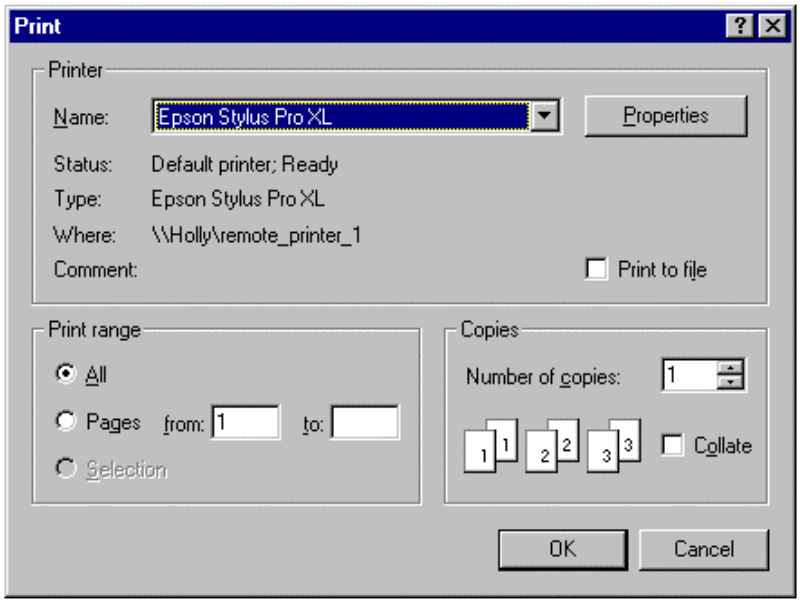
1, 2, 3...

1. To print the page, click the **Print** pushbutton, CX-Supervisor displays the Print dialog.

2. To display the next page, click the **Next Page** pushbutton.
3. To display the previous page, click the **Prev Page** pushbutton.
4. To display the current page, side-by-side with the next page, click the **Two Page** pushbutton. To return to a single page view click the same button again which now carries the legend, **One Page**.
5. Click the **Zoom In** pushbutton. Click it a second time to zoom in to the second level. This does not zoom into a specific area of the page.
6. To zoom out from a zoomed in view, click the **Zoom Out** pushbutton. Click a second time to zoom right out.
7. To close the preview screen, click the **Close** pushbutton.

Printing

To print a page, click the **Print Page** button from the toolbar. The Print dialog is displayed.



1, 2, 3…

1. Set the print range by clicking one of the setting in the *Print range* settings. The *Selection* setting is only enabled when an item (or items) are selected on the page prior to starting the print process. Click the *Pages* setting and enter a range of pages in the *from* and *to* fields.
2. To change the number of copies to be printed, enter a new value in the *Copies* field.

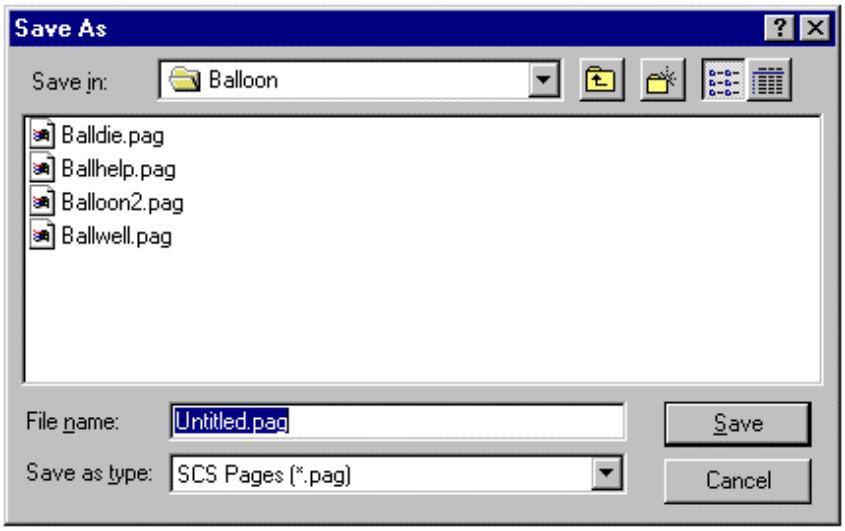
3. If multiple copies are selected, click the *Collate* setting to instruct the printer to collate the copies as they are printed.
4. To print to file, click the *Print to file* setting.
5. Click the **OK** pushbutton to activate printing. Whilst printing is in progress, a dialog is displayed showing the status of the print job. Clicking the **Cancel** pushbutton at this point aborts the printing. Once printed, the dialog disappears. The final printed version should be similar to that shown in the Print Preview dialog, with a header describing the project, and a footer describing the page with a page number and date stamp.

Note: The Properties pushbutton on the Print dialog gives access to advanced printer configuration functions for the selected printer. For details of these functions, please consult the Windows User Manual, On-line Help, or the appropriate Manufacturer's handbook.

Saving a Page to a Project

Once a page has been created it is wise to save it into the project in which it is planned to reside. It is good practice to ensure that pages are saved regularly, for example to minimise the loss of work in the event of a power failure.

To save a page click the **Save Page** button from the toolbar. If this is the first time the page has been saved, the Save As dialog is displayed:



Any files of the type specified in the *Save as Type:* control box, and resident in the current folder, are listed in this dialog. This list can provide simple or comprehensive file details as follows:

1, 2, 3...

1. Move to the location where the page file is to be stored using the *Save in:* field.
2. Ensure that the *Save as Type:* control is set to *CX-Supervisor Pages (*.PAG)*.
3. Enter a name in the *File Name:* field.
4. Click the **Save** pushbutton to save the file.

Subsequent saves do not cause the Save As dialog to be displayed.

To view file name(s) only click the **List** button in this dialog.

To view file name(s), file size, file type and modification date click the **Details** button from this dialog. The file name(s) can be sorted in ascending order by clicking once in the *Name* field, *Date* field, *Type* field or *Modification* field. Click twice in the appropriate field to sort in descending order.

After clicking the **Save** pushbutton**,** if the page is currently not assigned to a project, a confirmation dialog is displayed. Alternatively, select *Save Page* from the *File* menu (or use the short-cut key combination of <Ctrl>+S.

Save Page As

Should a copy of a page be required, (for incorporation into another project perhaps), select *Save Page As...* from the *File* menu.

CX-Supervisor displays the File Save As dialog as illustrated previously. After entering a new name for the page, CX-Supervisor prompts to save the different page into the current project as above.

Closing a Page

To close a page after editing select *Close Page* from the *File* menu.

Alternatively, either click on the control box for the page, (located in the top left corner of the page) and select *Close* from the *Control* menu, or simply double-click on the *Control* menu and the page closes.

Should you attempt to close a page which has not been saved, CX-Supervisor displays a confirmation dialog. If you want to save the changes, click the **Yes** pushbutton. Otherwise, click the **No** pushbutton, or click the **Cancel** pushbutton to abort closing the page.

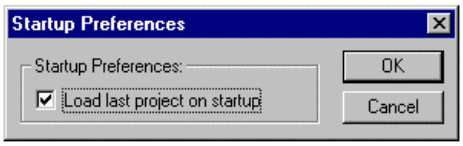
CX-Supervisor Preferences

CX-Supervisor allows a user to customise the working environment. To set or amend the CX-Supervisor setup, select *Preferences* from the *File* menu, followed by the preference to set up.

The types of customisation are described in the following paragraphs.

Startup Preference

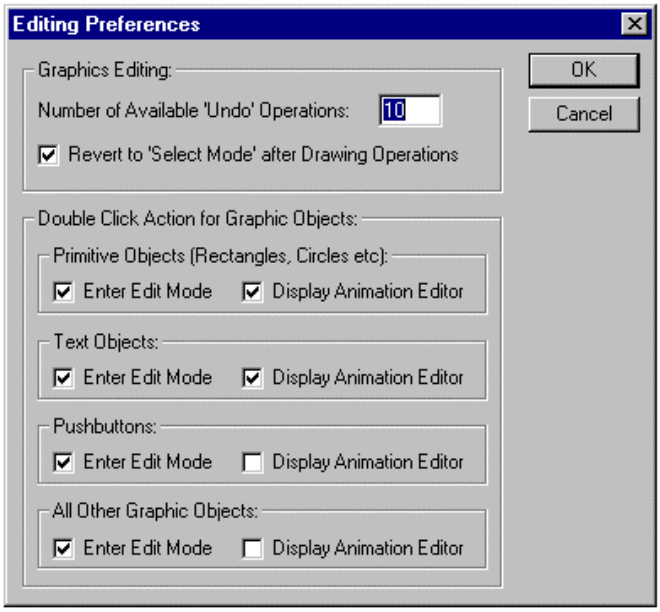
The Startup Preference allows the project last accessed in the previous session of CX-Supervisor to be automatically loaded in the next session. It is accessible by selecting *Startup* from the *Preferences* menu. Click in the *Load last project on startup* setting to switch this preference as desired. Click the **OK** pushbutton to accept the change, or **Cancel** to abort.



Editing Preferences

The Editing Preferences dialog provides a number of switches to enhance the use of the Graphics Editor and CX-Supervisor animation. It is accessed by selecting *Editing* from the *Preferences* menu. The number of undo operations in the Graphics Editor can be set in the *Number of Available 'Undo' Operations:* field. To make the Graphics Editor return to Select Mode after every drawing operation, click in the *Revert to 'Select Mode' after Drawing Operations* setting. The use of double-clicking on an object can be defined: when a check mark is present in the *Enter Edit Mode* field, a double-click on an object of that type causes it to enter Edit Mode.

When a check mark is present in a *Display Animation Editor* field, a double-click on an object of that type activates the Animation Editor. Click the **OK** pushbutton to accept the changes, or the **Cancel** pushbutton to abort.



CHAPTER 4
Points

This chapter describes CX-Supervisor points and the procedures associated with the creation, amendment and removal of points using the Points Editing facility. The application of external sources to points is also described.

What is a Point?

A point is a variable used internally by CX-Supervisor. All points within CX-Supervisor have a name, group and type associated with them.

CX-Supervisor provides a set of pre-defined System ($) Points, which are detailed in chapter System Points.

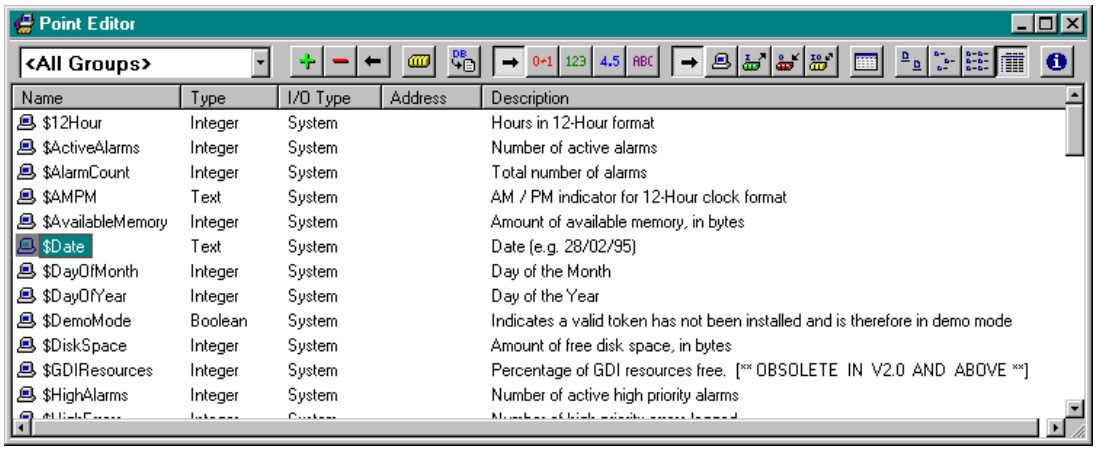
About the Point Editor

The Point Editor allows the viewing, creating, modifying and removing of points from the points database.

System Points cannot be modified.

To open the Point Editor dialog, select the **Point Editor** button from the toolbar.

An example of the Point Editor dialog is as follows:



The typeface of the editor can be amended by selecting *Preferences* from the *File* menu. This is especially useful when printing.

Note: To select a range of points, click on a point to mark the start of the range and click again with the <Shift> key down to mark the end.

Note: To individually select more than one point, click whilst holding the <Ctrl> key down.

Note: The short-cut keyboard combinations for Cut, Copy and Paste operations are valid within the Point Editor. Highlight one or more points and type <Ctrl>+X to cut or <Ctrl>+C to copy; use <Ctrl>+V to paste. Since the cut and copy operations store the information in the Windows Clipboard, points may be pasted to another CX-Supervisor application.

Note: If the I/O type ends with '*' and a number, it is an array point with the shown number of elements.

Viewing Points via the Point Editor

The Point Editor view of the points database can be tailored by filtering or sorting the available points.

Filtering the Points in the View via Group

Points are separated into groups. To select a group, pick an entry from the *Group* field.

All points can be displayed by selecting <*All Groups*> from this list.

Filtering the Points in the View via Point Type

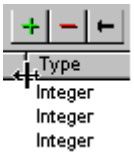
A selection of points can be displayed based on the point type. Selection of the **All Points** button from the toolbar displays points of all types.

The **Boolean Points** button only displays points of a Boolean type. The **Integer Points** button, the **Real Points** button and **Text Points** button, once selected, react in the same way.

Sorting the Points in the View by I/O Type

Points can also be filtered by I/O type. Respectively, these toolbar buttons display All Points, Memory Points, Input Points, Output Points or Input/Output Points.

Sorting the Points in the View



Individual listed points are sorted, based on a designated field type, either name, type, input/output type or description. By clicking on the **Name** button, the points are sorted alphanumerically by name. The **Type** button, the **I/O Type** button, the **Address** button and **Description** button, once selected, react in the same way. In the previous Point Editor example the list is sorted by Name.

The widths of the point fields can be widened or narrowed as required using the mouse to drag the column boundaries:

A double click on the text boundaries causes the column to autosize.

Changing the Viewing Mode

Select the **View Settings** button to view the information displayed in the Point Editor.

Select the **Large Icons** button to view details with large icons.

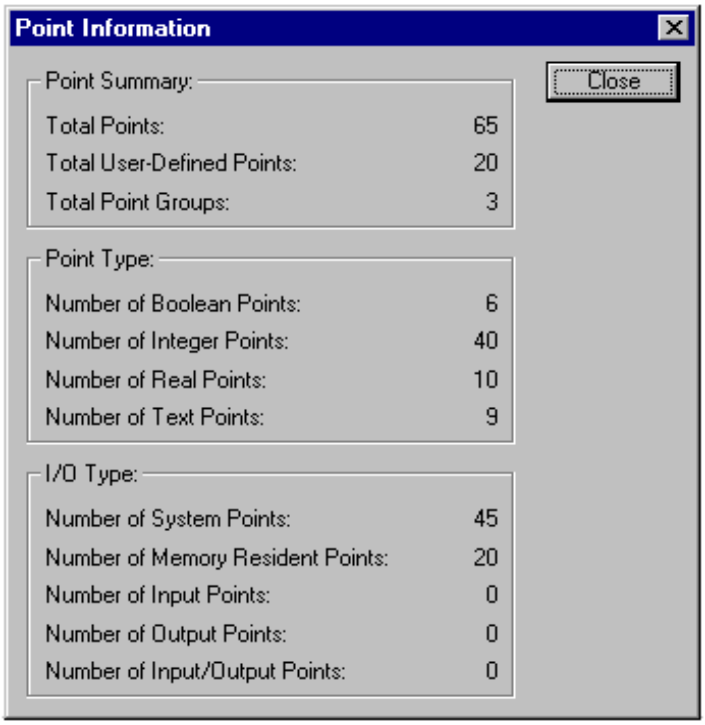
Select the **Small Icons** button to view details with normal icons.

Select the **List** button to view details as a list.

Select the **Details** button to view details as a list including name, type, I/O type, address and description information. The details can be sorted in ascending order by clicking once or in descending order by clicking twice, in the appropriate field.

Summary of Point Information

A summary of point information is available by selecting the **Display Information on Points** button from the toolbar. The resultant Point Information dialog shows an overall summary, a breakdown on the number of points per type and the input/output type. To exit the dialog, click the **Close** pushbutton. The Point Information dialog is shown as follows:



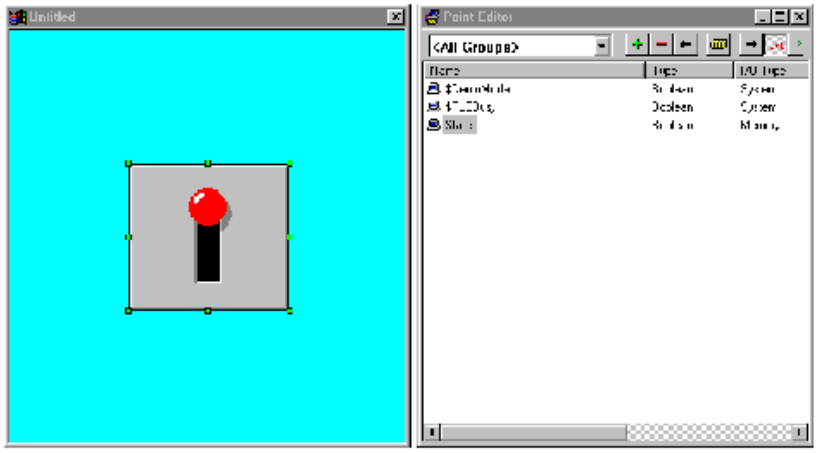
Drag and Drop of Points onto Control Objects

The Point Editor can be used to drag and drop points onto control objects. For instance, Integer points can be dragged from the Point Editor onto a Linear Gauge, Rotary Gauge, Trend Graph and Slider. Boolean points can also be applied to a Toggle.

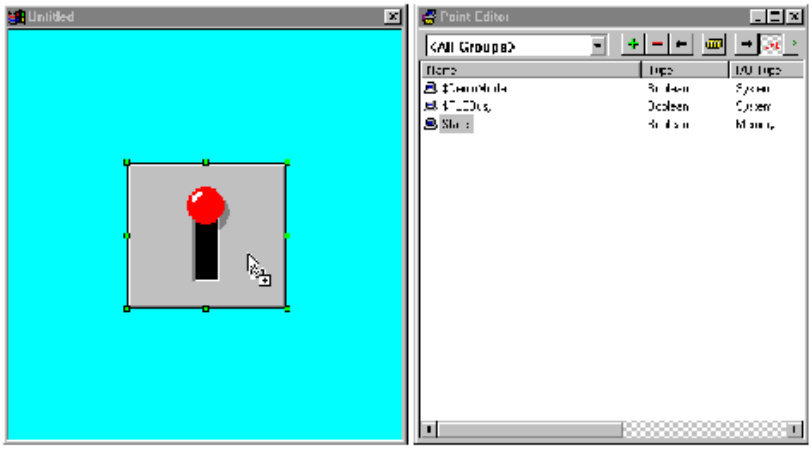
To apply a point to a control object with the Point Editor:

1, 2, 3...

1. Arrange the SYSMAC display so that the point to drag and the target control object are both visible.



2. Select the point to associate and drag it onto the page.

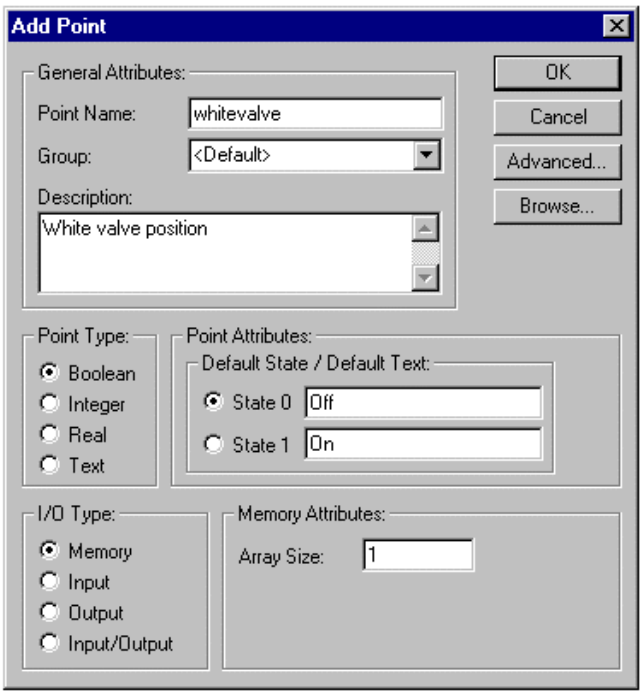


3. Drop the point at the position of the target control object. An invalid “drop” is denoted by the mouse pointer changing to a circular symbol.

For further information of the use of points with objects, refer to chapter 5, Objects.

Creating a Point

To add a new point, select the **Add Point** button from the toolbar. This results in the Add Point dialog being displayed:



Once all the information has been provided for the new point, clicking the **OK** pushbutton commits the new point to the points database, whilst the **Cancel** pushbutton aborts the add operation.

General Attributes

The name of the point is entered in the *Point Name:* field. The point name can be up to 20 alphanumeric characters, and must not begin with a digit or include mathematical operators such as "+", or be identical to a script reserved word such as "IF" or "cos". Any invalid characters (including spaces) generate an audible error, or an *"Invalid Point Name entered"* message when the **OK** pushbutton is clicked.

The group to which this point belongs is selected from the *Group:* field. A new group can be entered by typing in the *Group:* field.

A points description, detailing the use of the current point, may be inserted in the *Description:* field.

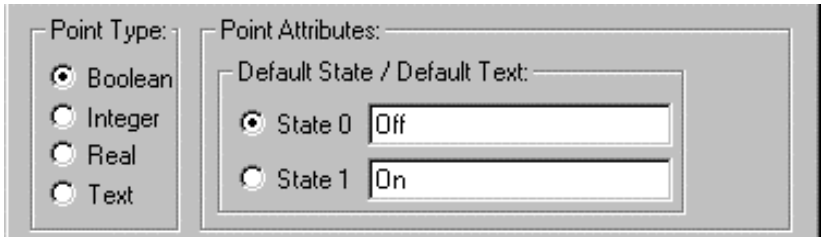
Point Type

The point type can be either Boolean, Integer, Real or Text. The default type is *Boolean*.

Point Attributes

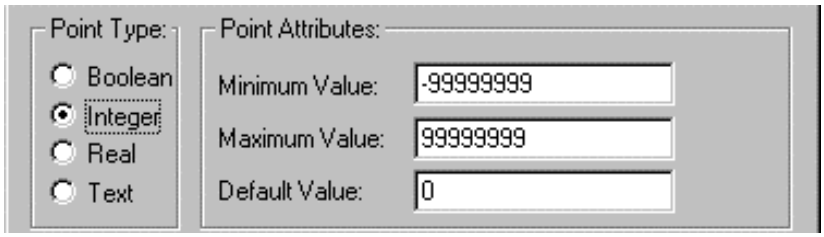
The attributes for a point vary according to the point type.

For a Boolean point, the following attributes are displayed:



The default state of the point is defined by selecting either the *State 0:* or *State 1:* setting. Associative text (such as *'OFF'* or *'FALSE'* for state 0) can be applied in the related *Default Text:* fields. The default text is associated with Toggle buttons and object animations such as Display Value and Edit Point Value when they are configured to use the point.

For an Integer point, the following attributes are displayed:

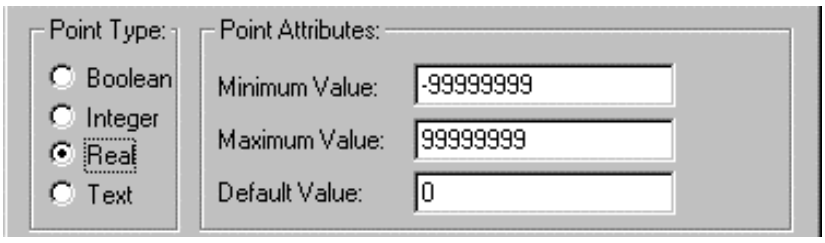


The minimum threshold for the point is inserted into the *Minimum Value:* field.

The maximum threshold for the point is inserted into the *Maximum Value:* field.

The default value is inserted in the *Default Value:* field.

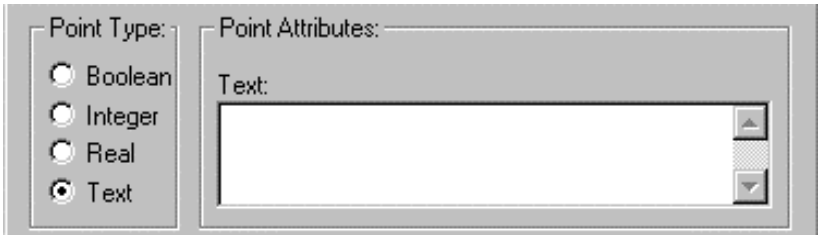
For a Real point, the following attributes are displayed:



The minimum threshold for the point is inserted into the *Minimum Value:* field. The maximum threshold for the point is inserted into the *Maximum Value:* field.

The default value is inserted in the *Default Value:* field.

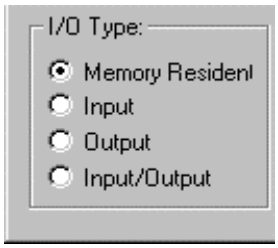
For a Text point, the following attribute is displayed:



Text is entered in the *Text:* field. Up to 255 characters may be entered.

I/O Type

The I/O type states the scope of the point, i.e. whether it is purely an internal variable or whether it communicates with a PLC.

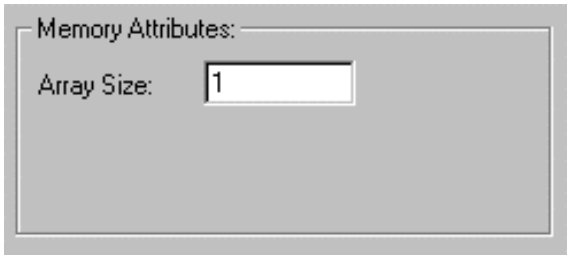


- A Memory Resident point is provided internally by CX-Supervisor.
- An Input point receives data from an external device.
- An Output point sends data to an external device.
- An Input/Output point both sends data to and receives data from an external device.

Memory Attributes

The *Array Size* field allows Memory Point arrays to be created. If an Array Size of 1 is specified, a single point is created. Specifying any other value creates an array of points of this type.

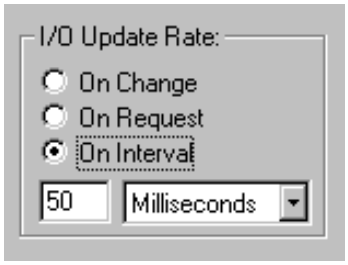
This option is only available to Memory Resident points.



I/O Update Rate

The I/O Update Rate specifies how and when communication with the PLC takes place.

This option is not available to Memory Resident points.



The On Change option specifies that communication with the PLC occurs as a result of a value change.

The On Request option specifies that data acts as a Memory Resident point with the ability to communicate to a PLC via the scripting commands InputPoint and OutputPoint. The point is updated internally but only communicates with the PLC when requested to by the script commands.

This option is only available for Output and Input/Output points.

The On Interval option specifies the frequency that communications occur with the PLC. When this option is selected an edit box appears allowing the frequency to be entered:

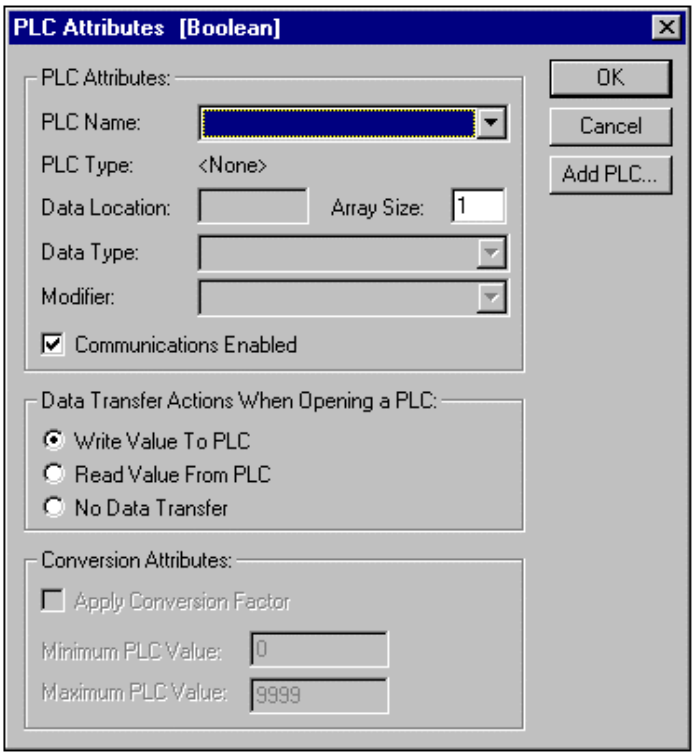
I/O Attributes

The I/O Attributes option specifies the external source or destination for the point.

This option is not available to Memory Resident points.

The external source is defined by selecting the appropriate *I/O Attributes:* setting. Further configuration of the external source can be applied by clicking the **Setup** pushbutton.

On clicking the **Setup** pushbutton for a PLC external source, the PLC Attributes dialog is displayed.



The point type associated with the PLC Connection attributes is shown in the title bar. The required PLC can be selected from the *PLC:* field. If no PLCs exist in the *PLC:* field then one must be added. This is achieved by clicking the **Add PLC** pushbutton and configuring one. A point cannot be configured to have a PLC connection unless all the PLC connection attributes are correctly configured.

PLC Attributes

The *Data Location:* field identifies the area of memory to which this address applies and is dependent upon the type and configuration of the PLC.

The *Data Type:* field identifies the type of data held at this address. The type determines how point values are converted from a computer format into a PLC format. The field contains options applicable to the Data Location.

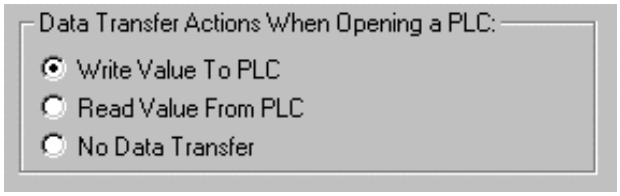
The *Modifier:* field indicates the command to be performed on the data at this address. An example of a modifier is for a bit: a modifier might declare that a bit is to be forced set. and not to be written normally. The field contains options applicable to the Data Location.

The *Array Size:* field specifies the number of data values associated with the point. A value greater than 1 allows the point to be treated as an array. For more detail on array points and their uses see Optimisation of PLC Communications.

The PLC Attributes dialog takes on a slightly different appearance if the point type is text, showing the number of characters which start at the specified data location:

Data Transfer Actions When Opening a PLC

The type of data transfer action for the selected PLC can be specified by selection of the appropriate setting. Options are *Write Value, Read Value* and *No Data Transfer.*



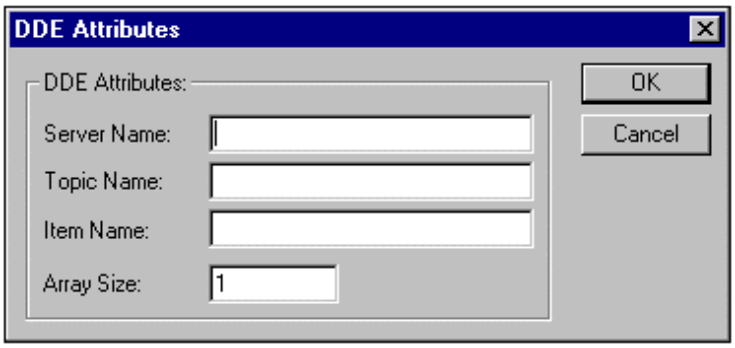
Conversion Attributes

The minimum and maximum PLC value and the application of a conversion factor is specified in the *Conversion Attributes:* fields (these fields are not applicable for Boolean and text points).

Conversion Attributes can be used to convert in a linear fashion between a value in a PLC and the point range. For example, if the possible range in the PLC is 0 to 1000, and the point range is 0 to 100, then a PLC value of 500 would correspond to a point value of 50. The conversion would be performed just before the data is sent to the PLC, or immediately upon receipt of it from the PLC.

On completion of the PLC configuration connection, click the **OK** pushbutton to continue, or the **Cancel** pushbutton to abort. Click the **Add PLC** pushbutton to create a new PLC connection. Information relating to the selection of this pushbutton is described in chapter 4, Device Configuration.

On clicking the **Setup** pushbutton for a DDE external source, the DDE Attributes dialog is displayed.

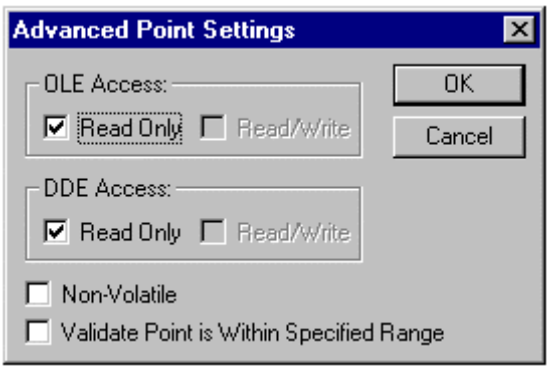


The server name, topic name, item name and array size are typed into the relevant fields. On completion, click the **OK** pushbutton to continue, or the **Cancel** pushbutton to abort the operation. If invalid data has been inserted into any of the fields, an error message is displayed after clicking the **OK** pushbutton.

Refer also to chapter 4, DDE for further information on DDE.

Advanced Point Settings

Advanced settings can be applied to a new point, by clicking the **Advanced** pushbutton in the Add Point dialog. This results in the Advanced Point Settings dialog being displayed.



In order to access a CX-Supervisor point value via OLE2 Automation or Dynamic Data Exchange, it must be given OLE Read or OLE Write access. The scope of the access can be defined by checking the appropriate setting in the *OLE Access* and *DDE Access* options. OLE Automation and DDE configuration and use are detailed in chapter 4, DDE and chapter 4, OLE Automation.

The point value which is stored to disk may be Volatile or Non-volatile by selecting or deselecting the *Non-Volatile* check-box. A Non-volatile point ensures the preservation of the point's value at regular intervals. If power is lost, or CX-Supervisor is shut down for any reason, then when the application is restarted the point is initialised to the last saved value.

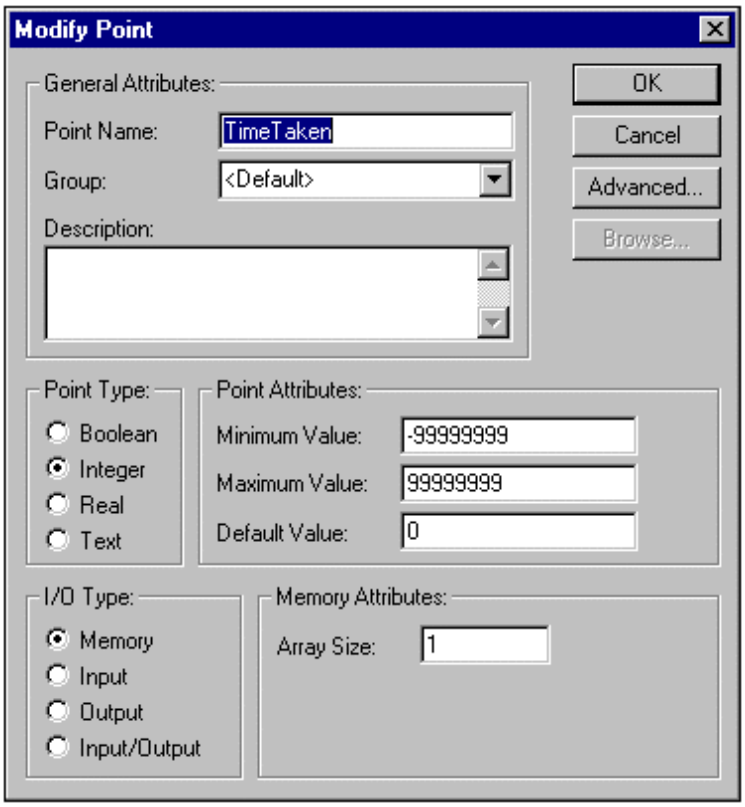
Select the *Validate Point is Within Specified Range* check-box. This option is only available for Input or I/O points of type Integer or Real. When checked, an error message is displayed in the error log if the data passed to CX-Supervisor is outside of the specified Minimum and Maximum range.

Click the **OK** pushbutton to accept the advanced settings, or the **Cancel** pushbutton to abort the operation.

Amending an Existing Point

To modify an existing point, highlight the points entry from the points list and click the **Modify Point** button from the toolbar.

This results in the View Point dialog being displayed as shown below, a dialog based on the Add Point dialog:



The selected point can be redefined as described in chapter 4, Creating a Point.

Deleting an Existing Point

To remove an existing point, highlight the point from the points list and click the **Delete Point** button from the toolbar. This results in a confirmation dialog being displayed. Click the **Yes** pushbutton to remove the point from the points database, or the **No** pushbutton to abort the delete operation.

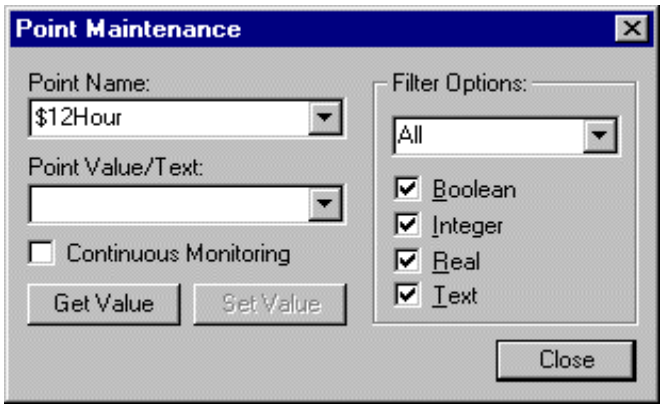
Note: It is possible to delete more than one point by either selecting points within a range or by selecting individually several points.

To select a range click on a point to mark the start of the range and click again with the <SHIFT> key down to mark the end.

To individually select more than one point click whilst holding the <CTRL> key down.

Runtime Point Maintenance

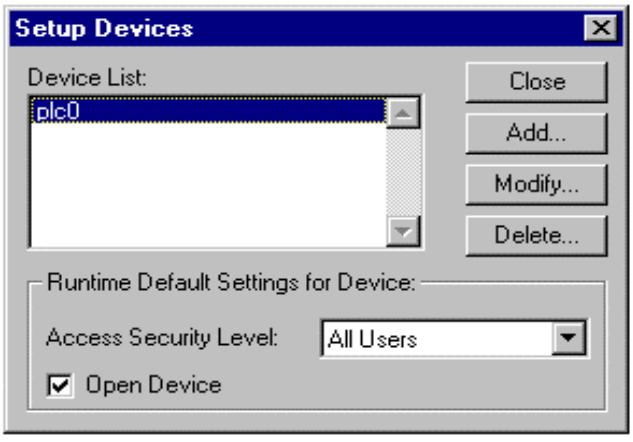
It is possible to reconfigure points at runtime via the right mouse button floating menu option *Points Maintenance*. The Point Maintenance dialog is displayed.



To engineer the properties of a point in runtime, select a point from the *Point Name:* field. The *Filter Options:* field and settings refines the points listed in the *Point Name:* field. Select the **Get Value** pushbutton to retrieve the current value of the selected point. Specify a new point value in the *Point Value/Text:* field and click the **Set Value** pushbutton. Select the **Close** pushbutton to complete the operation.

Device Configuration

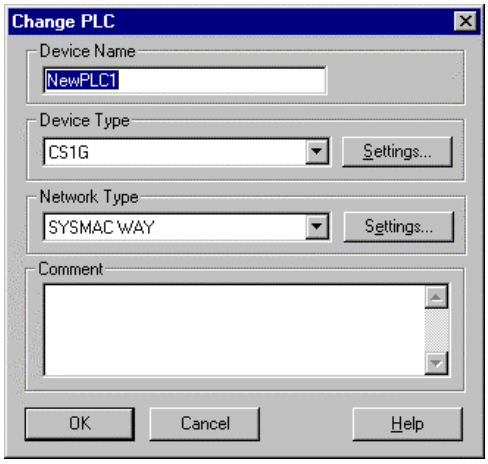
To amend the device configuration or create connections to a PLC or temperature controller, click the **Device Setup** button from the toolbar. This results in the Setup Devices dialog being displayed; currently active devices are denoted by a “lightning” symbol.



Creating a PLC Connection

A new device name can be added by clicking on the **Add** pushbutton on the Setup Devices dialog.

Note: CX-Supervisor calls an external application to change PLC information. The functions described in the following paragraphs may differ slightly depending upon which application has been invoked.



A name can be assigned for the device in the *PLC Name* field.

A device type may be applied to the selected PLC, by selecting from the *Device:* field. To add a temperature controller, select a temperature controller from the *Device:* field, e.g. E5AF-AH.

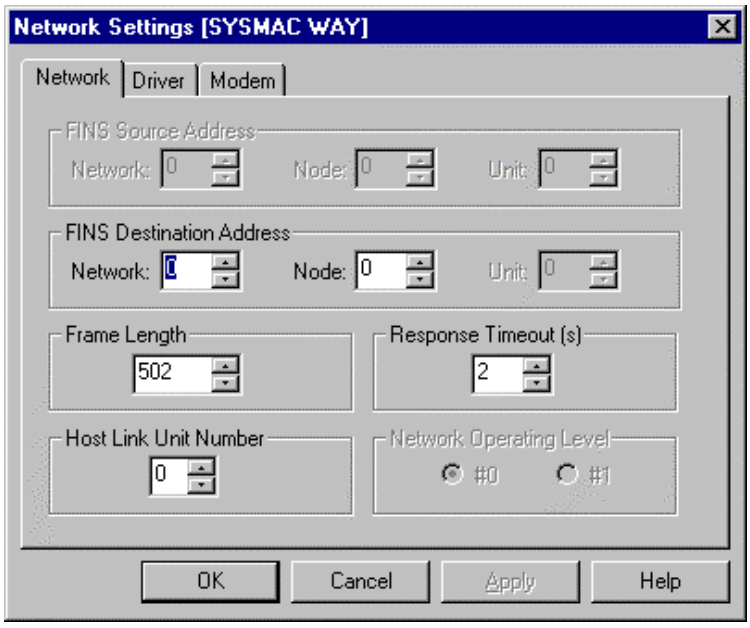
Clicking the **Setup** pushbutton results in the Device Type Settings dialog being displayed allowing the device type of the PLC to be configured.

Note: The possible settings for PLC configuration depend upon the type of PLC selected (this applies also to the Read Only and Timer/Clock fields).

On completion, click the **OK** pushbutton to continue, or the **Cancel** pushbutton to abort the operation. Values specified may be set as default by clicking the **Make Default** pushbutton.

A network may be specified for the selected PLC, by selecting from the *Network:* field. The networks available are dependent on the device type selected.

Clicking the ***Setup*** pushbutton results in the Network Settings dialog being displayed.

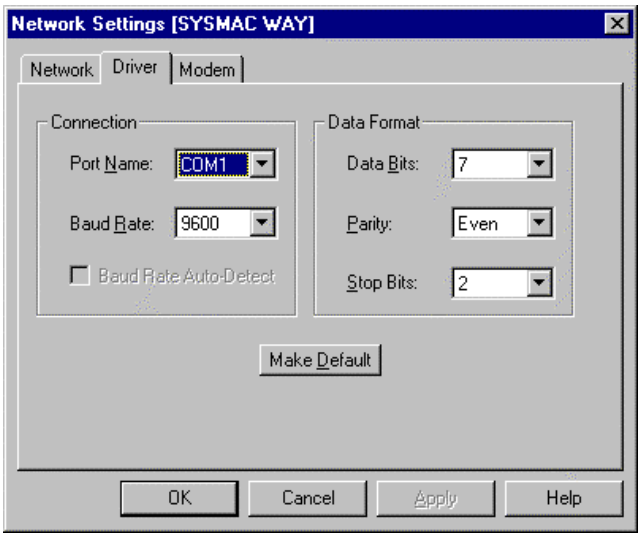


The *Unit Number* is the identifier for the network being configured.

The *Destination Network Address* and *Destination Node Number* identify the connection point to the network.

A PLC can be selected to act as a gateway to the PLC being edited; this list is restricted to the PLCs contained in the current project.

Selecting the *Driver* tab results in the Driver Configuration view being displayed; this part of the Network Settings dialog helps to ensure that data is transmitted correctly over the network.



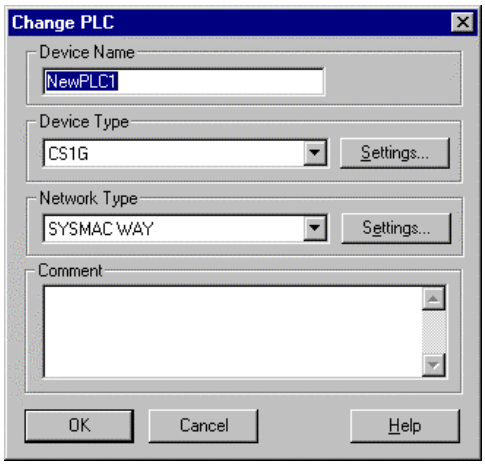
Note: The possible settings for the Baud Rate, Parity, Data Bits, and Stop Bits fields depend upon the port selected.

If a timeout occurs, the communication is not complete. Where necessary, increase the *Timeout Offset* value (in milliseconds) to ensure that the device does not cause a timeout.

Values specified may be set as default by clicking the **Make Default** pushbutton.

Modifying a PLC Connection

From the Setup Devices dialog, a PLC name may be modified by selecting the PLC name from the *Device List* on the Setup Devices dialog, and clicking the **Modify** pushbutton. This results in the Change PLC dialog being displayed.



A new name can be entered in the *PLC Name:* field. If an invalid PLC name is entered, an error message is displayed on clicking the **OK** pushbutton.

Removing a PLC Connection

From the Setup Devices dialog, a PLC name may be removed from the *PLC Name:* field by selecting the PLC name from the *Device List* on the Setup Devices dialog, and clicking the **Delete** pushbutton. This results in a confirmation dialog being displayed. Click the **Yes** pushbutton to remove the PLC from the list, or the **No** pushbutton to abort the delete operation.

Note: A PLC cannot be renamed, deleted or edited if it is currently open for communications.

Accessing PLC Connection in Runtime

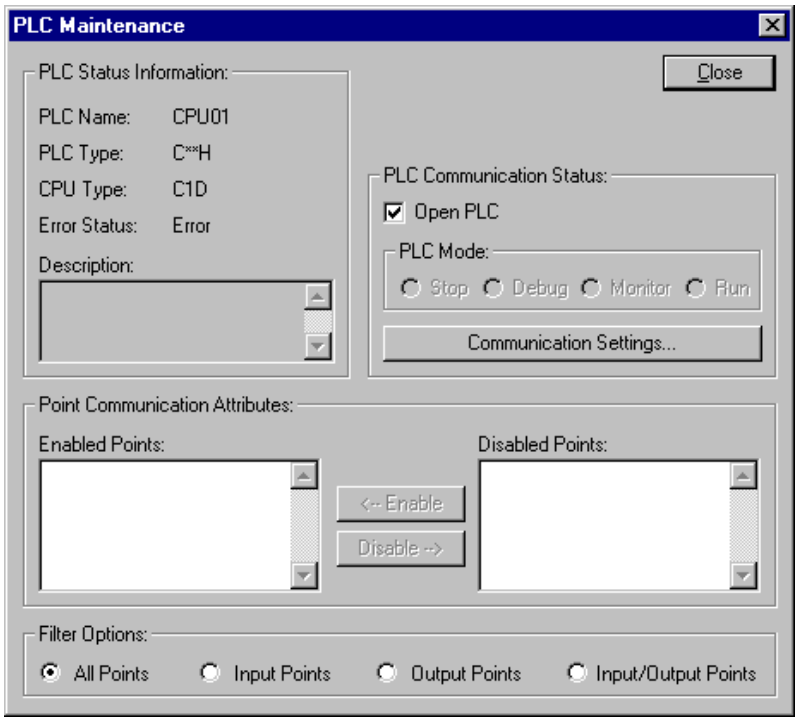
It is possible to reconfigure PLCs at runtime via the right mouse button floating menu option *PLC Maintenance List*. The list of currently configured PLCs is displayed via the PLCs in Project dialog box. On selection of a PLC, the PLC Information dialog is displayed, which allows the user to change the PLC configuration dynamically during runtime.

The *Open PLC* option provides the capability to toggle the communications status of the PLC.

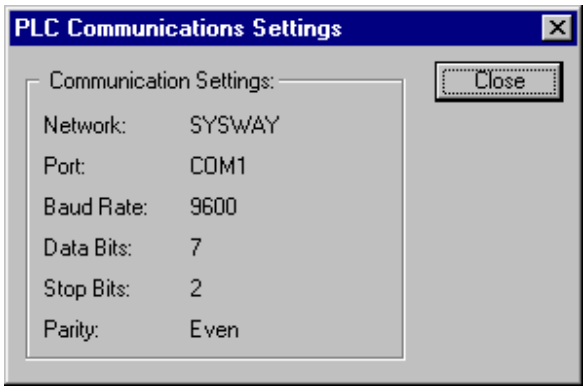
The *PLC Mode* options switch the current mode of operation of the PLC between Stop, Debug, Monitor and Run.

- Stop mode halts the PLC program execution allowing the PLC to be programmed.
- Debug mode allows for the single stepping of program execution. This mode is reserved for CV-series PLCs only.
- Monitor mode operation allows normal PLC program execution and modification of data.
- Run mode operation allows normal PLC program execution. No data in any of the PLC memory areas can be changed.

It is possible to individually enable / disable point communications via the Point Communication Attributes chapter.



Selection of the *Communication Settings* option displays the Communication Settings dialog, showing the current settings for the PLC:



It is possible to configure default settings for the runtime via the *PLC Runtime Default Settings* fields in the Setup PLCs dialog.

Communications to the PLC can be enabled on startup via the *Open PLC* option.

Optimisation of PLC Communications

PLC communication speeds can be increased by creating “array” points which contain several elements of the same type, rather than creating a large number of individual points. For instance, the time taken to update an array point containing 50 elements are quicker than the time taken to update 50 individual points.

Creation of an “Array” Point

An “array” point can be created by specifying a value greater than 1 in the *Elements:* field of the Setup PLC Connection dialog. The *Data Location* field specifies the memory address from which the array of data begins.

Note: Elements of an array point are located at consecutive addresses after the address specified in the Data Location field.

Accessing Elements of an “Array” Point

Access to array point elements is achieved via the script functions GetPointValue() and SetPointValue(). Both these functions allow the ability to specify an index into a point array. For more information on these functions refer to the *SYSMAC Script Language Reference Manual.*

Direct access to array points can be achieved by applying a subscript to the pointname, e.g. pointname[index].

Point Import

To import PLC points from other applications, click the **Import PLC Points** button from the toolbar. This results in the Import PLC Points From Another CX-Server Project dialog being displayed.

The Point Import tool can be used to import point information into the CX-Supervisor project that has already been configured. The symbol name, symbol type and PLC address is imported from the CDM file generated by other applications.

The CDM file can be generated from CX-Programmer by linking the project to the CDM file. The CDM file can also be generated by exporting from a SYSWIN project to a CDM file. Refer to the documentation supplied with the package for information on how to export or link the data to the CDM file.

It is possible to import points from the CDM file of another CX-Supervisor project but this is not recommended, as only the name, type and address are imported. A better method is to copy the points from one application to the clipboard, and paste them in the required application. This way all point information is copied.

Steps to import from another CDM file.

1) Open the Import PLC Points From Another CX-Server Project dialogue
2) Press Open Project and find the project to import from
3) Select the tab depending upon the I/O type required
4) Click the Add button and select the symbols required
5) Add these to the CX-Supervisor project by clicking the Add button
6) Press OK to return
7) Repeat for other I/O types
8) Press OK to finish

System Points

System Points are those points that are pre-defined within CX-Supervisor. They cannot be edited or deleted, but their attributes can be viewed. All system points can be selected from the System Point dialog.

System points are listed in the points list, and are denoted by a '$' symbol preceding the point name. To view system points only, select *System Points* from the *Group:* field. Once listed, the **Boolean Points, Integer Points, Real Points, Text Points** and **All Points** pushbuttons on the toolbar are unavailable for selection. To view other points, select *All Groups* from the *Group:* field.

Time Points

The following table describes system points for use with time based operations. Provisions are given to both 12 hour and 24 hour time formats.

System point	Point type	Point range	Remarks
$12Hour	Integer	0-12	Hours in 12-hour format.
$AMPM	Text	—	AM/PM indicator for 12-hour clock form.
$Hour	Integer	0-23	Hours in 24-hour format.
$Millisecond	Integer	0-999	Number of milliseconds.
$Minute	Integer	0-59	Minutes.
$Second	Integer	0-59	Seconds.
$Time	Text	—	Time (e.g. 09:46).

Date Points

The following table describes system points for use with date based operations. Provisions are given for numerical and alphanumerical formats.

System point	Point type	Point range	Remarks
$Date	Text	—	Date (e.g. 28/02/95).
$DayOfMonth	Integer	1-31	Day of the month.
$DayOfYear	Integer	1-366	Day of the year.
$Month	Integer	1-12	Month (1 - January, 12 – Dec.).
$MonthName	Text	—	Month name (e.g. February).
$ShortMonthName	Text	—	Abbreviated month name (e.g. Feb).
$ShortWeekDayName	Text	—	Abbreviated weekday name (e.g. Wed).
$ShortYear	Integer	0-99	Abbreviated year (e.g. 95).
$WeekDay	Integer	0-6	Day of the week (0 - Sun, 6 – Sat).
$WeekDayName	Text	—	Weekday name (e.g. Wednesday).
$WeekOfYear	Integer	0-51	Week number for the year.
$Year	Integer	1970-2038	Year (e.g. 1995).

Internal Points

The following table describes system points for use with interrogating current system settings, such as memory and disk space restrictions and other system resources.

System point	Point type	Point range	Remarks
$AvailableMemory	Integer	0-2,147,483,647	Amount of available memory, in bytes.
$CopyProtected	Boolean	—	Indicates a valid token has been installed.
$DiskSpace	Integer	0-2,147,483,647	Amount of free disk space available, in bytes.
$GDIResources	Integer	0-100	Percentage of GDI resources free.
$SystemResources	Integer	0-100	Percentage of system resources free.
$UserResources	Integer	0-100	Percentage of user resources free.

Display Points

The following table describes system points for use with the display mode.

System point	Point type	Point range	Remarks
$ScreenSizeX	Integer	0-2,147,483,647	Screen width.
$ScreenSizeY	Integer	0-2,147,483,647	Screen height.

Mouse Points

The following table describes system points for use in mouse movement and operation. They are updated on a left button click.

System point	Point type	Point range	Remarks
$MouseX	Integer	0-65535	Mouse X co-ordinates.
$MouseY	Integer	0-65535	Mouse Y co-ordinates.

Alarm Points

The following table describes system points for use with CX-Supervisor alarms.

System point	Point type	Point range	Remarks
$ActiveAlarms	Integer	0-2,147,483,647	Number of active alarms.
$AlarmCount	Integer	0-2,147,483,647	Total number of alarms.
$HighestAlarms	Integer	0-2,147,483,647	Number of active highest priority alarms
$HighAlarms	Integer	0-2,147,483,647	Number of active high priority alarms
$MediumAlarms	Integer	0-2,147,483,647	Number of active medium priority alarms
$LowAlarms	Integer	0-2,147,483,647	Number of active low priority alarms
$LowestAlarms	Integer	0-2,147,483,647	Number of active lowest priority alarms
$Unacknowledged Alarms	Integer	0-2,147,483,647	Number of alarms currently unacknowledged

Error Logger Points

The following table describes system points for use with CX-Supervisor errors.

System point	Point type	Point range	Remarks
$HighErrors	Integer	0-2,147,483,647	Number of high priority errors logged.
$LowErrors	Integer	0-2,147,483,647	Number of low priority errors logged.
$MediumErrors	Integer	0-2,147,483,647	Number of medium priority errors logged.

PLC Communications Points

The following table describes system points for use in the communication between CX-Supervisor and a PLC.

System point	Point type	Point range	Remarks
$PLCBusy	Boolean	—	Indicates if PLC communications are busy.
$PLCFailures	Integer	0-2,147,483,647	Total number of PLC failures.

Security Points

The following table describes system points for use with user login, logout, and user privileges in the runtime environment.

System point	Point type	Point range	Remarks
$SecurityLevel	Integer	0-4	Current users security level.
$SecurityName	Text	—	Current users security name.
$UserName	Text	—	User currently logged on.

Printing Points

Print Setup

The Point Editor can be printed in the same way pages can. Before printing, ensure that the printer has been set up correctly. To check the printer settings, refer to chapter 3, Pages.

Print Preview

To preview the page before printing, select *Print Preview* from the *File* menu.

Refer to chapter 3, Pages regarding the use of the Print Preview display.

Printing

To print the contents of the Point Editor, select the **Print** button from the toolbar.

Refer to chapter 3, Pages regarding the use of the Print dialog.

DDE

Overview

CX-Supervisor supports Dynamic Data Exchange (DDE), which is a method of communication between Windows programs. DDE uses messages to exchange data between applications and a protocol to synchronise the passing of data. DDE applications fall into four categories *client, server, client/server* and *monitor*. A client application requests data or services from a server application. A server application responds to a client applications request's for data or services. Monitor applications can intercept DDE messages but cannot act on them, they are therefore useful for debugging purposes. CX-Supervisor is a client/server application, which is both a client application and a server application, thus requesting and providing information.

All CX-Supervisor DDE data transfers are carried out on points and are asynchronous transfers. There are two types of DDE points that can be created, namely 'DDE Client Points' and 'DDE Server Points'.

With 'DDE Client Points' all data transfers or conversations are initiated by CX-Supervisor either sending data to or requesting data from external DDE Server Application(s). For example, a CX-Supervisor point could be linked to update a cell on a Microsoft Excel worksheet.

With 'DDE Server Points' all data transfers are initiated by external DDE Client Application(s) either requesting or sending point values. For example, a value could be entered into a cell in Microsoft Excel which would update a CX-Supervisor point.

DDE Client Points

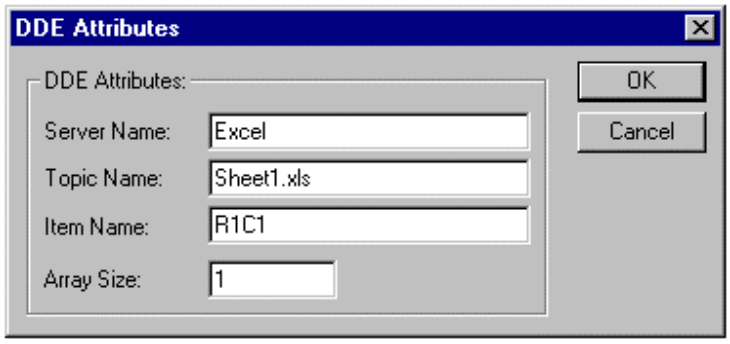
A DDE client point sends data to or requests data from an external server application. This chapter explains how to create points that make use of the CX-Supervisor DDE Client capabilities. In order for data to be transferred between a point and a server application the point must uniquely identify the application and the data that is to be used in the transfer. DDE applications use a three-tiered identification system to distinguish themselves from other DDE applications. An *application name* is at the top of the hierarchy, the application name refers to a server application e.g. "EXCEL". A *topic name* further defines a server application e.g. for Microsoft Excel the topic would define the worksheet to be used e.g. "SHEET1.XLS", a server can support one or more topics. Finally each topic can have one or more *item names,* which uniquely identifies a data item within a topic, i.e. "R1C1" or a cell name reference identifies a single cell within a Microsoft Excel worksheet.

Example

A DDE Client point named "DDE1" that connects to Microsoft Excel, worksheet – "Sheet1.xls" and cell "R1C1", is created.

1, 2, 3…

1. Select the Add Point button from the Point Editor toolbar. The Add Point dialog is displayed.
2. Enter "DDE1" in the *Point Name:* field.
3. Set the *I/O Attributes* setting to *DDE* and click on the **Setup** pushbutton. The DDE attributes dialog is displayed.



4. Enter "Excel" in the *Server Name:* field. This is the name of the external DDE server application.

5. Enter “Sheet1.xls” in the *Topic Name:* field. This is the required topic, in this case it is a Microsoft Excel worksheet named ‘Sheet1.xls’. It is possible to specify a specific topic: for instance, in Microsoft Excel, to specify a sheet within a book a colon is used to delimit the information, e.g. ‘Book1:sheet3.xls’.
6. Enter “R1C1” in the *Item Name:* field. This refers to the item name.
7. Enter “1” in the *Array Size:* field.
8. Click the **OK** pushbutton to accept the settings in both the DDE Attributes dialog and the Add Point dialog.

Note: It is not necessary to give ‘DDE Client Points’ DDE access via the Advanced dialog - this field is only used in the creation of ‘DDE Server Points’. If the DDE Access Read/Write setting is set ‘ON’, this point’s value would then be ‘exposed’ to change by external DDE server application(s) which may not always be desirable.

This process is repeated for any further DDE data transfers that are required.

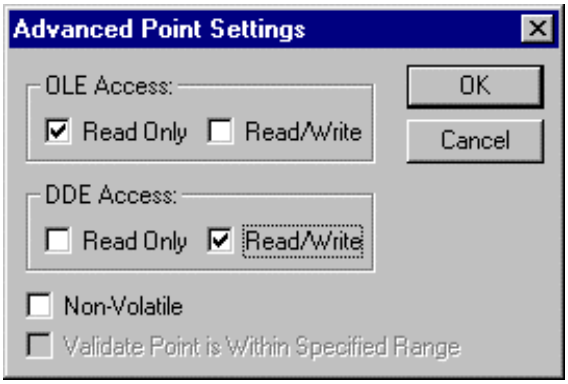
DDE Server Points

A DDE server point receives data from or receives a request for data from an external Client application. This chapter explains how to create “DDE Server Points”, these points are exposed to DDE Client applications either for “Read/Only” or “Read/Write” access. In order for a point to take part in a conversation with a DDE Client, it must be given ‘DDE Access’. The following dialog demonstrates how to give a Real memory point, DDE Read/Write access:

A DDE Server point is created as follows:

1, 2, 3…

1. Select the Add Point button from the Point Editor toolbar. The Add Point dialog is displayed.
2. Enter a meaningful name for the DDE Server point in the *Point Name:* field.
3. Click on the **Advanced** pushbutton. The Advanced Point Settings dialog is displayed.



4. Ensure the DDE Access Read/Write setting is set to 'ON.
5. Click the **OK** pushbutton to accept the settings in both the Advanced Point Settings dialog and the Add Point dialog.

Note: The DDE Access group's Read/Write box in the Advanced Point Settings dialog is checked, this is the only action required to expose "DDESVR3" to a DDE Client application for read/write access.

Note: Any CX-Supervisor point can be given DDE Access, even DDE Client points.

DDE Array Points

CX-Supervisor supports arrays in DDE, for both 'Client' and 'Server' transactions. DDE Client data transfers are initiated by CX-Supervisor, either sending or requesting data from external DDE Applications (such as Microsoft Excel). DDE Server data transfers are initiated by external DDE Applications either sending or requesting data to or from CX-Supervisor.

Refer to the *CX-Supervisor Script Language Reference Manual* for further details.

DDE Client Array Points

This chapter explains how to create DDE Client Array points, this is similar to the way normal DDE Client points are created, except extra information is required to specify the range of the array and also whether it is to be stored as a row or column in the Server application.

1, 2, 3…

1. Select the Add Point button from the Point Editor toolbar. The Add Point dialog is displayed.
2. Enter a meaningful name in the *Point Name:* field.
3. Set the *I/O Attributes* setting to *DDE* and click on the **Setup** pushbutton. The DDE attributes dialog is displayed.
4. Enter an application in the *Server Name:* field.
5. Enter a topic in the *Topic Name:* field.
6. Enter the item in the *Item Name:* field. It is also necessary to specify how the array is to be transferred. For instance, in Microsoft Excel, this is either as a '[row]' or '[column]', the default is as a row which can be omitted. The following are valid array item names: "R1C1:R3C1[col]", "first:last[c]", "R5C2:R5C5", "r1c1:r3c1[column]".
7. Enter the number of elements in the array in the *Array Size:* field. This must match with the specified range in the Item Name field

In the CX-Supervisor Runtime environment, the above DDE Client array transactions are initiated by means of script in the same way as single DDE Client points. The CX-Supervisor script below gives examples of the facilities available with DDE Client array points:

1) Example CX-Supervisor Script demonstrating client array points

```
chan = DDEInitiate(“Excel”, “Book1.xls”)
IF chan > 0 THEN

  ‘Establish data transfers between point ‘DDEArray’ and Excel
  ‘the initial values of DDEArray is sent to Excel
  DDEOpenLinks(chan)

  ‘The array is initialised with the value 5 and sent to Excel in
one
  operation.
  InitArray(DDEArray, 5)

  ‘The contents of ‘MemoryArray’ are copied into ‘DDEArray’ and the
  ‘array are sent to Excel in one operation.
  MemoryArray[0] = 100
  MemoryArray[1] = 34
  MemoryArray[2] = 89 * 6
  CopyArray(MemoryArray, DDEArray)

  ‘Sets element 2 of the array to 6 and sends the whole array to
Excel
  ‘Note: Use ‘On Request’ option and ‘OutputPoint’ to send the array
  ‘after ‘setting several elements of a large array.
  DDEArray[2] = 6
ENDIF
```

DDE Script Functions

The existing DDE Script functions DDEPoke() and DDERequest() can be used with any array points as the following example CX-Supervisor Scripts show:

1) Example CX-Supervisor Script demonstrating DDEPoke() with arrays

```
chan = DDEInitiate(“Excel”, “Book1:Sheet2”)
IF chan > 0 THEN

  ‘Send element 1 of ‘RealArray’ to Excel
  DDEPoke(chan, "R16C1", RealArray[1])

  ‘Send IntegerArray to Excel as a column (note: range and column
must
  ‘be ‘specified)
  DDEPoke(chan, "R1C1:R3C1[column]", IntegerArray)

  ‘Send TextArray to Excel as a row (default only range required)
  DDEPoke(chan, "R1C2:R1C4", TextArray)
ENDIF
```

2) Example CX-Supervisor Script demonstrating DDERequest() with arrays

```
chan = DDEInitiate("Excel", "Book1:Sheet3")
IF chan > 0 THEN

  'Request a row of cells from Excel and copy into 'Array1
  Array1 = DDERequest(chan, "R1C1:R1C3")

  'Request a column of cells from Excel and copy into Array2, using
  'the return 'flag
  Array2 = DDERequest(chan, "R1C2:R3C2", bReturnFlag)

  'Request a cell value from Excel and copy into element 2 of
'Array1'
  Array1[2] = DDERequest(chan, "R3C2")
ENDIF
```

Note: All the above points must have DDE Read/Write access set.

DDE Server Array Points

The value of an array point named 'ddearray' in an CX-Supervisor project called 'ddetest.srt' can be read from a Microsoft Excel worksheet by entering the following formula format into a cell.

```
=<Server>|<Topic>!<item>.<index>
```

Example

```
=SCS|Point!ddearray.3        'access ddearray[3] using 'Point' topic
```

or

```
=SCS|ddetest.srt|ddearray.0  'access ddearray[0] using 'Project'
topic
```

Note: Microsoft Excel accepts the square brackets '[ ]' used in CX-Supervisor to reference an array index in a formula; use '.' Instead.

Note: The index must always be specified if an individual array element is required.

Note: CX-Supervisor supports 'Hot' DDE links, if Microsoft Excel has the link option automatic set, then the value in Microsoft Excel are updated whenever ddearray[index] changes.

The above example is the simplest way to access/read single elements of an array from Microsoft Excel, to read/write whole arrays, it is necessary to use macros (Microsoft Excel Visual Basic scripts).

The example scripts that follow have all been created using Microsoft Excel and are working examples. They contain the minimum amount of information required to demonstrate the particular facility being described; i.e. they do not contain any error-checking code.

Sending Arrays to CX-Supervisor via DDEPoke()

In order to write to an CX-Supervisor array point using the DDEPoke() function, it must first be given DDE Read/Write access, via the Advanced Point Settings dialog when adding or modifying the point. The following script shows how to send arrays of values from Microsoft Excel to CX-Supervisor via DDEPoke().

1) Example sending array values from Microsoft Excel to CX-Supervisor

```
Sub SendArrayValues()
  Dim chan As Integer
  chan = DDEInitiate("SCS", "Point")
  If chan <> 0 Then

    'Send a row of data to an array point named "Array1"
    DDEPoke chan, "Array1", Range(Cells(1,1), Cells(1,3))

    'Send a column of data to an array point named "Array2"
    DDEPoke chan, "Array2", Range(Cells(2,1), Cells(4,1))

    'Send individual array element values to "Array3"
    'The '[ ]' or '.' format can be used to delimit the array index
    DDEPoke chan, "Array3[0]", Cells(1,1)
    DDEPoke chan, "Array3.1", Cells(1,2)
    DDEPoke chan, "Array3[2]", Cells(1,3)
  End If
End Sub
```

Requesting Arrays from CX-Supervisor via DDERequest()

Requesting arrays from CX-Supervisor and storing them in Microsoft Excel is a little more complicated than sending, in that both CX-Supervisor and Microsoft Excel need to know if the array is to be stored in rows or columns. CX-Supervisor is informed of the row/col requirement by specifying either 'row' or 'column' after the array points name. The default is 'row' if nothing is specified. The following are all valid examples of specifying names for "Array1" in a DDERequest():

```
"Array1", "Array1:Row", Array1:r"       'Valid ways to specify a row
"Array1:Column", "Array1:col", Array1:C" 'Valid ways to specify a
                                          'column
```

Microsoft Excel is informed of the row/col requirement by specifying a Range of cells in either row or column format. Both the Microsoft Excel and CX-Supervisor specifications must match in order for the call to be successful. It is not necessary to specify rows or columns if a single element of an array is required.

Note: DDE Requests are one-shot request, i.e. they are not part of a 'Hot' link.

1) Example requesting CX-Supervisor array values from Microsoft Excel

```
Sub RequestingArrayValues()
  Dim chan As Integer
  chan = DDEInitiate("SCS", "Point")
  If chan <> 0 Then
```

```
   'Request "Array1" from CX-Supervisor and store in a row starting
at R1C1
   Range(Cells(1,1), Cells(1,3)) = DDERequest(chan, "Array1")

   'Request "Array2" from CX-Supervisor and store in a column
starting at R2C1
   Range(Cells(2,1), Cells(4,1)) = DDERequest(chan, "Array2:col")

   'Request elements [2] and [3] from "Array2" and store in R3C1 &
    'R3C2
    'The '[ ]' or '.' format can be used to delimit the array index
    Cells(3,1) = DDERequest(chan, "Array2[2]")
    Cells(3,2) = DDERequest(chan, "Array2.3")
  End If
End Sub
```

OLE Automation

OLE Automation provides a mechanism whereby one application can control another. In order to access a CX-Supervisor points value via OLE Automation, it must be given either OLE Read or OLE Write access. This can be achieved by checking the appropriate box in the Advanced Point Settings dialog when the point is created or modified.

Note: All CX-Supervisor System points are given OLE2 read access by default.

CX-Supervisor exposes the following Runtime functions via OLE2 Automation:

- *SetValue(stringPointName,Value)*. Enables any point with OLE Read/Write access to be modified (value may be Boolean, integer, long or string).
- *GetValue(stringPointName,&Value)*. Enables any point with OLE Read access to be monitored (value may be Boolean, integer, long or string).
- *QueryCount()*. Returns the total number of points in the CX-Supervisor database.
- *QueryId(stringPointName)*, Returns the WORD id of a given point name. The id is an integer in the range between 1 and the total number of points in the CX-Supervisor database.
- *QueryOLE(wordID)*. Returns the Read/Write access rights of a point as an integer. 0 represents no access type; 1 represents Read Only; 2 represents Read/Write; 3 represents an invalid access type.
- *QueryType(wordID)*. Returns the points data type as an integer from a given id. 0 represents a void datatype; 1 represents a digital datatype; 2 represents an integer datatype; 3 represents a real datatype; 4 represents a text datatype; 5 represents an invalid datatype.
- *QueryName(wordID)*. Returns the points name string from a given identity.CX-Supervisor provides OLE Automation helper routines and code examples in the OLE2AUTO subdirectory. Refer to the file OLE2AUTO.WRI in that subdirectory for more information.

CHAPTER 5
Objects

This chapter describes the various objects available within CX-Supervisor. It also describes the processes for creating, editing and manipulating objects.

Objects

Pages created with CX-Supervisor are constructed from objects that are inserted and linked together to form a coherent interface. CX-Supervisor objects are divided into three groups: graphical, control and embedded.

Generally, the procedures for creating objects are identical. A pushbutton representing the desired object is clicked on the Graphic Object bar. The mouse pointer is then either clicked on the page (for a default sized object), or clicked and dragged to the appropriate point on the page for a custom sized object.

Editing Objects

Editing falls into three distinct categories:

- Re-sizing an object.
- Re-shaping an object.
- Modifying an object using a Wizard.

Re-sizing

To re-size an object, click on it with the left mouse button. This 'selects' it and brings up green sizing grab handles. Click and drag the handles until the object is of the desired size.

Re-shaping

Re-shaping procedures are similar for all graphical objects which can be reshaped. Not all can. Control objects can only be reshaped using Wizards.

To change the shape of a graphical object, choose *Edit Object* from the *Edit* menu to bring up the red editing grab handles. Click and drag the handles until the object is of the desired shape.

The typeface of the editor can be amended by choosing *Preferences* from the *File* menu. This is especially useful when printing.

CX-Supervisor preferences can be configured such that double-clicking on a graphical object also brings up the red editing grab handles. Setting this preference is achieved by selecting *Preferences* from the *File* menu. Refer to chapter 3, Pages for further details on preferences and CX-Supervisor configuration.

Wizards

Control objects cannot be re-shaped in the same way as a graphical object but are edited using Wizards. Wizards customise control objects to display information in an easy to understand manner.

To edit a control object and activate a Wizard, double click on the object.

Note: The shortcut keyboard combinations for Cut, Copy and Paste operations are valid within Wizards. Highlight part or all of a field and type <Ctrl>+X to cut the text or <Ctrl>+C to copy the text; move the cursor to the desired field and type <Ctrl>+V to paste the text. Since the cut and copy operations store the information in the Windows Clipboard, they may be pasted to another Wizard, dialog or application.

Creating and Editing Graphic Objects

For details on re-sizing the graphic objects described in the following paragraphs, refer to chapter 5, Editing Objects.

Arc

Arcs may be transparent or filled with a colour or pattern. To insert an Arc, select the **Arc** button from the Graphic Object bar. Click or click and drag on the page.

To edit the arc, obtain the red grab handles. Click and drag to change the angle subtended by the arc. To finish editing, click elsewhere on the page or press <Esc>.

Block Text

To insert block text, click the **Block Text** button, and then click on the page. Stretch the text object to resize it. Standard text tools from the toolbar and the keyboard (e.g. bold, italic, left-justify) can be used, and their effect applies to the whole content of the object.

To edit block text, double click on it. A Text-Editing dialog is displayed. The text can then be changed, as can the word-wrap and border options. Standard Windows cut, copy and paste facilities can be used.

Ellipse

Ellipses may be transparent or filled with a colour or pattern. To create a filled ellipse, click the **Ellipse** button.

To create a transparent ellipse, click the **Ellipse Frame** button. Alternatively, select a filled ellipse and click the **Transparency**.

Either click on the page to create a circle, or click and drag to create an ellipse. Ellipses cannot be edited but can be re-sized.

Line

To insert a line, click on the **Line** button. Click and drag on the page to draw a line of the required length.

To edit the line, obtain the red grab handles. Click and drag to change the line. To finish editing click elsewhere on the page or press <Esc>.

Polygon

Polygons may be transparent or filled with a colour or pattern. To create a polygon, click the **Polygon** button. Click on the page to draw vertices. To finish creating the polygon either click the right mouse button, press <Esc> or double click the left mouse button.

To edit the polygon obtain the red grab handles. Click on an edge to add a vertex or click and drag a vertex to move it.

To finish editing, either click elsewhere on the page or press <Esc>.

To split a straight line into two, click at the point on the line where the split is required then drag the mouse. CX-Supervisor creates a new handle which may be moved to the desired point. To remove a red handle and the vertex on which it rests, click on it with the delete key held down on the keyboard.

Polyline

To create a polyline, click the **Polyline** button. Click on the page to draw vertices. To finish creating the polyline, click the right mouse button.

To edit a polyline, obtain the red grab handles. Click on an edge to add a vertex. Press the <Delete> key whilst moving a vertex to delete it.

To finish editing, click elsewhere on the page.

Rectangle

Rectangles can be transparent or filled with a colour or pattern. To create a filled rectangle, click the **Rectangle** button.

To create a rectangle frame, click the **Rectangle Frame** button. Alternatively, select a filled rectangle and click the **Transparency** button from the toolbar.

Click on the page to draw a square, or click and drag to create a rectangle of the required size. Once created, rectangles can be edited exactly like polygons.

To finish editing, click elsewhere on the page.

Round Rectangle

Rounded rectangles can be transparent or filled with a colour or pattern. To create a filled rounded rectangle, click the **Round Rectangle** button from the Tool Bar.

To create a rounded rectangle frame, click the **Round Rectangle Frame**. Alternatively, select a filled round rectangle and click the **Transparency** button from the Control Bar.

Click on the page to draw a rounded square, or click and drag to create a rounded rectangle of the required size.

To edit the rounded rectangle, obtain the red grab handles. The radius of curvature of the rounding can be adjusted by clicking on the single red grab handle and dragging it, as illustrated below:

Text

To insert text, click the **Text** button. Click on the page and type inside the red edit box. The cursor is moved round the text using the arrow keys. Standard text editing tools from the toolbar and the keyboard can be used, and their effect applies to the whole content of the object.

To edit text, double click on it. A box is displayed round the text.

Press <Return> to finish editing and create a new text object on the line below. To finish editing, click elsewhere on the page.

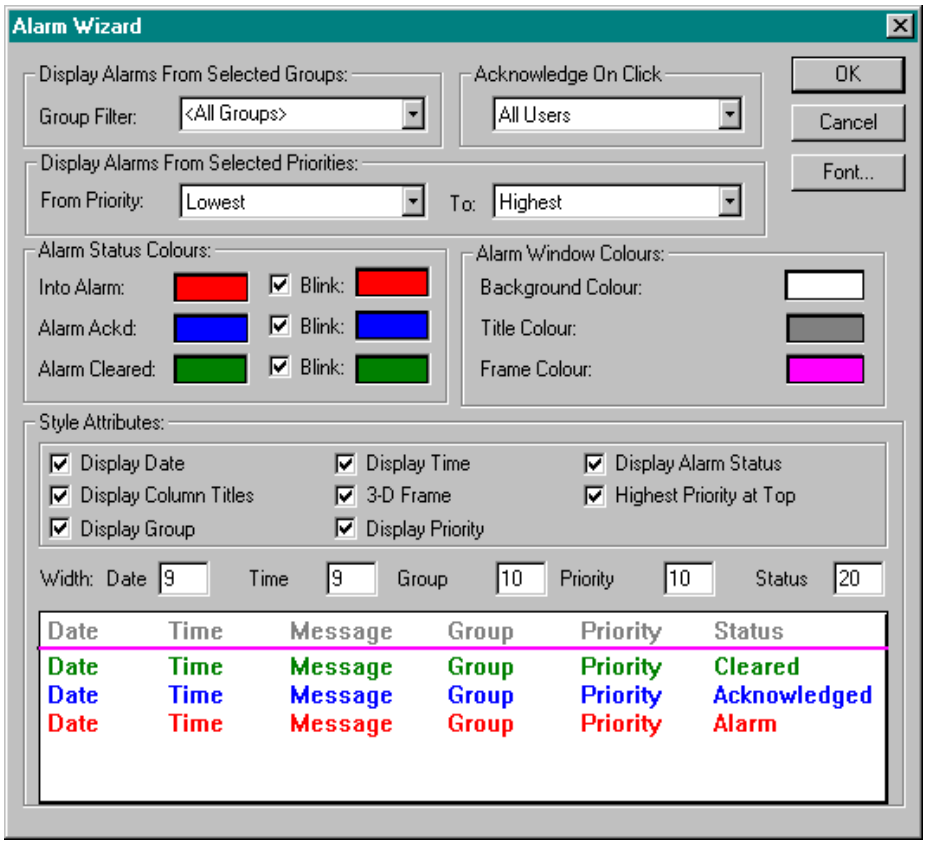
Creating and Editing Control Objects

Alarm Object

Click the **Alarm** button, then click or click and drag on the page to insert the alarm object.

The Alarm object displays alarm messages in runtime. These messages may be optionally filtered by an alarm group and can be formatted to include the date, time and status of the alarm.

To edit an Alarm object, double click on it. The Alarm Wizard dialog is displayed as follows:



Alarms are defined using the Alarm Editor; refer to chapter 9, Alarms for information on using the Alarm Editor.

The Alarm Wizard allows entry of the alarm group filter, alarm status colour codes and various style attributes. The Alarm Wizard presents a preview of the alarm object, which immediately updates to show the user selections as they are made.

1, 2, 3...

1. Select the name of the alarm group by which alarm messages are to be filtered using the *Group* field to display the list of available groups. The default selection is *<All Groups>*, which displays all alarm messages.

   To display more than one group use the * wildcard character e.g. Group1* will include all groups starting Group1.

2. From the Acknowledge On Click options select the level of security that is required for acknowledgement. The default is *All Users.*

3. From the *Display Alarms from Selected Priorities,* options select the range of alarms that are to be displayed. The default selections are from the Lowest to the Highest.

   Note that the range 'From' must be the same or lower than the range 'To'. Use the check box 'Highest Priority at Top' to reverse the alarm order.

4. In *Alarm Status Colours,* the colour codes for each of the three alarm states and blinking colours may be specified by clicking the appropriate colour box and selecting a new colour from the resultant Colour dialog.

5. The *Alarm Window Colours* options allow you to select the colours for the Alarms Windows Background, Title text and the Frame.

6. Select the font used by the alarm object using the **Font** pushbutton.

7. In *Style Attributes*, set the following options as desired:

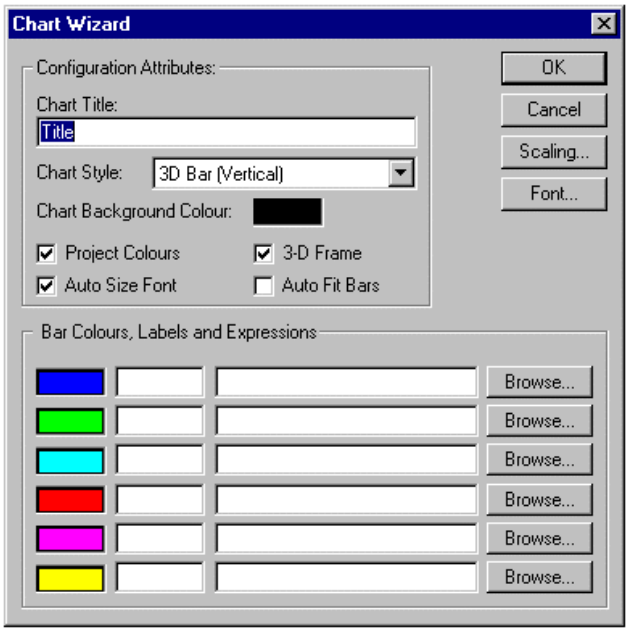
Display Date:	shows the date of the alarm.
Display Time:	shows the time of the alarm.
Display Alarm Status:	shows the status of the alarm.
Display Column Titles:	shows the column headings.
3-D Frame:	displays object with 3-D border.
Highest Priority at Top:	shows highest priority at top.
Display Group:	shows the groups of the alarm.
Display Priority:	shows the priority of the alarm.
Date Width:	number of characters in date field.
Time Width:	number of characters in time field.
Group Width	number of characters in priority field
Status:	number of characters in status field.

8. Exit the Wizard by clicking the **OK** pushbutton to accept the new alarm object attributes or click the **Cancel** pushbutton to leave the alarm object unchanged.

Bar Chart

Click the **Chart** button, then click or click and drag on the page to insert the Chart.

To edit a Bar Chart, double click on it. The Chart Wizard dialog is displayed as follows:

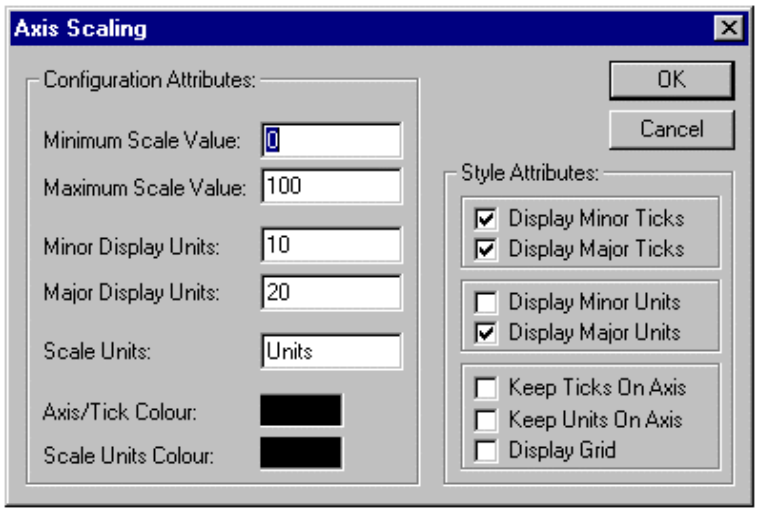


The Chart Wizard allows entry of configuration attributes and assignment of expressions.

1, 2, 3…

1. Enter a title for the chart in the *Chart Title:* field.
2. Select the chart style from the *Chart Style:* field.
3. Select the colour of the chart background.
4. Toggle the *Project Colours, 3-D Frame* and *Auto Fit Bars* fields as desired. The *Project Colours* option allows the user to change the colour of the axis using the toolbox. The *3-D Frame* option enables the chart to appear with a 3-D frame. The *Auto Fit Bars* option forces the configured bars to resize themselves to occupy all of the available chart area.
5. Change the fonts used for the chart via the Font pushbutton. The font size used for the chart can be automatically calculated by selecting the *Auto Size Font* option.
6. Enter an arithmetic trace expression for each point or select one by clicking on a **Browse** pushbutton. An existing point can also be associated with the Wizard by dragging a point directly from the Point Editor. Refer to chapter 4, Points regarding adding a new point and dragging from the Point Editor.
7. Exit the Wizard by clicking the **OK** pushbutton to accept the new chart attributes, or click the **Cancel** pushbutton to leave the chart unchanged.

To select the chart scaling, click the **Scaling** pushbutton; the Axis Scaling dialog is displayed as follows:



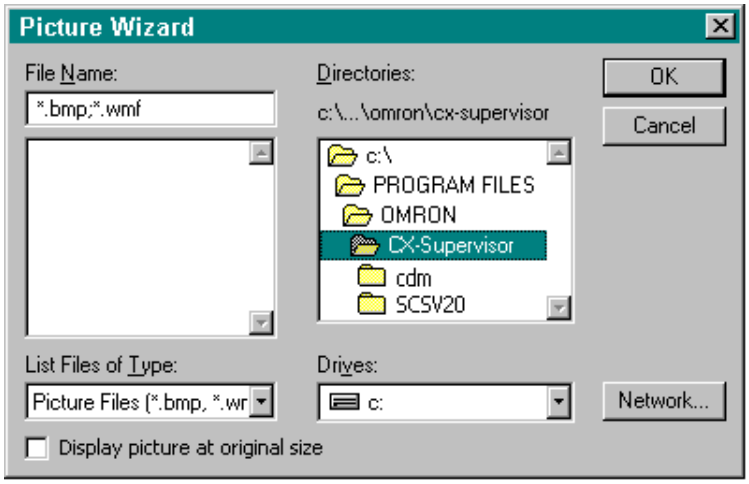
The *Configuration Attributes* fields can be altered by typing over the existing entries. The *Style Attributes* fields can be amended by clicking on the settings.

Exit the Axis Scaling dialog by clicking the **OK** pushbutton to accept the scaling attributes, or click the **Cancel** pushbutton to leave them unchanged.

Pictures

Pictures and graphics can be inserted on a page in the form of bitmaps (.bmp) or Windows MetaFiles (.wmf). Click the **Picture** button, then click or click and drag on the page to insert a picture placeholder.

To insert a picture, double click on the placeholder. The Picture Wizard dialog is displayed as follows:



1, 2, 3...

1. Locate the drive and directory where the desired picture is stored using the *Directories:* and *Drives:* controls.
2. Select the file type and then the picture from the list presented.
3. Use the *Display picture at original size* setting to specify whether the picture is to be displayed at original size or scaled.
4. Click the **OK** pushbutton to load the page.

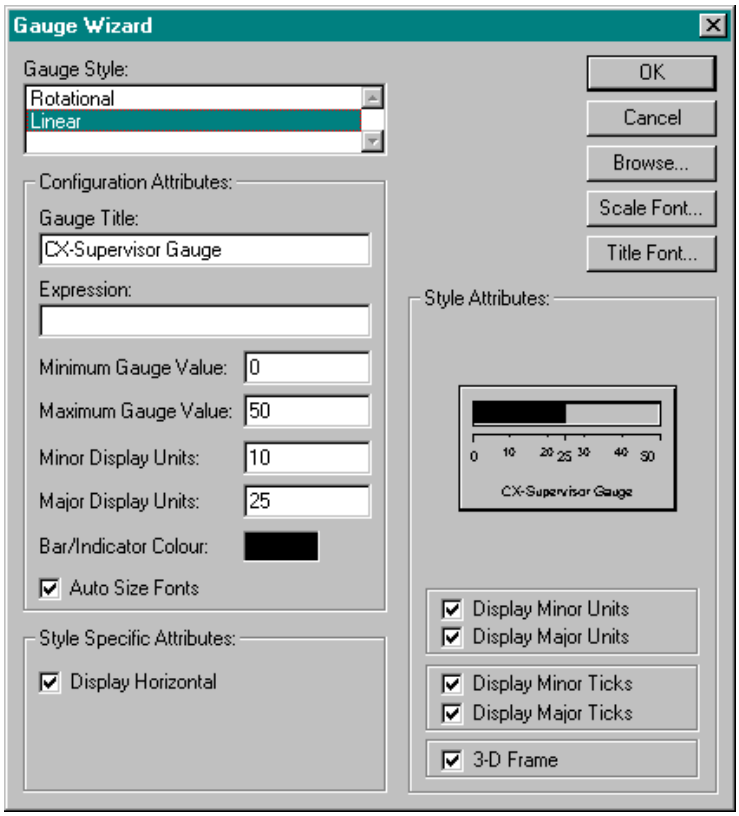
Note: If the PC installation of CX-Supervisor is on a networked machine, a Network pushbutton is added to the dialog. For further information on the function of the Network dialog, refer to the Microsoft Windows User Guide.

A bitmap or Windows MetaFile image can be selected and resized just like a graphical object.

Linear Gauge

A Gauge provides a display of operational values. Click the **Linear Gauge** button, then click or click and drag on the page to insert the gauge.

To edit a Linear Gauge object, double click on it. The Gauge Wizard dialog is displayed as follows:



The Gauge Wizard dialog allows entry of the *Gauge Style:, Configuration Attributes:, Style Attributes:* and *Style Specific Attributes:* fields.

To select a style, click on an option from the appropriate field. To select an Expression Attribute, click on the **Browse** pushbutton and select a point from the displayed list. The Select Required Item dialog is displayed; click the **OK** pushbutton to accept the point or click the **Cancel** pushbutton to leave the point unselected. Clicking the **Add Point** button from the toolbar allows a new point to be created prior to association with the Gauge Wizard. An existing point can also be associated with the Gauge Wizard by dragging a point directly from the Point Editor. Refer to chapter 4, Points regarding adding a new point and dragging from the Point Editor.

To enter gauge values or display units, type over the existing field entries.

The Gauge can be displayed in linear or rotary format, either with or without ticks.

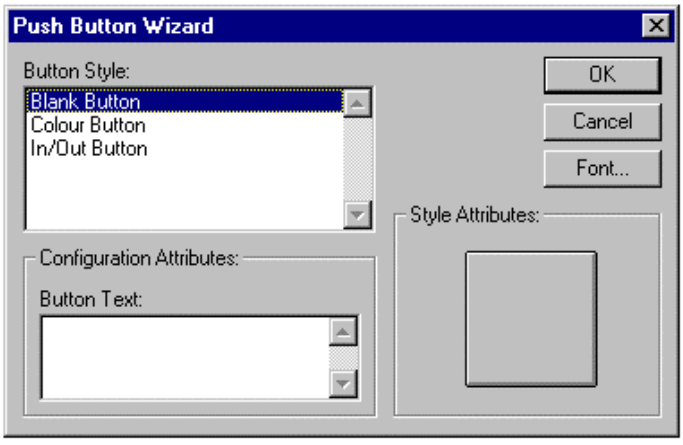
The text font used for the gauge title can be changed via the **Title Font** pushbutton. The text font used for the gauge scale can be changed via the **Scale Font** pushbutton. The font size used by the gauge can be automatically calculated for the user by selecting the *Auto Size Fonts* field.

Exit the Gauge Wizard by clicking the **OK** pushbutton to accept the new gauge attributes or click the **Cancel** pushbutton to leave the gauge unchanged.

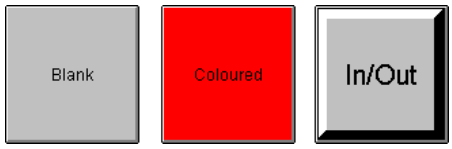
Pushbutton

Pushbuttons provide a simple means to start a set of actions. Click the **Push Button** button, then click or click and drag on the page to insert a pushbutton.

To edit the pushbutton, double click on it. The Push Button Wizard dialog is displayed as follows:



The Wizard allows a pushbutton to be assigned a style or text or both to signify its purpose. To select a style, click on an option in the *Button Style* field. To enter button text, type in the *Button Text* field (the Style Attributes: dialog is automatically updated). The text font can be changed via the **Font** pushbutton. Click the **OK** pushbutton to accept the new button attributes, or click the **Cancel** pushbutton to leave the button unchanged. Examples of the different styles of pushbutton are illustrated below:

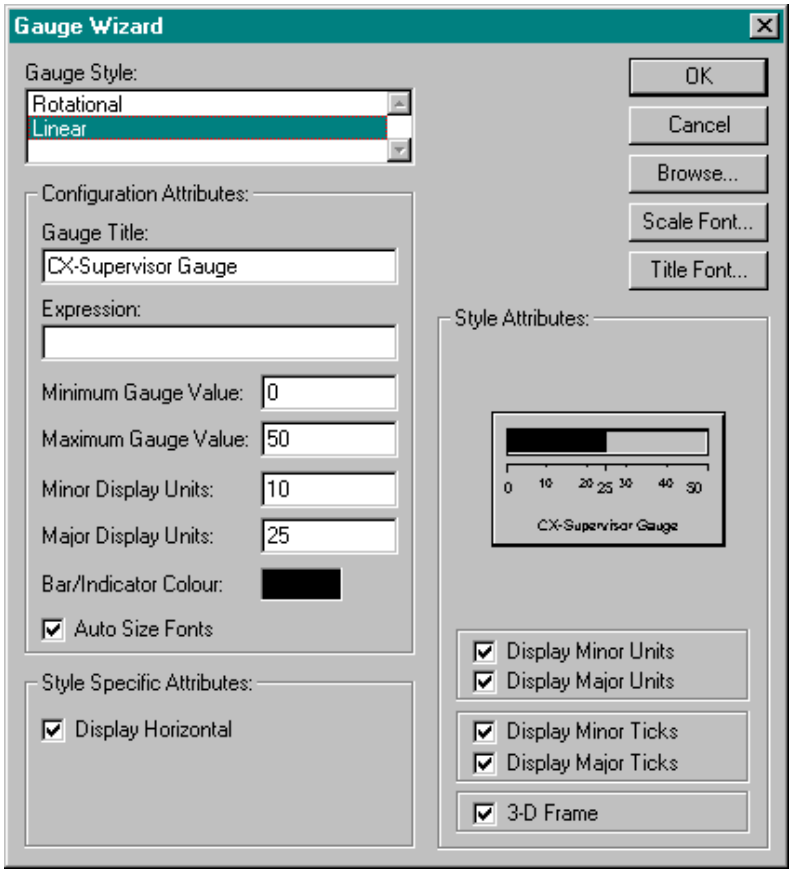


The colour of the coloured pushbutton is red by default, but can be changed by using the Palette.

Rotary Gauge

A Gauge provides a means of displaying the value of an operation or the value of a point. Click the **Rotary Gauge** button, then click or click and drag on the page to insert a gauge.

To edit the Rotary Gauge, double click on it. The Gauge Wizard dialog is displayed as follows:



The Wizard allows entry in the *Gauge Style:, Configuration Attributes:, Style Attributes:* and *Style Specific Attributes:* fields.

To select a style, click on an entry in the *Gauge Style* field. To select an Expression Attribute, click on the **Browse** pushbutton and select a point from the displayed list. The Select Required Item dialog is displayed; click the **OK** pushbutton to accept the point or click the **Cancel** pushbutton to leave the point unselected. Clicking the **Add Point** button from the toolbar allows a new point to be created prior to association with the Wizard. An existing point can also be associated with the Wizard by dragging a point directly from the Point Editor. Refer to chapter 4, Points regarding adding a new point and dragging from the Point Editor.

To enter gauge values or display units, type over the existing field entries. Enter display angles by typing over the existing field entries.

Check the boxes to choose the required style attributes. The Gauge can be displayed in linear or rotary format, either with or without ticks.

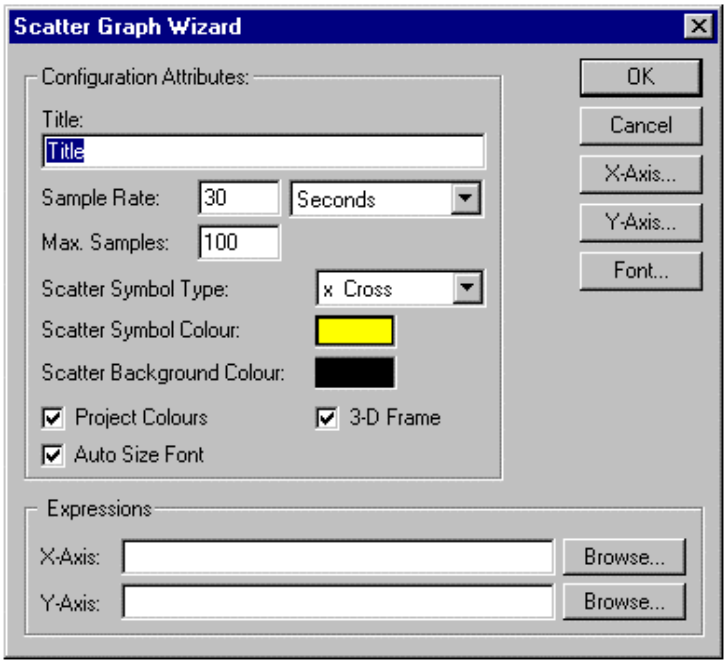
The text font used for the gauge title can be changed via the **Title Font** pushbutton. The text font used for the gauge scale can be changed via the **Scale Font** pushbutton. The font size used by the gauge can be automatically calculated for the user by selecting the *Auto Font Size* option.

Exit the Wizard by clicking the **OK** pushbutton to accept the new gauge attributes or click the **Cancel** pushbutton to leave the gauge unchanged.

Scatter Graph

Click the **Scatter Graph** button, then click or click and drag on the page to insert a graph.

To edit the graph, double click on it. The Scatter Graph Wizard dialog is displayed as follows:

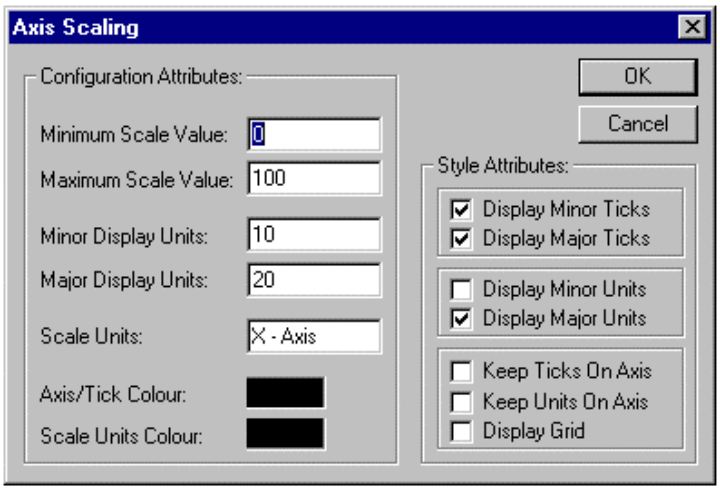


The Wizard allows entry in the *Configuration Attributes:* and *Expressions* fields.

1, 2, 3…

1. Enter the frequency of data sampling in the *Sample Rate:* field; in this example the sample rate is every thirty seconds.
2. Enter the maximum number of samples to be displayed on the scatter graph in the *Max Samples:* field.
3. Select the type of symbol to represent the data.
4. Select the colour of the symbol representing the data.
5. Select the colour of the scatter graph background.
6. Toggle the *Project Colours* and *3-D Frame* settings as desired. If set, the *Project Colours* field allows the colour of the axis to be changed using the Palette. The 3-D Frame option enables the graph to appear with a 3-D frame.
7. Either enter an arithmetic expression for the X and Y axis or select one through the **Browse** pushbutton. An expression point can also be associated with the Scatter Graph Wizard by dragging a point directly from the Point Editor. Refer to chapter 4, Points regarding adding a new point and dragging from the Point Editor.
8. Change the fonts used for the Scatter Graph via the **Font** pushbutton. The font size used by the graph can be automatically calculated for the user by selecting the *Auto Size Font* field.
9. Exit the Scatter Graph Wizard by clicking the **OK** pushbutton to accept the new scatter graph attributes or click the **Cancel** pushbutton to leave the scatter graph unchanged.

To configure the X axis, click the **X-Axis** pushbutton. To configure the Y axis , click the **Y-Axis** pushbutton. The Axis Scaling dialog is displayed:



Configuration attributes can be altered by typing over the existing field entries. The style attributes can be amended by clicking on the settings.

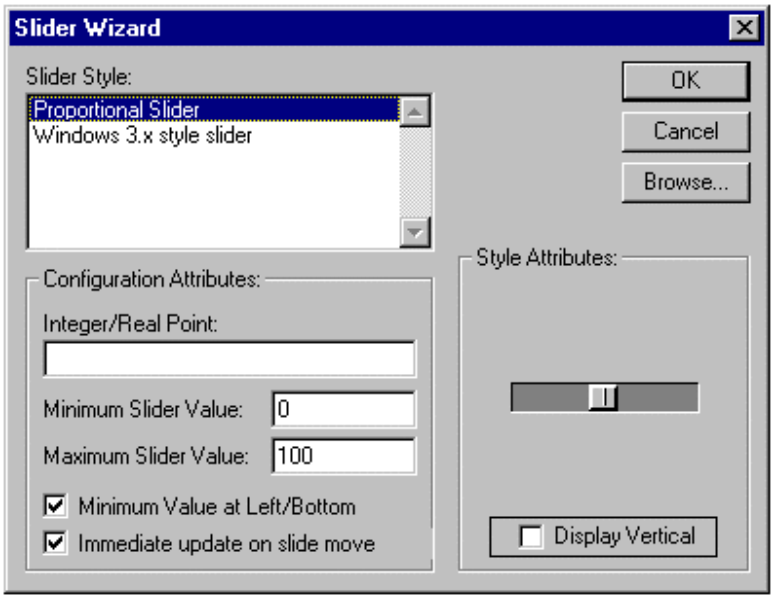
Exit the Axis Scaling dialog by clicking the **OK** pushbutton to accept the scaling attributes, or click the **Cancel** pushbutton to leave unchanged.

Slider

Sliders allow values associated with them to increase or decrease between certain limits. They can also ensure that values do not exceed previously set limits.

Click the **Slider** button, then click or click and drag on the page to insert a slider.

To edit the Slider, double click on it. The Slider Wizard dialog is displayed as follows:



The Wizard allows entry of in the *Slider Style:, Style Attributes:* and *Configuration Attributes:* fields. To select a style, click on an option from the list box. The *Style Attributes:* can be either *Display Vertical* or *Display Horizontal*. To select a Boolean point, click on the **Browse** pushbutton and select a point from the displayed list. Click the **OK** pushbutton to accept the point or click the **Cancel** pushbutton to leave the point unselected. Clicking the **Add Point** button from the toolbar allows a new point to be created prior to association with the Wizard. An existing point can also be associated with the Wizard by dragging a point directly from the Point Editor. Refer to chapter 4, Points regarding adding a new point and dragging from the Point Editor.

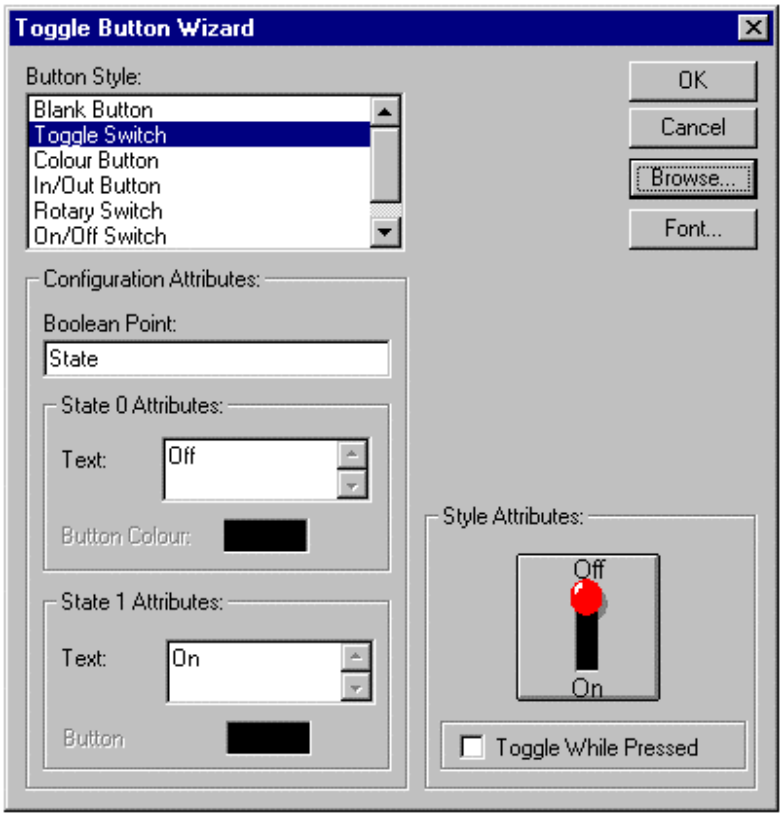
Enter the maximum and minimum slider values and check the box to display the minimum value at the left or bottom of the page.

Exit the Wizard by clicking on the **OK** pushbutton to accept the new slider attributes or click on the **Cancel** pushbutton to leave the slider unchanged.

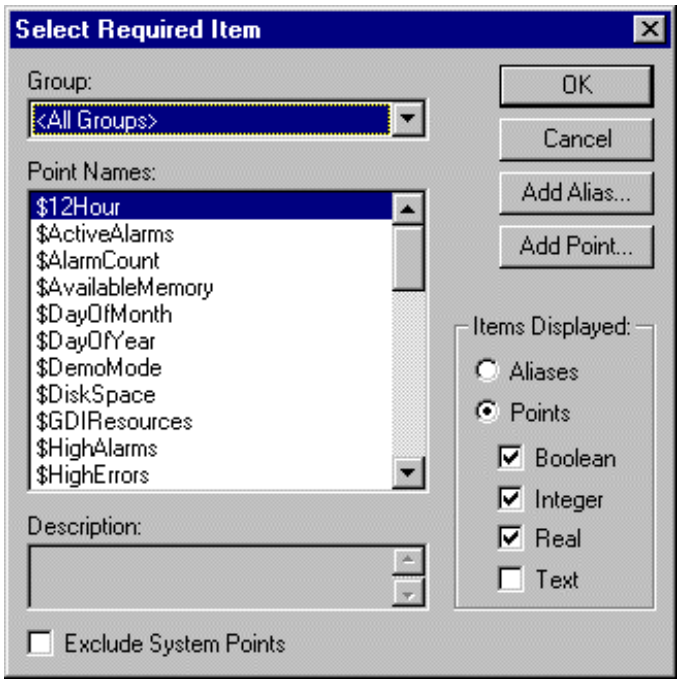
Toggle Button

Toggle buttons are used to control and display the current value of a digital point. Click the **Toggle Button** button, then click or click and drag on the page to insert a button.

To edit the Toggle Button, double click on it. The Toggle Button Wizard dialog is displayed as follows:



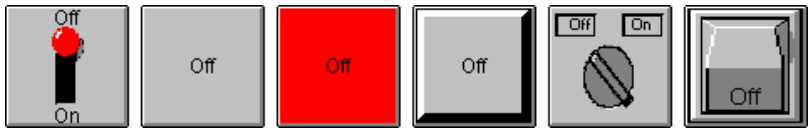
The Toggle Button Wizard allows a Toggle Button to be assigned a style, State 0 text and State 1 text to signify its purpose. It also allows selection of a Boolean point. To select a style, click on an option from the list box. To enter button text, type in the Text fields for States 0 and 1, or select *ON* and *OFF* (the Style Attributes: dialog is automatically updated). Some toggle buttons can have an On/Off colour associated with them. The text font can be changed via the **Font** pushbutton. To select a Boolean point, click on the **Browse** pushbutton and click on a point from the displayed list. The Select Required Item dialog is displayed, as illustrated below:



Only viable points can be viewed from a Select Required Item dialog. The list of items in the *Point Names:* field can be refined by selecting an option from the *Group:* field. Click the **OK** pushbutton to accept the new point or click the **Cancel** pushbutton to leave the point unchanged. Clicking the **Add Point** pushbutton or **Add Alias** pushbutton allows a new point or alias to be created prior to association with the Wizard. An existing point can also be associated with the Wizard by dragging a point directly from the Point Editor. Refer to chapter 4, Points regarding adding a new point and dragging from the Point Editor.

Select the *Toggle While Pressed* field if the value should only be set while the button is pressed (i.e. the mouse button is held down when the toggle button is clicked). The value has its state toggled and then set back when the mouse button is released.

The different styles of toggle button are the same as those for pushbuttons. Examples of some of the different styles of toggle button are illustrated below:



Switch **Blank Toggle** **Coloured** **In/Out** **Rotary** **On/Off**

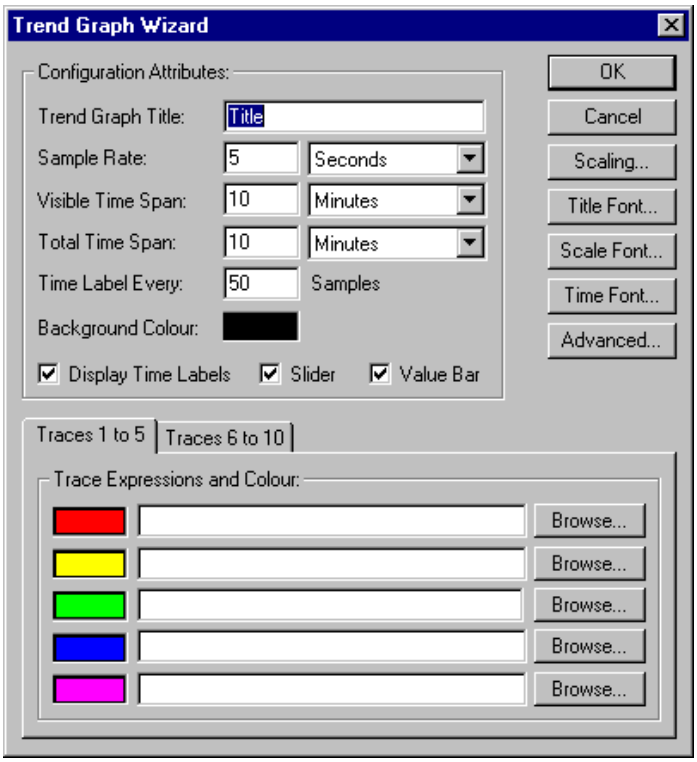
The colour of the coloured pushbutton is red by default, but can be changed by using the Palette.

Click the **OK** pushbutton to accept the new toggle button attributes or click the **Cancel** pushbutton to leave the button unchanged.

Trend Graph

Trend graphs allow the display of data over time. Click the **Trend Graph** button, then click or click and drag on the page to insert the graph.

To edit the Trend Graph, double click on it. The Trend Graph Wizard dialog is displayed as follows:



The Wizard allows entry of *Configuration Attributes:* and assignment of line colours and expressions.

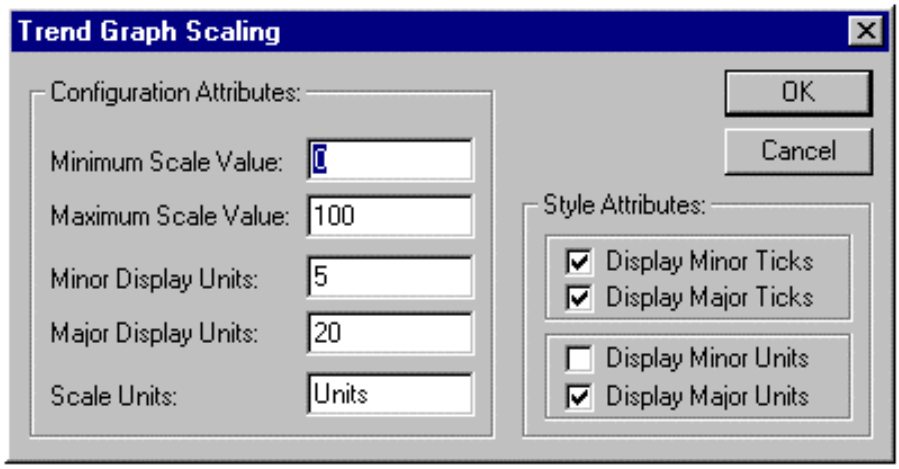
1, 2, 3…

1. Enter a title for the graph in the *Trend Graph Title:* field.
2. Enter the frequency of data sampling in the *Sample Rate:* field, in this example it is every five seconds.
3. Enter the period displayed by the graph at any one time in the *Visible Time Span:* field.
4. Enter the size of buffer for stored data of samples in the *Total Time Span:* field.
5. Enter the number of samples on the X-axis in the *Time Label Every:* field.
6. Click on the background colour and select the required colour from the palette.

7. Toggle the *Display Time Labels*, *Display Slider and Value Bar* settings as desired. Enabling the Value Bar allows the graph to be clicked during runtime to display the data value at that point.
8. Enter an arithmetic trace expression for each point or select an expression via a **Browse** pushbutton. An existing point can also be associated with the Wizard by dragging the point directly from the Point Editor. Refer to chapter 4, Points regarding adding a new point and dragging from the Point Editor.
9. Change the fonts used for the Graph Title, Scale and Time axis via the appropriate font button. Alternatively, font sizes can be automatically calculated by selecting the Auto Font Size option.
10. Exit the Wizard by clicking the **OK** pushbutton to accept the new Trend Graph attributes, or click the **Cancel** pushbutton to leave the Trend Graph unchanged.

The units of measurement of time are selected from the associated field.

To select graph scaling, click the **Scaling** pushbutton; the Trend Graph Scaling dialog box is displayed as follows:

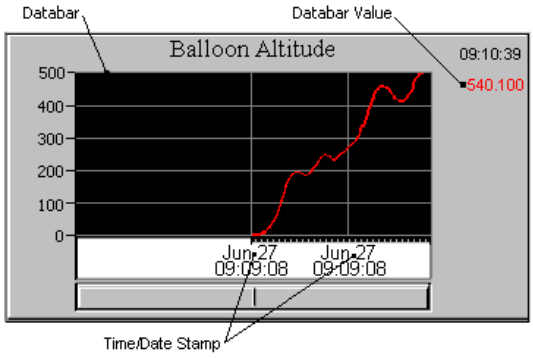


Configuration Attributes: can be altered by typing over the existing entries. The *Style Attributes:* can be amended by clicking on the settings.

For backward compatibility it is possible to save trend graph data to disk. If the Enable Trend Graph Logging Capabilities option is set in the Advanced Settings of the General Settings on the Project menu, then an Advanced button will be visible on the trend graph wizard. This shows the advanced settings used to capture trend graph logging:

Exit the Trend Graph Scaling dialog by clicking the **OK** pushbutton to accept the scaling attributes, or click the **Cancel** push button to leave unchanged.

An example of a trend graph is illustrated as follows:



Web Browser Object

The Web Browser object allows web files, like HTML JPG or AVI files to be added to a CX-Supervisor page. These files may be stored locally, on a File Server or be distributed from any Web Server. The Web Browser object includes a Java Virtual Machine (JVM) allowing execution of Java Script and Java Applets.

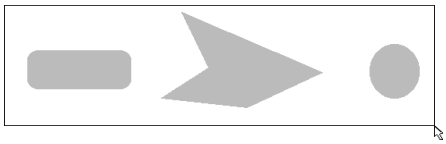
Manipulating Objects

Once inserted, objects can be manipulated to give the required results. An object must be selected before it can be manipulated.

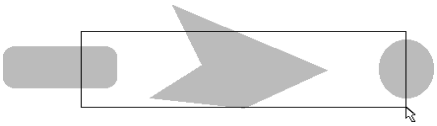
Select

To select an object, either click on it with the left mouse button or select it from the object identification control, (for further details on this control refer to chapter 2, Graphics Editor). Eight “grab handles” are displayed around the object.

To select several objects within a rectangular area, use a rubber band by clicking the left mouse button and dragging over an area, as illustrated below:



It is also possible to select all the objects a rubber band intersects by holding down the <Ctrl> key whilst rubber banding a selection, as illustrated below:



Multiple objects can be selected by holding the <Shift> key down and clicking on each object in turn. Objects can also be de-selected in similar fashion. Grab handles are displayed for each selected object.

The most recent object to be selected from the group is denoted by its green grab handles, all other grab handles are cyan. The co-ordinates of the most recent selection are displayed in the status bar.

All objects can be selected by clicking *Select All* from the *Edit* menu.

Move

To move an object or a number of objects, select them and click and hold the left mouse button within the selection, the object(s) can now be 'dragged' to their new location.

Cut

Where objects are to be moved between pages, it is often useful to cut them without having to insert a new object. CX-Supervisor has the ability to cut and paste objects. Objects which are cut and pasted retain the properties assigned to them, for example animation or alarms.

To cut an object from the current page, select it and click the **Cut** button on the toolbar.

The object is removed from the page and is held on the "clipboard" until a new object is cut or copied.

Copy

An object which is to appear on a number of pages can be copied from an original. To copy an object, select it then click the **Copy** button on the toolbar.

A copy of the object is held on the clipboard, overwriting the previously copied or cut object.

Paste

To paste an object which has been cut or copied to the clipboard, click the **Paste** button on the toolbar.

The object currently on the clipboard is pasted, either over the original if the object is to remain on the same page, or positioned in a new page. Objects can then be re-positioned by selecting and dragging using the mouse.

Delete

To delete an object or objects, select them and press the <Delete> key on the keyboard.

Undo

The **Undo** button on the toolbar allows the most recent action (or actions) to be undone. To undo the action, click the **Undo** button on the toolbar.

The number of undo operations stored by CX-Supervisor for retrieval can be amended from the *Preferences* option on the *File* menu. This is especially useful when constructing complex pages.

Mirror Image

There are various ways of mirroring objects:

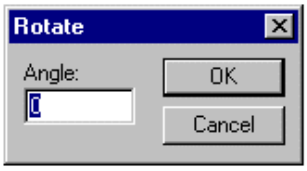
- Via the **Mirror Horizontal** and **Mirror Vertical** buttons on the toolbar.
- By selecting *Mirror* from the *Edit* menu and clicking on either *Horizontal* or *Vertical*.
- By clicking on a grab handle and dragging it across the opposite side

Text and Control Objects cannot be mirrored. For further details of mirroring objects refer to chapter 2, Graphics Editor.

Orientation

Lines, Rectangles, Polygons and Polylines can be rotated. To rotate an object, click the **Rotate** button on the toolbar.

The Rotate Object dialog is displayed:



Enter the angle of rotation in degrees in the value entry box and click the **OK** pushbutton.

Transparency

Solid shapes, polygons and text boxes can be filled with colours and patterns from the tools palette. When they are created solid objects are filled with the colour already selected on the palette. Further details on transparency are contained in chapter 2, Graphics Editor.

Group

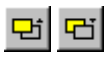
When there are a number of objects together they can be moved around in a group, keeping their relative position.

To group a number of objects, select them, activate the *Edit* menu and click on *Group*.

The selection is now regarded as one group with eight “grab handles” for the group rather than eight for each object; the objects can now be moved together.

Once objects have been grouped they can be ungrouped by selecting the object, activating the *Edit* menu and clicking on *Ungroup.*

Raise and Lower



Each new object inserted on a page is placed on top of the previous one. Although they may appear to be on the same level, objects can overlap, so it may be necessary to ‘raise’ an object so that it appears over the top of another object. For further details on raising and lowering objects refer to chapter 2, Graphics Editor.

Alignment

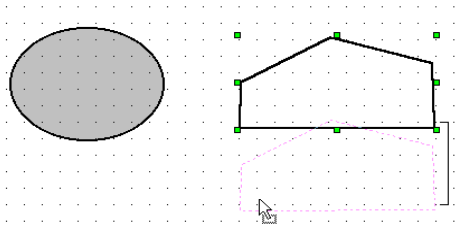
Objects inserted on a page can look messy unless they are aligned relative to each other. CX-Supervisor helps by allowing the contents of a page to align on a grid. The grid can be turned on and off as required.

There are a number of different grid sizes available: 4, 8, 16, 32 and 64 pixels. The Snap To Grid function snaps to the nearest grid.

To align page objects and view a grid, select *Grid* from the *View* menu.

Select the required grid size or click on *Snap to Grid* to align the most recently entered objects on the chosen grid. The grid can be turned off by selecting *Off*.

An example of the use of the grid is illustrated as follows:



In this example, the selected polyline is in the process of being moved down. The presence of the grid governs the movement of the object in all directions. As the object is moved, its position “snaps” an equal distance from the original position of the object against the grid. Currently, the object has been moved five grid steps down (shown by the bracket).

Alignment Toolbox

Objects on a page can be aligned in a variety of ways using the Alignment toolbar.

It is possible to:

 Click the **Centre Horizontally on Page** button from the toolbar to centre objects on a page horizontally.

 Click the **Centre Vertically on Page** button from the toolbar to centre objects on a page vertically.

 Click the **Left Alignment** button from the toolbar to align objects along their left edge.

 Click the **Right Alignment** button from the toolbar to align objects along their right edge.

 Click the **Top Alignment** button from the toolbar to align objects along their top edge.

 Click the **Bottom Alignment** button from the toolbar to align objects along their bottom edge.

 Click the **Centre Align Horizontal** button from the toolbar to align objects on their horizontal centres.

 Click the **Centre Align Vertical** button from the toolbar to align objects on their vertical centres.

 Click the **Make Same Width** button from the toolbar to make objects the same width

 Click the **Make Same Height** button from the toolbar to make objects the same height.

 Click the **Make Same Height and Width** button from the toolbar to make objects the same width and height.

 Click the **Align to Grid** button from the toolbar to align objects to the grid.

When performing alignment operations, the Master Object determines how the other objects are aligned. The Master Object, i.e. the last object clicked on, has green sizing handles.

To align objects:

1, 2, 3…

1. Select the objects to be aligned.
2. Ensure the correct master object is selected.
3. Choose the appropriate tool from the Alignment toolbar.

The alignment operations available at any one time vary according to the number of objects selected.

Zoom

It is often useful to be able to view an object in more detail. The Zoom option allows selected objects to be magnified up to four times their normal size.

To enlarge an area of the screen, choose the *View* menu and select *Zoom.* Then select the required magnification factor: *Off, 2×* or *4***.**

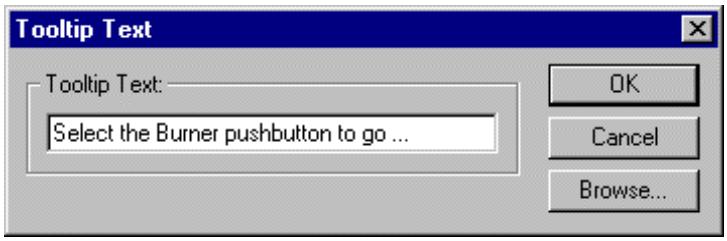
A specific object can be zoomed in on by selecting that object and then performing the procedures described above.

Applying Tooltips

In the runtime environment, it is possible to provide instant help for the object currently selected by the cursor. This is achieved by tooltips that can be applied to all objects.

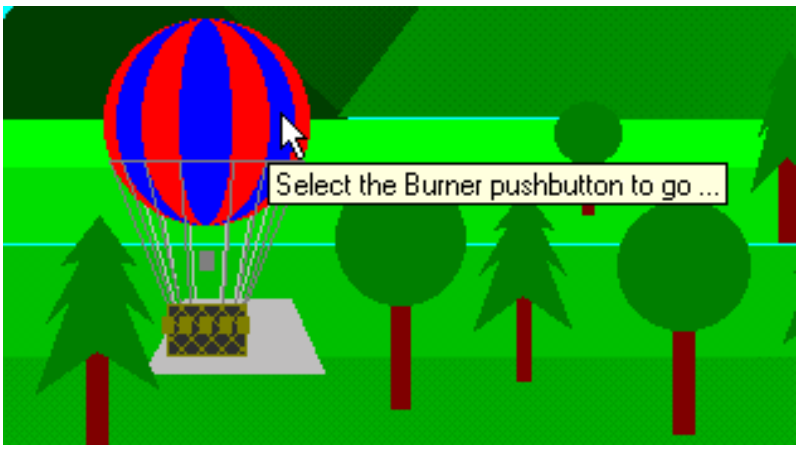
1, 2, 3...

1. In the development environment, select the object to apply a tooltip.
2. Click on *Tooltip Text* from the *Edit* menu. The Tooltip Text is displayed.



3. Type the help text in the *Tooltip text:* field or select the **Browse** pushbutton to apply the value of a point.
4. Click the **OK** pushbutton to accept the settings or the **Cancel** pushbutton to abort the operation.

An example of a tooltip in the runtime environment is as follows:



Using the Floating Menu

Clicking the right mouse button within CX-Supervisor brings up a context-sensitive menu known as the Floating menu. There are two such menus, one in the development environment and one in the runtime environment. The development environment Floating menu contains short-cuts for many operations discussed in this chapter.

CHAPTER 6
ActiveX and OLE Objects

This chapter describes the process of embedding and linking ActiveX and OLE objects within CX-Supervisor applications.

Overview

The Microsoft Windows operating environment allows the transfer and sharing of information between applications by using a technique known as Object Linking & Embedding, or OLE (pronounced olé). Embedding allows drawings, sounds or almost any objects to be created within an application, and then inserted (embedded or linked) within another file or document. The embedded object can then be edited (or activated) by merely double clicking on it. Linking allows an object to be shared by several documents by forging links between the destination documents and the source object, e.g. a company logo may appear in several word processor documents by linking to a graphics object rather than embedding.

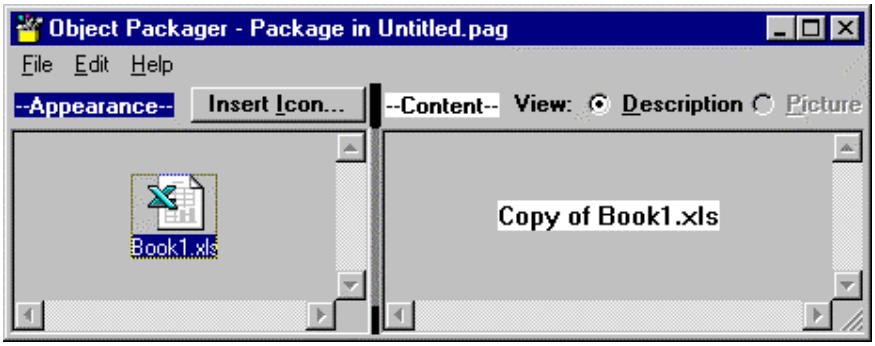
Embedding and Linking Objects within the CX-Supervisor application can either be achieved by using the Object Packager, or by embedding or linking objects directly within a page.

Note: Packages may only be embedded or linked into CX-Supervisor pages if they are created using OLE-compliant applications. This applies to objects either directly linked or embedded within CX-Supervisor, and those inserted using the Object Packager.

Object Packager

The Object Packager is a Windows application which enables objects to be “wrapped” for insertion into documents. It can be used to either create a link to a file held on disk or to embed an object into a page. Once embedded or linked, the object can be moved and positioned in a similar way to any other object created within CX-Supervisor.

To use the Object Packager, select *Package* from the list of objects displayed in the Insert Object dialog shown later in this chapter. An example of a typical Object Packager window is as follows:

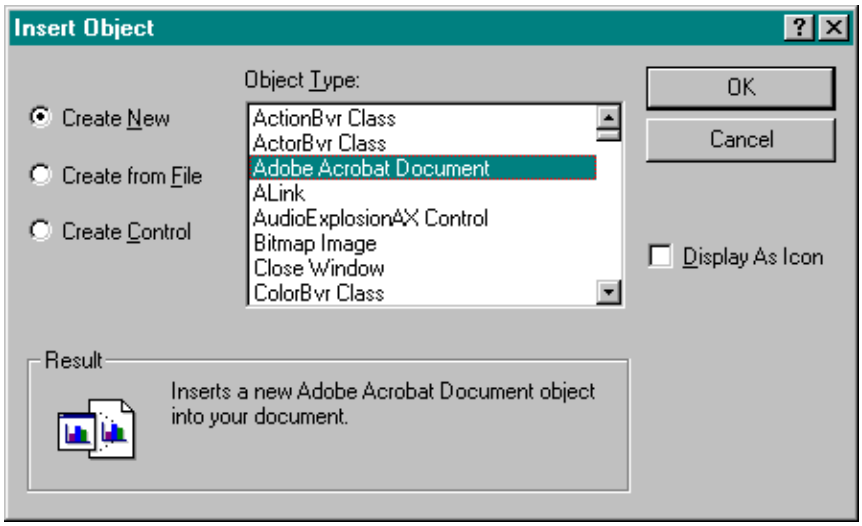


For the remainder of this chapter only the direct insertion of objects using the CX-Supervisor built-in functions are detailed. For further details of using the Object Packager refer to the *Windows User Guide*, or the *Object Packager On-line Help*.

Whether using the Windows Object Packager or embedding or linking objects directly, proceed as follows:

1, 2, 3...

1. Click on the page in which the object is to be inserted.
2. Click the **Insert OLE Object** button. The Insert Object dialog is displayed:



Creating an Object From New

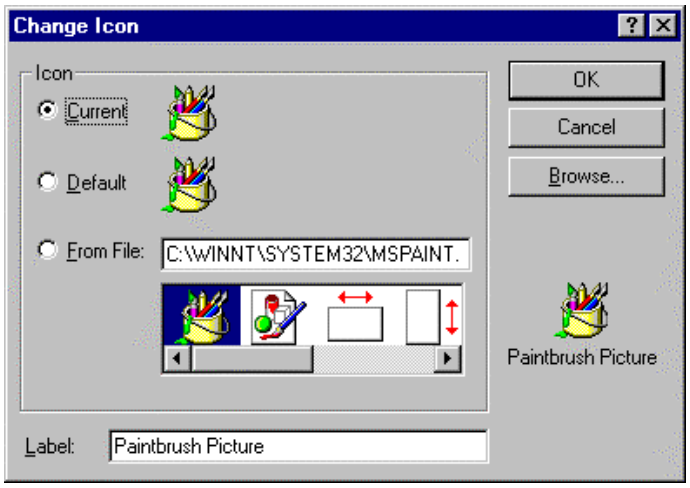
To create an object from new, proceed as follows:

1, 2, 3...

1. Scroll through the list of object types presented in the list box until the desired type is highlighted.
2. Click the **OK** pushbutton to insert the object into the current page and display it as it would look from within the application in which the object was created.

To display the object as an icon, click on the *Display As Icon* setting.

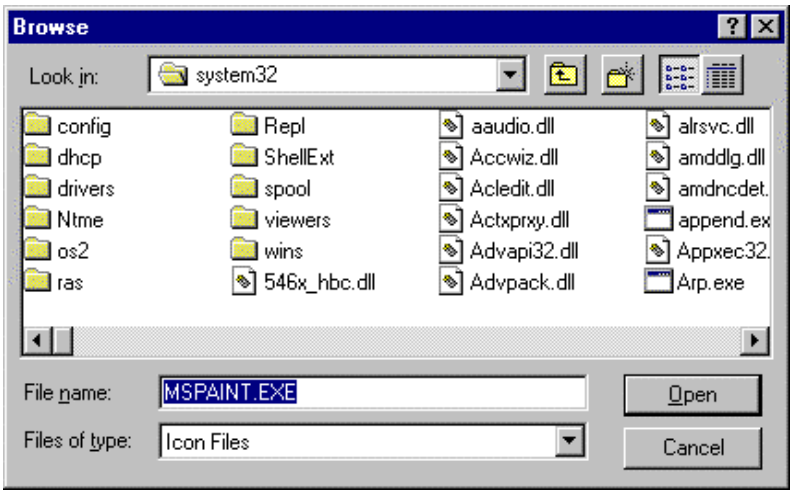
The icon displayed is the first one which is stored in the icon resource table for the application which created the object (in the case of the example shown, a Paintbrush icon). If another icon is required, clicking the **Change Icon** pushbutton displays the following dialog:



1, 2, 3…

1. Select either the current or default icon by clicking either the *Current:* or *Default:* setting; and click the **OK** pushbutton to return to the Insert Object dialog. Should a different label be required to display beneath the inserted icon, delete the contents of the *Label:* field and type in a new label (the default label offered is the filename of the file containing the inserted object).
2. Type the full path of the target application or DLL, ending with the application or DLL name, into the *From File:* field. To locate an existing file name or a different path, click the **Browse** pushbutton to display the Browse dialog.

An example of the Browse dialog is shown as follows:



Both programs (extension .EXE) or Dynamic Link Libraries (extension .DLL) are listed in the *Files of Type* field.

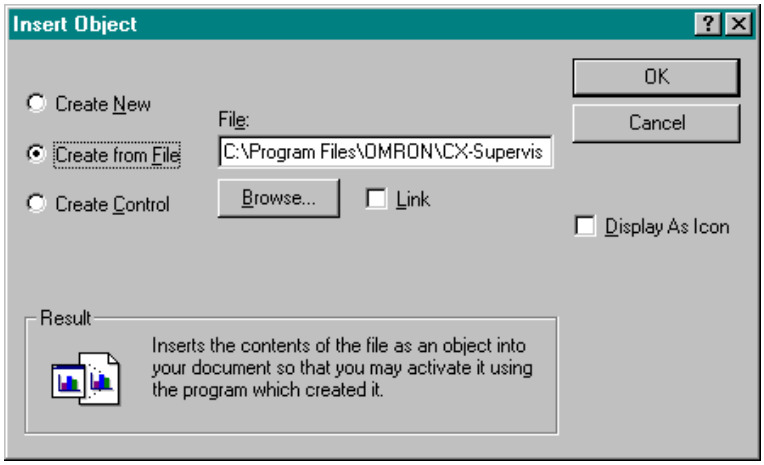
The Browse dialog functions identically to the File Open dialog described in chapter 7, Projects except the file list offered shows icons as opposed to pages.

1, 2, 3…

1. On return to the Change Icon dialog, select the required icon from those presented.
2. Change the icon's label (if required).
3. Click the **Open** pushbutton to return to the Insert Object dialog.
4. On return to the Insert Object dialog click the **OK** pushbutton to return to the current page and embed the selected object into it at the current insertion point.

Creating an Object From a File

Creating an object from a file allows linking or embedding of objects created at sometime in the past. As before, select *Insert New Object* from the *Edit* menu, and the Insert Object dialog is displayed. Click the *Create From File:* setting and the dialog changes to a format similar to that of the following:



Type the full path of the file containing the object to be inserted, ending with the full file name, into the *Create from File:* field. To locate an existing file name or a different path, click the **Browse** pushbutton to display the Browse dialog.

A Browse dialog similar to that used for changing an object's icon is displayed, the difference being that the *List Files of Type* field has a single entry of *All Files (extension .*).*

1, 2, 3…

1. Use the *Look in:* field to navigate to the appropriate location.
2. Select the file from the list offered and click the **Open** pushbutton to return to the Insert Object dialog.
3. On return to the Insert Object dialog click the **OK** pushbutton to return to the current page and embed the selected object into it at the current insertion point.

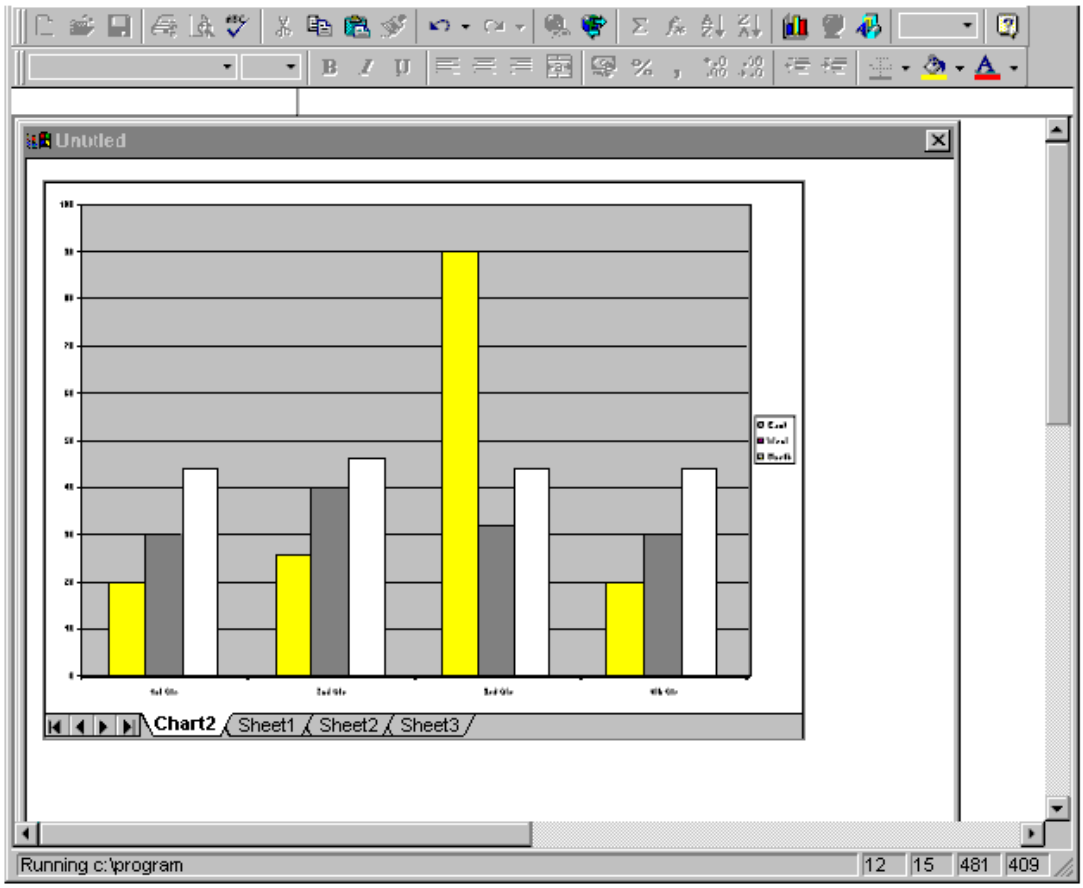
To display the object as an icon, follow the procedure detailed in the previous chapter and click the **OK** pushbutton to return to the current page and embed the selected object, in icon form, into it at the current insertion point.

It is often more appropriate to link to an object rather than embedding it in the current page. By linking to an object rather than embedding it CX-Supervisor always has access to the most up-to-date copy of the object every time the page containing it is opened.

Placing a check mark in the *Link* field forges a link between the page and the file containing the object.

All other activities are carried out in an identical manner to those explained previously.

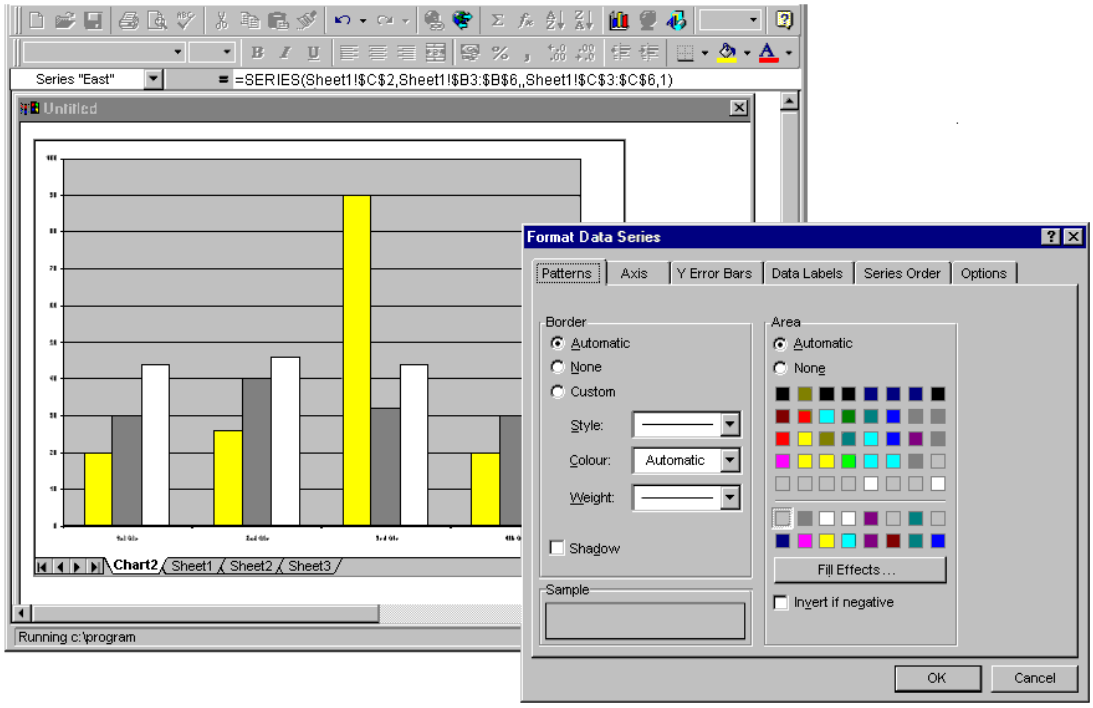
The following illustrates a Microsoft Excel Chart object which has been inserted in a page:



Activating an Object

To activate an embedded or linked object, merely double click using the left mouse button on the object's graphical representation on the page (either a true representation of the object or an icon). If the object is a document or image, Windows activates the application which created the object and place it, ready to be edited.

In the following example, the bitmap image when activated launches the Format Chart Area application to allow editing:



When editing is complete, select *Update and Exit* from the application's *File* menu to return to CX-Supervisor.

Note: The Update and Exit command varies from application to application.

If the object is an animation or sound file, when activated it is played through until it ends, at which point control is returned to CX-Supervisor.

Note: If the application which created the object no longer be available, CX-Supervisor reports an error.

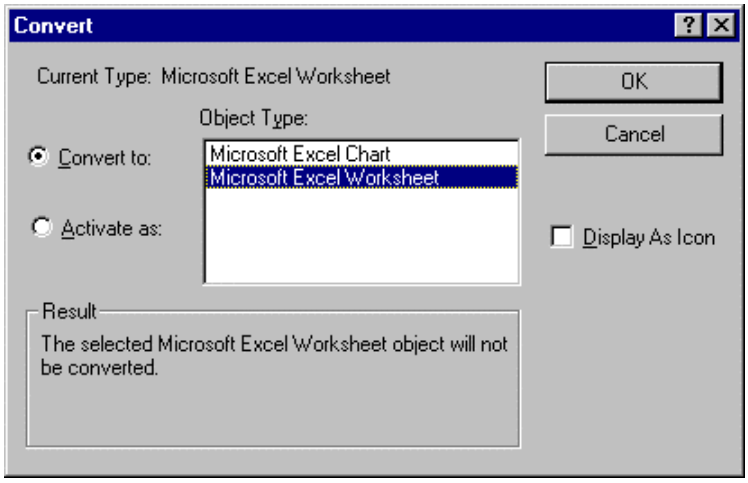
Converting a Package Object

Certain types of object may be converted from one form to another. To initiate conversion:

1, 2, 3...

1. Select the object on the page.
2. Activate the *Edit* menu and select *Package Object (*displayed as the last item on the *Edit* menu).
3. Select *Convert* from the sub-menu displayed.

Note: The menu item name varies from application to application but always references the inserted object.

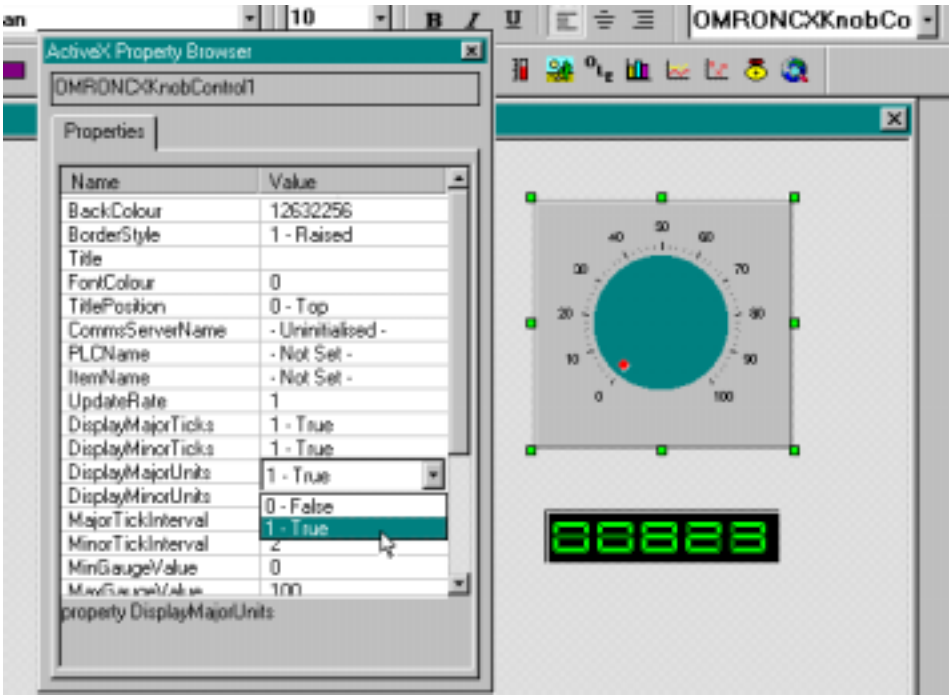


Editing Properties at Design Time

The properties of ActiveX objects can be edited during the design stage using the following procedure:

1, 2, 3...

1. Open the ActiveX Property Browser by clicking the ActiveX button in the toolbar or by selecting the ActiveX option from the Utilities menu.
2. With the ActiveX Property Browser displayed select the appropriate ActiveX control. This will display the full range of properties available for that control in the browser.
3. The Value of each Name can be changed as required by clicking in the value box and entering the new value. Some options require you to enter specific information, others provide a choice of entries from a drop down menu.
4. To edit the values of other ActiveX controls simply click on the control to select it. The values of the previous selection will be replaced with those of the new selection.



CHAPTER 7
Projects

This chapter describes the concept of projects. It details procedures for creating and amending projects, and the process of associating users with projects. It also deals with the process of compiling a project.

Overview

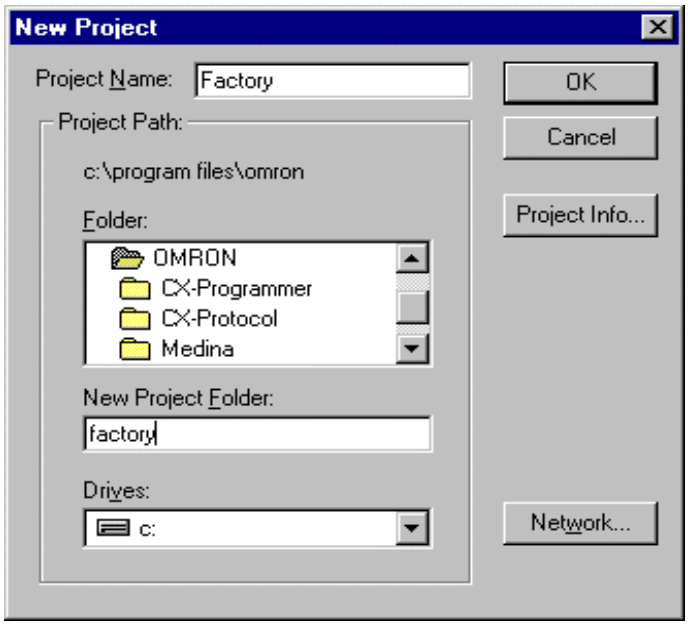
A CX-Supervisor application consists of a number of pages linked together. The pages may contain passive or active graphics, text or animations, and may be grouped together logically to form a project. A project may consist of many pages, or simply a single page. Projects may be built and tested within the CX-Supervisor development environment, and run "stand-alone" under the CX-Supervisor run-time environment.

Only one project at a time may be open for editing within the CX-Supervisor development environment. An attempt to open a second project forces CX-Supervisor to close the current project (prompting to save changes where there is unsaved information), and open the second project.

Creating a Project

To create a new project within CX-Supervisor, select *New* from the *Project* menu.

CX-Supervisor displays the following dialog:



1, 2, 3...

1. Locate the parent directory in which the project directory is to reside using the *Folder:* and *Drives:* fields.
2. Enter a name for the project directory in the *New Project Folder:* field. If a name is entered, the folder is created and used; otherwise the selected folder is used. The directory name must be no more than 8 characters and may only contain characters valid for use in MS-DOS file names.
3. Enter a name for the project in the *Project Name:* field. The project name must be no more than 8 characters and may only contain characters valid for use in DOS file names.
4. Click the **OK** pushbutton on the New Project dialog to create the project.

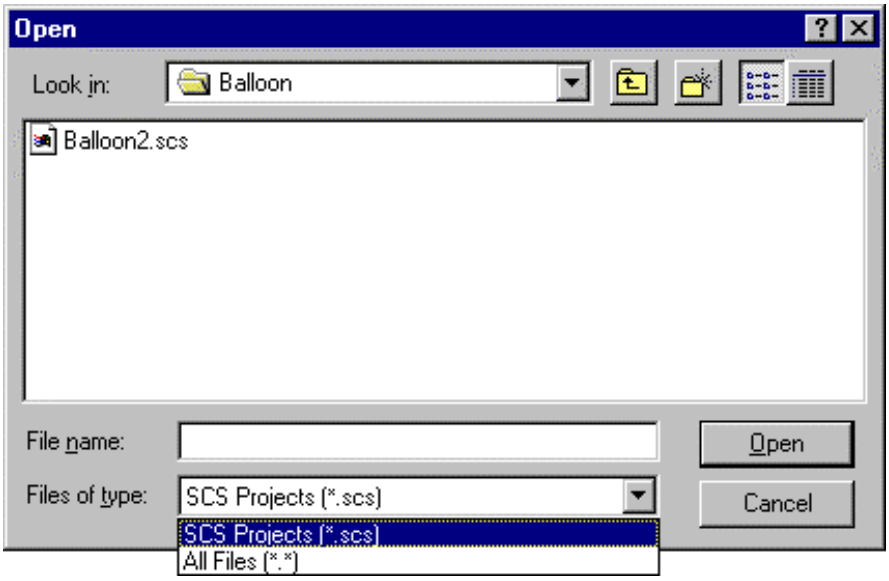
Alternatively, click the **Project Info** pushbutton to open the Project Information dialog, and enter a title and some descriptive text for the new project. For details of using the Project Information dialog refer to chapter 7, Project Information. Click the **OK** pushbutton on the New Project dialog to create the project.

Note: If the PC installation of CX-Supervisor is on a networked machine, a Network pushbutton is added to the dialog. For further information on the function of the Network dialog, refer to the Microsoft Windows User Guide.

Amending a Project

To amend an existing project it must first be opened (assuming it is not already open). To open a project select *Open* from the *Project* menu.

CX-Supervisor displays the following dialog:



1, 2, 3...

1. Locate the drive and directory where the desired project is stored using the *Look in:* field.
2. Select the desired project from the list presented.
3. Click the **Open** pushbutton to load the project.

Once the project is loaded, the various editing tasks required may be carried out (such as editing page or graphics formats), as described in the other chapters of this manual.

Saving a Project

Once a project has been created it is wise to save it. It is good practice to ensure that projects are saved regularly, in case of an event such as a power failure. To save a project, select *Save* from the *Project* menu.

If this is the first time the project has been saved, the Save As dialog is displayed.

1, 2, 3...

1. Move to the location where the project is to be stored using the *Save in:* field and the folders listed.
2. Ensure that the *Save as Type:* field is set to *CX-Supervisor Projects (*.SCS).*
3. Enter a name for the project. The name under which the project was created is offered as a default.
4. Click the **Save** pushbutton to save the project.

Note: Subsequent saves do not cause the Save Project As dialog to be displayed.

To view file name(s) only click the **List** button in this dialog.

To view file name(s), file size, file type and modification date click the **Details** button from this dialog. The file name(s) can be sorted in ascending order by clicking once in the *Name* field, *Date* field, *Type* field or *Modification* field. Click twice in the appropriate field to sort in descending order.

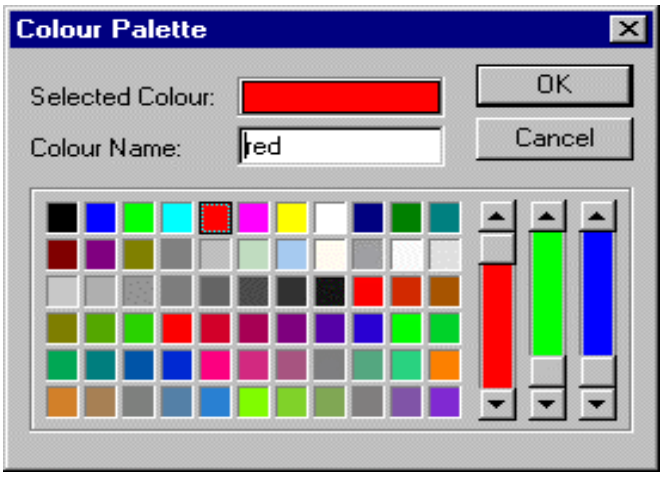
Settings

General Settings

Colour Palette

A specific set of colours may be defined for use within a project. This may include a maximum of 66 unique colours. To adjust the colours, select *General Settings* from the *Projects* menu, and select *Colour Palette* from the sub-menu.

CX-Supervisor displays the following dialog:



1, 2, 3...

1. Select the coloured square which requires editing.
2. Adjust its colour values using the Red, Blue and Green sliders.
3. When the desired colour has been created, enter a name in the *Colour Name:* field.
4. Click the **OK** pushbutton when all colours requiring editing have been edited.

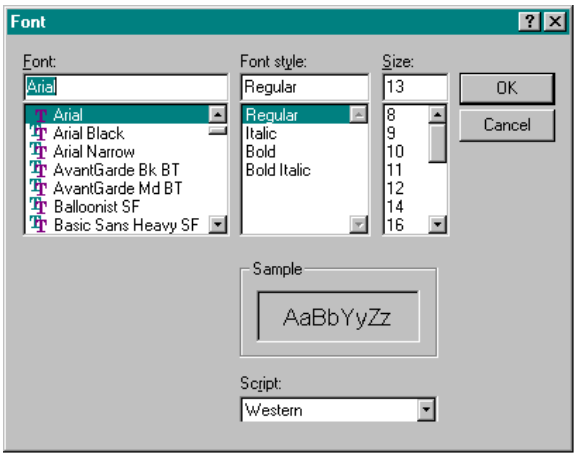
Note: The mixing of colours on screen differs from the mixing of, for example, colour paint. Under normal circumstances, the more of a colour which is added to a mix, the darker it gets. The opposite is the case for mixing colours on screen, i.e. Black consists of no Red, no Green and no Blue, whilst White consists of full Red, full Green and full Blue.

Note: The first sixteen colours cannot be mixed.

Note: Using a 16 colour-based screen resolution (consult the Microsoft Windows documentation for further information) the seventeenth colour onwards are dithered from the sixteen base colours. Higher colour-based resolutions are not dithered.

Default Button Font

The *Default Button Font* option, which can also be selected from the *General Settings* sub-menu of the *Project* menu, displays the standard font dialog:



This dialog is used to set the default font specification to be used for all text displayed on push buttons created using the graphics editor. Any button can also have its font changed from the default, using the relevant Wizard in the graphics editor. See chapter 5, Objects.

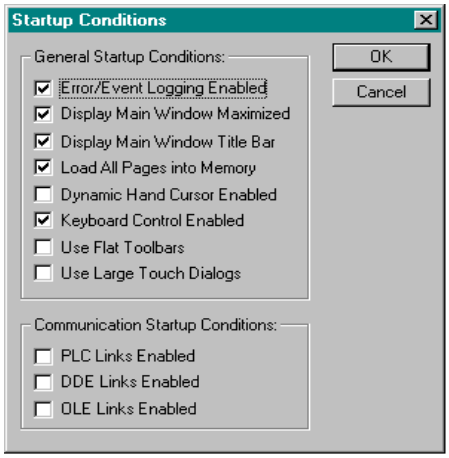
Runtime Settings

The *Runtime Settings* option is selected from the *Project* menu.

The settings discussed in the following paragraphs help to configure runtime environment applications and have no effect in the development environment. Settings that affect the development environment are discussed in chapter 3, Pages.

Startup Conditions

To open the Startup Conditions dialog, select *Startup Conditions* from the *Runtime Settings* menu. The dialog is displayed as follows:



Click the settings to enable/disable *General Startup Conditions* and *Communication Startup Conditions.* Click the **OK** pushbutton to accept the settings or the **Cancel** pushbutton to abort.

When Keyboard Control is enabled, a focus rectangle becomes visible around the currently selected object. The cursor keys and <Tab> key can then be used to navigate around the selectable objects on a page. Once an object is selected certain actions can then be applied, depending on the object's type. The most common action is to simulate a left mouse button click.

The following list shows all the possible facilities with Keyboard Control enabled.

Moving Around Selectable Objects Using Cursor Keys. The cursor keys can be used to move around the objects in the respective direction.

- With an object selected, if the right cursor key is pressed, then the closest object is selected from within an area bounded by lines drawn diagonally upwards and diagonally downwards (and to the right) from the centre of the object. If no object is found then the current object remains selected. A similar rule also applies when using the left cursor key, and the up and down cursor keys.

  Note: Selectable items must have a left mouse button event defined or have a default action.

- *Moving Around Selectable Objects Using <Tab> Key*. The <Tab> key can be used to move around all the objects in the order in which they are drawn (this can be varied using the 'raise object' and 'lower object' editing facilities). The <Shift>+<Tab> key can be used to move around the objects in the reverse order.
- To select items in a specific tab order: use the <Tab> key to move around the page items in a specific order, using the 'move to top' feature. Start at object number 1 and end with the last object, i.e. if obj1, obj2 and obj3 then use 'move to top' on obj1 first, followed by obj2 and then by obj3; this gives the tab order obj1, obj2, obj3.
- *Changing Between Pages*. The <Ctrl>+<Tab> key can be used to change between pages.
- *Simulating a Left Mouse Button Click*. Objects that have scripts attached (such as a pushbutton) or objects that perform a particular action when clicked (such as toggle buttons) can be executed by using the <Enter> key.
- *Slider Operation*. When a slider object is selected, the plus (+) and minus (-) keys can be used to increment or decrement its value respectively. This also applies to the sliders on trend graphs.
- *Obtaining the Runtime Floating Menu*. To display the Runtime Floating menu, use either the <Shift>+<F10> key combination or use the Windows 95 right mouse button key, which is next to the <Ctrl> key on the right hand side of the keyboard.
- *Standard Windows Keys*. Some standard Windows key combinations are as follows:

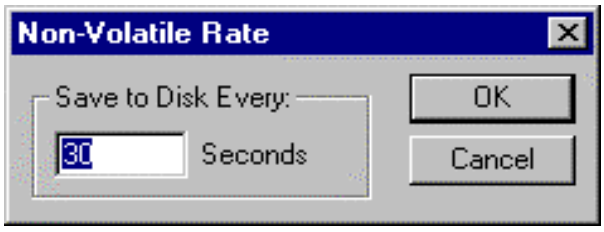
<Alt>+<-> (hyphen)	Used to access the child window control box at the top left hand side of the dialog.
<Alt>+<Spacebar>	Used to access the main window control box at the top left hand side of the dialog.
<Alt>+<F4>	Used to close down the current application.

- *Using Runtime Alarm, Error and Recipe Viewer*. These can be invoked from the Runtime Floating menu (see above). To access their functionality use the <Tab> key to move from toolbar button to toolbar button, and <Enter> to press a button. The up and down cursor keys can be used to scroll the displayed list. To close them (or to move or resize them) use the standard <Alt>+<-> (hyphen) key combination to access their menus.

- *Other Notes*. In Project level scripts, it is possible to define 'OnKeyPress' scripts, which are attached to the cursor keys. If Keyboard Only operation is set, then it is not possible to execute a script attached to one of the cursor keys, since they are being used for navigating around the selectable objects on the page. Alternative additional keys have been added to compensate for this. They are the number pad cursor keys (i.e. 2, 4, 6, and 8). However, these can only be used when the <Num Lock> key is on.

Non-Volatile Rate

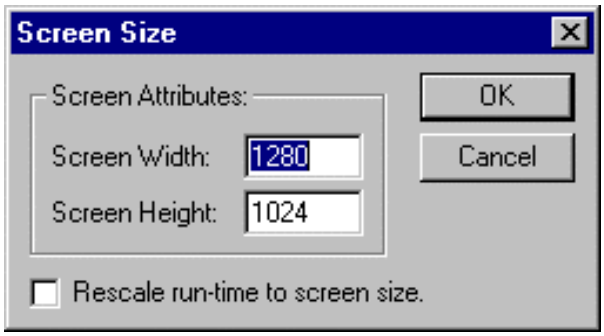
The Non-Volatile rate specifies how often the value of points flagged as 'non-volatile' are saved to disk, in seconds. The latest disk values are used to re-initialise the point values when CX-Supervisor is restarted. To adjust this value select *Runtime Settings* from the *Projects* menu, and select *Non-Volatile Rate* from the sub-menu. CX-Supervisor displays the following dialog:



Enter a new value for the Non-Volatile Rate in the *Seconds* field and click the **OK** pushbutton.

Screen Size

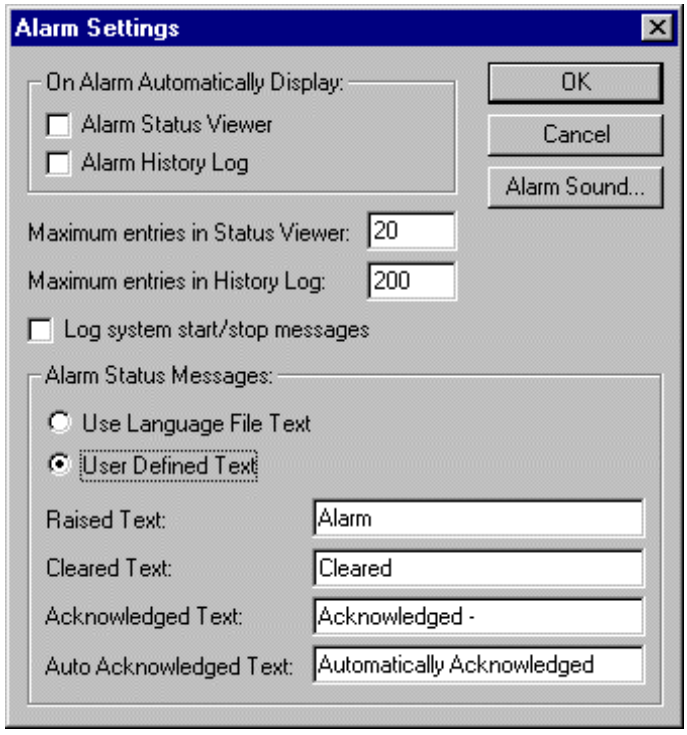
To open the Screen Size dialog, select *Screen Size* from the *Runtime Settings* menu. The dialog is displayed as follows:



Type valid values into the *Screen Width:* and *Screen Height:* fields. These values are used to define the screen size of the runtime application, but do not affect Maximise and Minimise dialog states. By enabling the *Rescale run-time to screen size* option the screen rescales itself to take into account the resolution of the runtime system. Click the **OK** pushbutton to accept the setting or the **Cancel** pushbutton to abort.

Alarm Settings

To open the Alarm Settings dialog select *Alarm Settings* from the *Runtime Settings* menu. The dialog is displayed as follows:



In the *On Alarm Automatically Display* area set the *Alarm Status Viewer* and *Alarm History Viewer* settings as required. When these options are set, the Current Alarms viewer or Alarm History viewer (respectively) is automatically displayed in runtime when an alarm occurs.

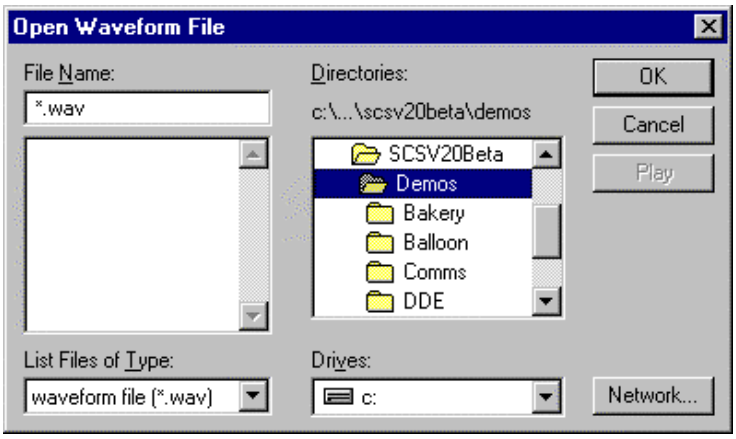
Set the *Maximum entries in Status Viewer* and *Maximum entries in History Log* fields to the desired values. The numbers specify how many messages are displayed in the respective viewer dialogs in runtime. Select the *Log system start/stop messages* setting to ON if required.

Note: If more messages exist than are requested to be displayed, the most recent messages are displayed in preference to older messages.

The values shown above are sensible defaults.

In the *Alarm Status Messages* area, if the *User Defined Text* option is set, default messages for *Raised Text, Cleared Text, Acknowledge Text,* and *Auto Acknowledge Text* can be applied. If the *Use Language File Text* option is set, the alarm status messages default to the supplied language file.

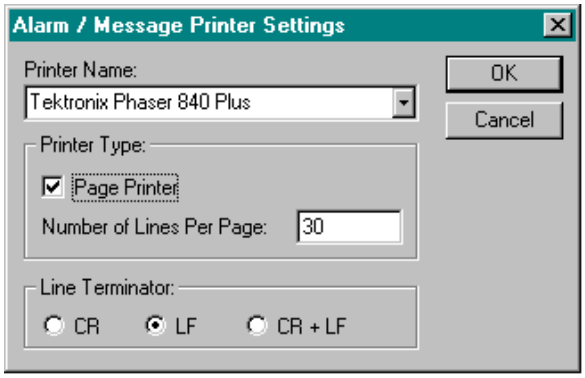
The **Alarm Sound** pushbutton allows the selection of an audible warning which may be played when an alarm occurs in runtime. The Open Waveform File dialog is shown below:



Note: If the PC installation of CX-Supervisor is on a networked machine, a Network pushbutton is added to the dialog. For further information of the function of the Network dialog, refer to the Microsoft Windows User Guide.

Alarm/Message Printer Settings

To open the Alarm/Message Printer Settings dialog select *Alarm/Message Printer Settings* from the *Runtime Settings* menu. The dialog is displayed as follows:

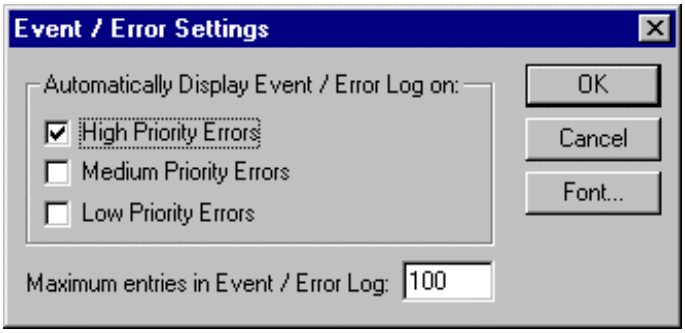


1, 2, 3…

1. Select the target printer in the *Printer Name:* field.
2. If the printer type is a Page Printer, ensure the *Page Printer* setting is set 'ON' and the appropriate number of lines per page are specified in the *Number of Lines Per Page:* field.
3. Specify a *Line Terminator:* setting, either *CR* (Carriage Return), *LF* (Line Feed) or *CR + LF*.
4. Click the **OK** pushbutton to accept the changes, or the **Cancel** pushbutton to abort.

Event/Error Messages

To open the Event/Error Settings dialog select *Event/Error Settings* from the *Runtime Settings* menu. The dialog is displayed as follows:

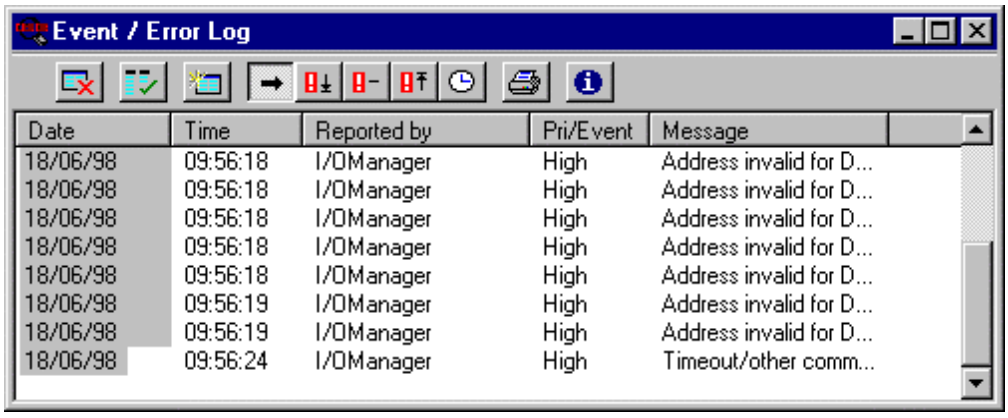


Set the *Maximum entries in Event/Error* field and the *Automatically Display Event/Error Log on:* options as desired. To change the typeface of the Event/Error Status dialog, click on the **Font** pushbutton. The Font dialog is displayed.

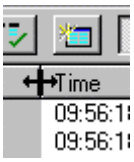
The font, font style and size are picked from the *Font:, Font Style:* and *Size:* drop down lists. The content of the *Font Style:* and *Size:* fields are dependant on the font chosen. The text can be shown struck through by selecting *Strikeout*, and underlined by selecting *Underline*. The colour is selected from the *Color:* drop down list.

A preview of the new typeface is provided in the Sample dialog. Click the **OK** pushbutton to accept the changes, or the **Cancel** pushbutton to abort.

In the runtime environment, the Event/Error Log dialog can be displayed at any time.



The events can be sorted, based on a designated field type: date, time, reported by, priority or associated message. By selecting the *Date* field, the events are sorted alphanumerically by date. The *Time*, *Reported by*, *Pri/Event* and *Message* fields react in the same way. The Event/Error Log display shows the log listed in date order.



The widths of the alarm fields can be widened or narrowed as required using the mouse to drag the column boundaries.

There are a number of toolbar buttons that aid the use of the Event/Error Log.

The **Disable Error Updates** button, once pressed, stops further events occurring in the runtime environment being added to the log. The Event/Error Log dialog is still accessible to switch back subsequently.

The **Enable Column Sorting** button allows the format of the Error/Event Log dialog to be continually updated when subsequent errors or events are added.

The **Clear Event/Error Log** button clears all entries from the log.

The **Display All Errors/Events** button lists all events and errors irrespective of priority. The list is sorted according to the *Date*, *Time*, *Reported by*, *Pri/Event* or *Message* field.

The **Low Priority** button lists all errors designated as a low priority only. Other errors and events are not deleted from the log; they are merely not visible.

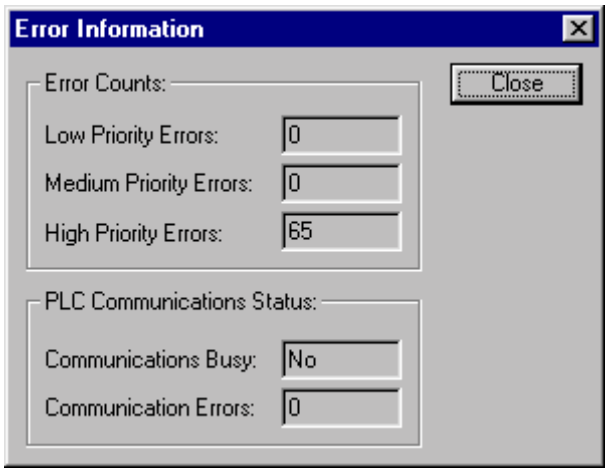
The **Medium Priority** button lists all errors designated as a medium priority only. Other errors and events are not deleted from the log; they are merely not visible.

The **High Priority** button lists all errors designated as a high priority only. Other errors and events are not deleted from the log; they are merely not visible.

The **Events** button lists all events. Errors, of all priorities, are not deleted from the log; they are merely not visible. Examples of events are system startup, system shutdown and user security notices.

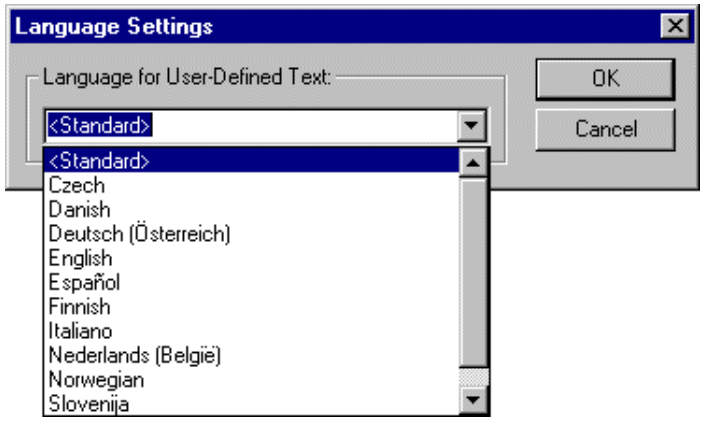
The **Print** button prints the current contents of the error and event log. Ensure that the printer is correctly set up before printing.

The **Error Information Dialog** button, once pressed, displays a summary of error information, including a detailed count of errors and PLC communication information. Click the **Close** pushbutton to remove this dialog.



Language Settings

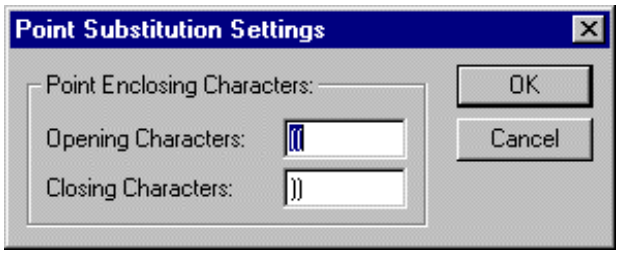
The language for user-defined text can be set via the Language Settings dialog. Select *Runtime Settings* from the *Projects* menu, followed by *Language Settings* to display the Language Settings dialog.



Select a language from the *Language for User-Defined Text:* field. Click the **OK** pushbutton to accept the settings, or the **Cancel** pushbutton to abort the operation.

Point Substitution Settings

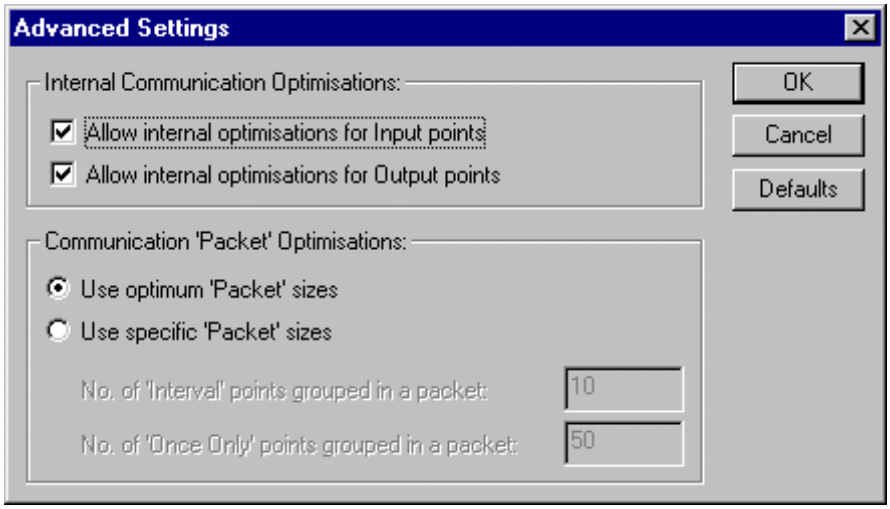
The enclosing characters associated with a report can be changed via the Point Substitution Settings dialog. Once set, these characters must be fixed for all reports generated by the project. Select *Runtime Settings* from the *Projects* menu, followed by *Point Substitution Settings* to display the Point Substitution Settings dialog.



Supply enclosing characters in the *Opening Characters:* field and *Closing Characters:* field. Click the **OK** pushbutton to accept the settings, or the **Cancel** pushbutton to abort the operation.

Advanced Settings

To open the Advanced Settings dialog select *Advanced Settings* from the *Runtime Settings* menu. The dialog is displayed as follows:



Click the settings to enable/disable *Internal Communication Optimisations* and *Communication 'Packet' Optimisations.* Click the **OK** pushbutton to accept the settings or the **Cancel** pushbutton to abort.

Runtime Security

Configured Users

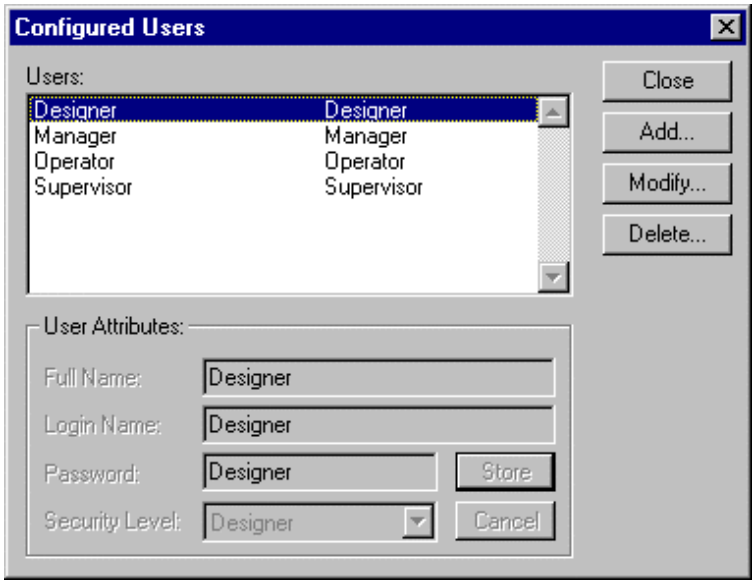
In a runtime application, it is possible to apply security measures in the development environment so that only sufficiently privileged users of the runtime application can access certain elements. It is also possible to housekeep security information within the runtime environment, with privileged users able to add, amend or remove users.

There are four levels of user privilege available in CX-Supervisor:

- Operator level privilege.
- Supervisor level privilege.
- Manager level privilege.
- Designer level privilege.

User configuration in the development environment is handled by the Configured Users dialog. Select *Configured Users* from the *Runtime Security* menu.

The Configured Users dialog is displayed as follows:



By default, there are four previously defined users listed in the *Configured Users:* field: *Designer* with designer-level privileges, *Manager* with manager-level privileges, *Operator* with operator-level privileges and *Supervisor* with supervisor-level privileges.

To add a new user:

1, 2, 3…

1. Click the **Add** pushbutton. The *User Attributes:* fields and buttons become enabled, and the contents of all fields are cleared, ready for a new user to be added.
2. Type the full name of the new user in the *Full Name:* field.
3. Type a login name in the *Login Name:* field.
4. Type a user password in the *Password:* field. The password must be at least four characters in length.
5. Select a level of privilege from the *Security Level:* drop down list.

6. Click the **Store** pushbutton to add the new user to the *Configured Users:* list, or the **Cancel** pushbutton to abort the operation.

To modify an existing user:

1, 2, 3…

1. Select a user from the *Configured Users:* list and click the **Modify** pushbutton. The *User Attributes:* fields and buttons become enabled, with the contents of all the fields filled with the attributes of the selected user.
2. Amend the full name, login name, password and level of privilege in the same way as adding a new user.
3. Click the **Store** pushbutton to update the user in the *Configured Users:* list, or the **Cancel** pushbutton to abort the operation.

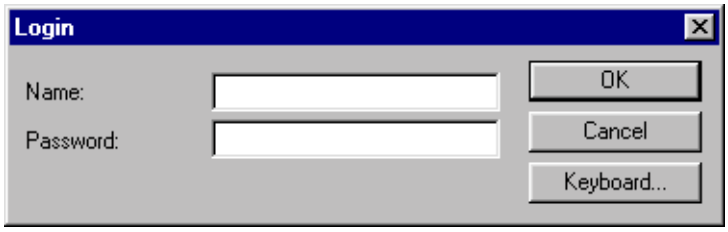
To remove a user from the *Configured Users:* list:

1, 2, 3…

1. Select a user from the *Configured Users:* list and click the **Delete** pushbutton.
2. A confirmation dialog is displayed. Click the **Yes** pushbutton to remove the selected user or the **No** pushbutton to abort the operation.

When all user amendments are complete, click the **Close** pushbutton.

In the runtime application, to make use of the designated privilege, the user must log in. Login can be accessed in a variety of ways, and so is dependent on the setup of the runtime application. Some applications may require login as soon as the application is run, others may allow login from a context-sensitive floating menu. Refer chapter 10, Animation for further information. The Login User dialog is as follows:



To log in, enter the login name (not the full name) in the *Login Name:* field and the associated password in the *Password:* field. Any characters typed in the *Password:* field are disguised by a '*' symbol for each character typed. Click the **OK** pushbutton to log in or the **Cancel** pushbutton to abort.

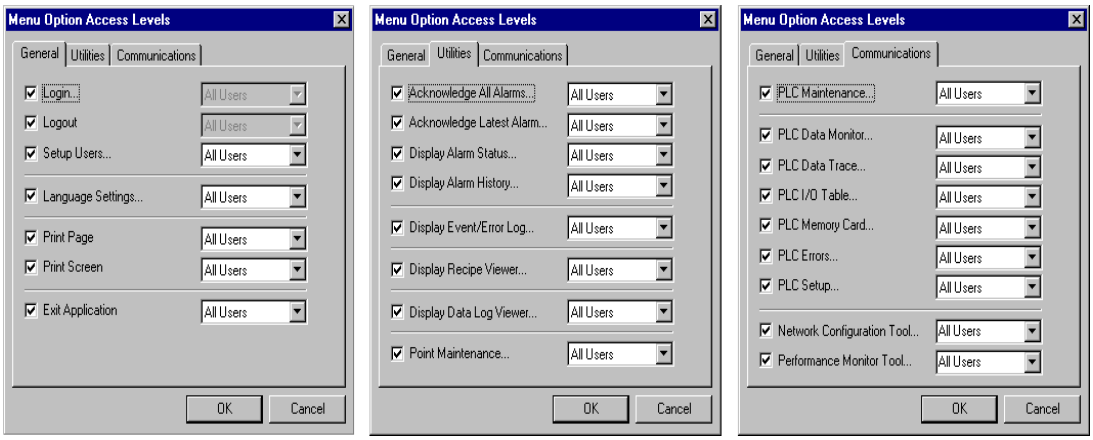
For users without a keyboard to enter login details, select the **Keyboard** pushbutton. The login name and password can be constructed from the subsequent dialog by clicking on each pushbutton in turn, followed by the **Enter** pushbutton to complete.

A user can detach from specialised user privileges by logging out. Access is again dependant on the application. There is no dialog associated with logout; once logout is activated privileges are immediately discontinued. Whilst one user is logged in, it is possible for a different user to log in, as prior to login, the current user is automatically logged-out by CX-Supervisor.

A user with the designer privilege can further amend the user configuration in the runtime environment using a similar dialog to the development environment's Configured Users dialog. As well as typing a password, verification of the password is required, and both fields are disguised by a '*' symbol. This is so that a new user can apply their own password, and that only they know the password. Verification is required to ensure the password was typed correctly in the first instance.

Menu Option Access Levels

To open the Menu Option Access Levels dialog select *Menu Option Access Levels* from the *Runtime Security* menu. The dialog is displayed as follows:

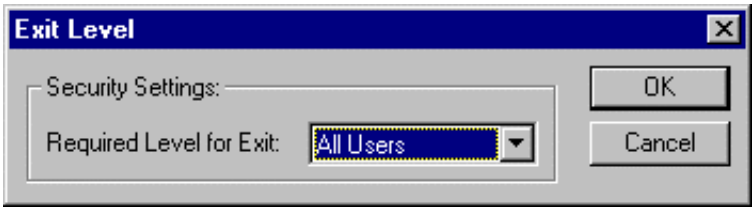


As well as a context-sensitive floating menu for the development environment, there is a floating menu for the runtime environment which is configurable in the development environment. It is possible to select the operations to be on the runtime floating menu, by clicking the relevant setting across the three tabs *General*, *Utilities* and *Communications*. It is also possible to assign a level of user privilege to the menu, so each level of user sees a different floating menu. This is achieved by selecting a user privilege from the relative drop down list. The *Communications* tab permits the activation of CX-Server components such as the PLC Data Trace and PLC Memory Card components. Refer to the *CX-Server Reference Manual* for further information on CX-Server components.

On completion, click the **OK** pushbutton to accept changes or the **Cancel** pushbutton to abort.

Exit Level

An additional security measure can be applied by selecting *Exit Level* from the *Runtime Security* menu. The Exit Level dialog is displayed as follows:



The dialog allows a specific privilege to be applied to exiting the runtime application. Select a user privilege from the drop down list and click the **OK** pushbutton to confirm the setting or the **Cancel** pushbutton to abort.

Compiling and Running a Project

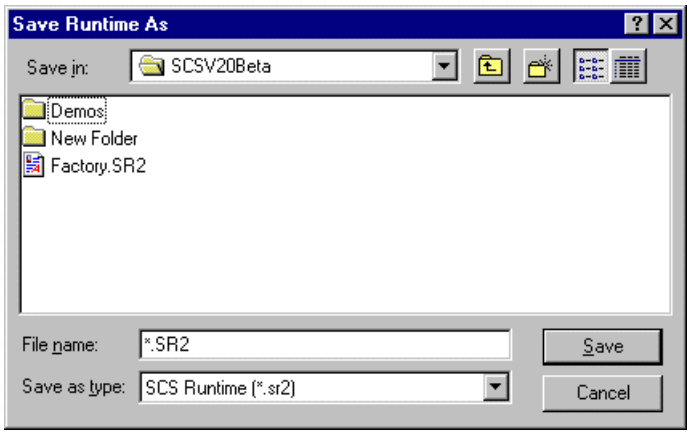
When a project is running it cannot be edited. CX-Supervisor runs projects under the CX-Supervisor runtime module.

To run the current project, click on the **Run** button on the toolbar.

The CX-Supervisor runtime environment starts, and automatically runs the project in a separate dialog which is given the name of the project. It allows examination of project alarm details and the run history.

Save Runtime As

Once the project has been compiled and run, the compiled version of the project may be saved into another directory location or onto another disc for issue to the target equipment. CX-Supervisor asks for a location and name for the runtime project. This dialog works in the same way as the file open or file save dialogs. The default file type is *.SR2.



Create Runtime Install Disc

A CX-Supervisor application can be packaged safely for authorised distribution by creating a runtime install disc. The process copies all required files, plus files to install to the specific directory e.g. “A:\” to be used to distribute the runtime project.

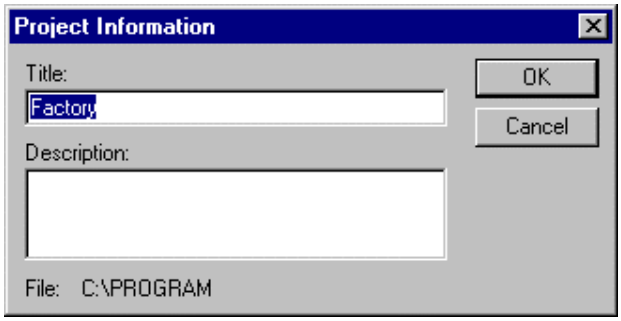
Click on *Create Runtime Install Disc* from the *Project* menu. The Save Runtime As dialog is displayed ready to create an installation to the floppy drive. Ensure a diskette is inserted into the floppy drive. Refer to chapter 7, Save Runtime As for further information regarding the Save Runtime As dialog.

Note: The files are not compressed. This feature does not support large projects which need to span multiple disks.

Project Information

Information may be stored concerning a project, by using the Project Information dialog. This dialog may be accessed, either when a project is first created, from the New Project dialog, or by selecting *Information* from the *Project* menu.

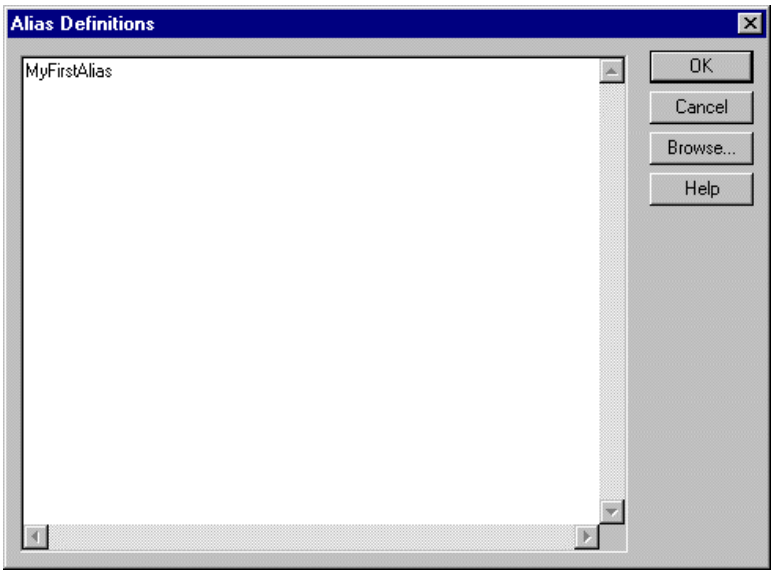
CX-Supervisor displays the following dialog:



Enter a title and any relevant details concerning the project in the *Title:* and *Description:* fields, and click the **OK** pushbutton.

Alias Definitions

An alias definition can be provided to replace strings in scripts and expressions used throughout CX-Supervisor applications. An associated string replaces the alias when used in a script or expression. Select *Alias Definitions* from the *Project* menu.



Select the **Browse** pushbutton to apply an alias. Click the **OK** pushbutton to accept the settings or the **Cancel** pushbutton to abort.

Find Points

The project can be searched to find occurrences of a point name. It can also be used to search for text within script e.g. where a text message is generated from.

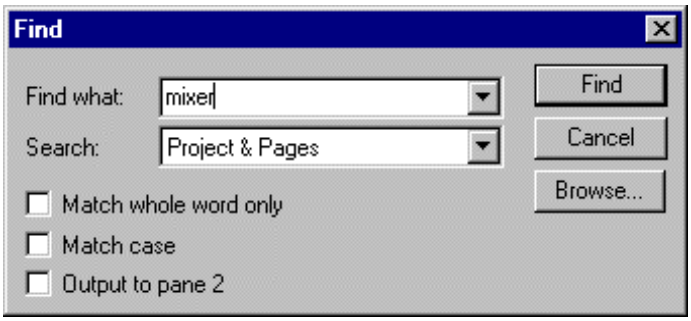
The areas which can be searched are:

- The current page.
- All pages.
- Project scripts.
- Alarms.
- Recipes.
- The project, which includes Project scripts, Alarms and Recipes.

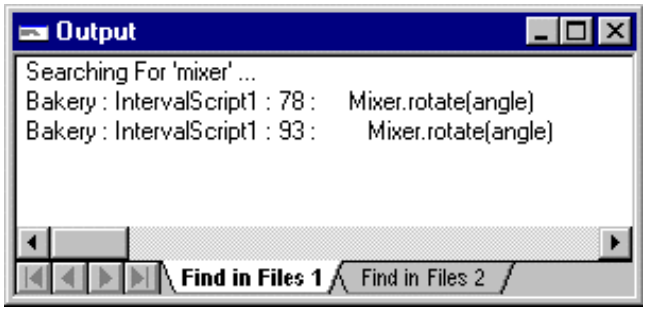
By default, all areas are searched i.e. 'Project and Pages'. To perform a Find operation:

1, 2, 3...

1. Select *Find* from the *Edit* menu.
2. Type the text to find in the *Find What* field, or select a previous entry from the drop down list. The **Browse** pushbutton can be used to select an item.
3. Select the area to search; *Project & Pages* searches all areas.
4. Choose the required options; *Output to pane 2* results in pane 1 to be saved for future use.
5. Press the **Find** pushbutton to start the search or the **Cancel** pushbutton to abort the operation.



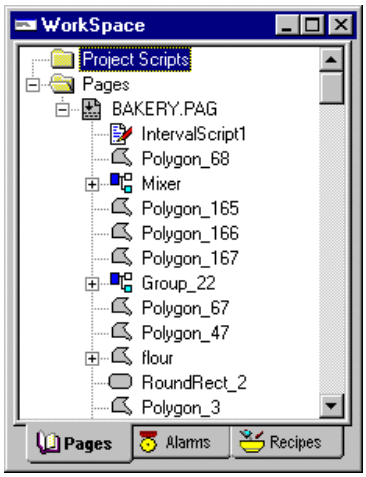
The output dialog shows all occurrences of the text in the selected areas. It illustrates the location including page name, alarm name, recipe, script name, object, line number and animation as relevant, followed by the occurrence itself. Double clicking on any line opens the appropriate editor.



The output can be printed by selecting *Print* from the right mouse context menu.

Navigating Projects with the Workspace

The Workspace is activated by clicking the **Workspace** button on the toolbar. The Workspace dialog is displayed:



Selecting the *Pages*, *Alarms* or *Recipes* pushbutton displays a list of the associated components that form part of the project.

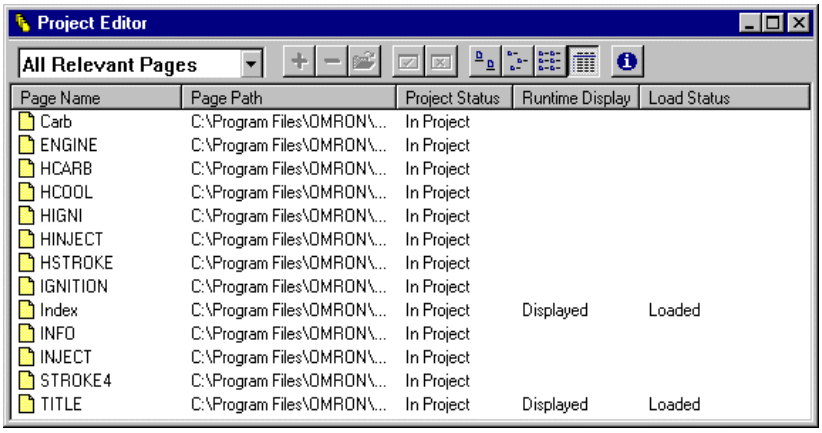
Project Editor

The Project Editor is activated by clicking the **Project Editor** button on the toolbar.

When activated, the Project Editor initially displays as an icon at the bottom of the main CX-Supervisor dialog. To view the contents of the Project Editor, double click on the icon.

About the Project Editor

The Project Editor provides a window into the contents of a project. It lists all the pages currently comprising a project, and allows for pages to be moved into or out of projects. An example of the Project Editor dialog is shown as follows:



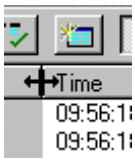
Page Name	Page Path	Project Status	Runtime Display	Load Status
Carb	C:\Program Files\OMRON\...	In Project		
ENGINE	C:\Program Files\OMRON\...	In Project		
HCARB	C:\Program Files\OMRON\...	In Project		
HCOOL	C:\Program Files\OMRON\...	In Project		
HIGNI	C:\Program Files\OMRON\...	In Project		
HINJECT	C:\Program Files\OMRON\...	In Project		
HSTROKE	C:\Program Files\OMRON\...	In Project		
IGNITION	C:\Program Files\OMRON\...	In Project		
Index	C:\Program Files\OMRON\...	In Project	Displayed	Loaded
INFO	C:\Program Files\OMRON\...	In Project		
INJECT	C:\Program Files\OMRON\...	In Project		
STROKE4	C:\Program Files\OMRON\...	In Project		
TITLE	C:\Program Files\OMRON\...	In Project	Displayed	Loaded

The Project Editor consists of a control bar and a display area. The control bar includes controls to filter the pages to be displayed, add and remove pages from a project, and open pages.

Viewing the Contents of a Project

The Project Editor is used to view the pages within a project.

Individual listed pages are sorted, based on the designated page name, page path, project status, runtime display or load status. By selecting the *Page Name* field, the pages are sorted alphanumerically by name. The *Page Type*, *Project Status*, *Runtime Display* and *Load Status* fields, once selected, react in the same way. The Project Editor display shows the projects listed in page name order.



The widths of the editor fields can be widened or narrowed as required using the mouse to drag the column boundaries.

The typeface of the editor can be amended from the *Preferences* option in the *File* menu. This is especially useful when printing.

Opening a Page via the Project Editor

To open pages via the Project Editor, click the **Open Page** button on the toolbar.

Adding Pages to a Project

When a new page is created, it is automatically registered in the Project Editor but its details are not saved. When the page is saved as a .PAG file, a message is displayed requiring confirmation to add this page to the project. Click the **Yes** pushbutton to add the page or the **No** pushbutton to save the page without adding to the project. If the page was not added to the project when saving, it can be added later by using the **Add Page** button on the toolbar.

Removing Pages From a Project

To remove pages from a project, select the page by clicking its description on the Project Editor and click the **Remove Page From Project** button on the toolbar. A message is displayed asking *'Do you want to remove (name and path of page) from the project?'*. Click the **Yes** pushbutton to delete the page, or click the **No** or **Cancel** pushbutton to keep it and return to the Project Editor.

Linking Pages in a Project

A number of pages may be linked together within a project. Linking allows a main page containing active elements (e.g. pushbuttons) to be loaded and depending upon the actions performed (i.e. which buttons are clicked) allow other pages to be loaded on demand. For further details of showing pages on demand, refer to chapter 10, Animation.

Selecting Pages for Display on Run

When a project is run the first pages to be displayed can be selected. To display a page when a project is run, open the Project Editor, select the page by clicking on its description

and click the **Display Page Upon Run** button on the toolbar.

To stop a page being displayed on run, click the **Don't Display Page Upon Run** button on the Project Editor toolbar.

Changing the View Mode

Select the **Large Icons** button to view details with large icons.

Select the **Small Icons** button to view details with normal icons.

Select the **List** button to view details as a list.

Select the **Details** button to view details as a list including page name, page path, project status, runtime display and load status information. The details can be sorted in ascending order by clicking once or in descending order by clicking twice, in the appropriate field.

Viewing Project Details

To open the Project Details dialog and view the project name and description, click on the **Edit Details About Project** button on the Project Editor toolbar.

Multiple Selection

Standard multiple-selection facilities can be used within the Project Editor. To select an additional line hold the control key down while clicking; to select all lines between the anchor line (the last line clicked on) and another line hold the <Shift> key down while clicking. The buttons can then be used to apply to all the selected lines at the same time.

Printing from the Project Editor

Print Setup

The Project Editor can be printed in the same way pages can. Before printing, ensure that the printer has been set up correctly. To check the printer settings, refer to chapter 3, Pages.

Print Preview

To preview the page before printing, ensure that the Project Editor dialog is displayed and currently selected, and then select *Print Preview* from the *File* menu.

Refer to chapter 3, Pages regarding the use of the Print Preview display.

Printing

To print the contents of the Project Editor, select the **Print** button from the toolbar.

Refer to chapter 3, Pages regarding the use of the Print dialog.

CHAPTER 8
Graphics Library

This chapter describes the CX-Supervisor Graphics Library. The chapter includes details of how the Graphics Library may be used for storing frequently used objects for use with a number of applications.

Overview

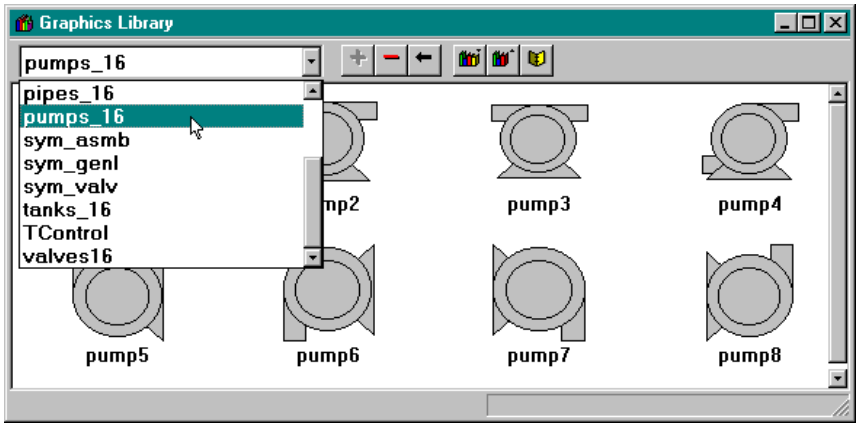
The Graphics Library is a repository for objects that are often used in CX-Supervisor pages. The Graphics Library Editor allows access to Libraries from a drop-down list box. Objects are stored in the Library and can be removed or copied, allowing quick addition of frequently used objects to pages or which appear in a project a number of times. Libraries are not project dependant, so objects can be copied from one project to another.

Graphics Library

Activating the Library

To activate the Library, click on the **Graphics Library** button on the toolbar. If the Library is already open but displayed as an icon, double click on the Library icon.

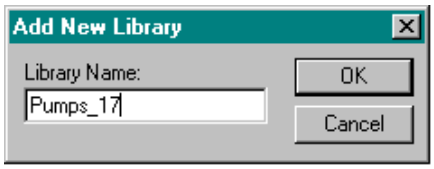
An example of the Graphics Library Editor is illustrated as follows, but note that actual library names and contents may differ from that shown in the following chapters.



Create Library

Each Library has a unique name which is entered when the Library is created.

To create a library, click on the **Add Library** button on the Graphics Library Editor toolbar. The Add New Library dialog is displayed as illustrated below:



Enter the name of the new Library file and click the **OK** pushbutton, or cancel the addition of the Library by clicking on the **Cancel** pushbutton.

If an object is dragged into the Library without a Library file open, then the Add New Library dialog is displayed. Refer to chapter 8, Manipulating Objects, for details on dragging objects into the Library.

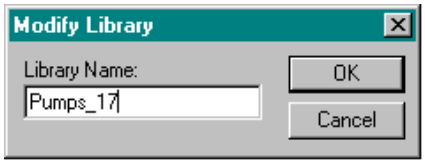
Opening a Library

The Graphics Library Editor consists of a number of Libraries which are selected from the drop down list box in the toolbar of the dialog.

Click on the Library name to display its contents in the dialog. The dialog shows the objects in the selected Library. The content of each library is provided for reference in chapter 8, Manipulating Objects.

Modify Library

The only element of the Library definition which is editable is the Library name. To change the name of a Library, open the desired Library file and click on the **Modify Library** button on the toolbar. The Modify Library dialog is displayed, an example of which is illustrated as follows:



Type over the current field entry with a new name and click the **OK** pushbutton, or cancel the operation by clicking the **Cancel** pushbutton.

Delete Library

A Library may be deleted by selecting it from the drop down list, to open it, and clicking the **Delete Library** button on the Graphics Library Editor toolbar. CX-Supervisor displays a message box to confirm the deletion of the Library.

Click the **Yes** pushbutton to remove the Library or the **No** pushbutton to cancel the operation and return to the Graphics Library. After clicking the **Yes** pushbutton, a second message box is displayed to confirm deletion of the library.

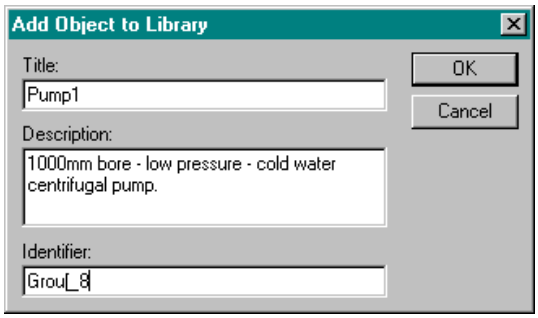
Click the **OK** pushbutton to delete the Library, or the **Cancel** pushbutton to the leave the Library unchanged.

Manipulating Objects

Add Object

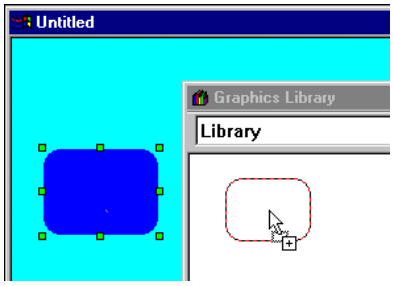
Any object created on a CX-Supervisor page can be added to the Library. All attributes assigned to an object that is copied to the Library are stored, for example animation information.

To add an object, select it from a page and click the **Add Object to Library** button on the Graphics Library Editor toolbar. The Add Object To Library dialog is displayed as illustrated below:



The name of the object used by the Object Identification control is shown in the *Title:* field. Type over this with a new name, if required (this is the name used by the Library). Enter a text description in the *Description:* field and an identifier for the object (this is used when it is inserted on a page) in the *Identifier:* field. Click the **OK** pushbutton to add the object to the Library and place the object in the dialog. Click the **Cancel** pushbutton to abort the operation. Further details on the Object Identification control are contained in chapter 2, Graphics Editor.

Alternatively, ensure that the Graphics Library Editor is open, click and hold the mouse button on the page object and drag it from the page onto the Graphics Library Editor, illustrated as follows:



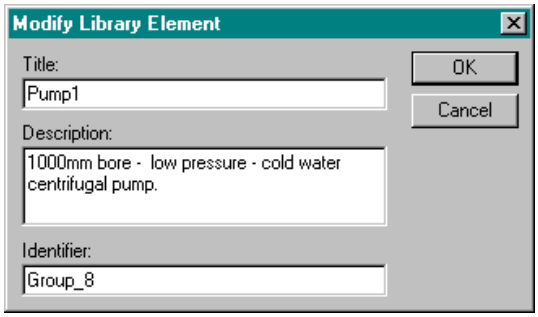
When the mouse button is released the object is placed in the Library, and the Add Object To Library dialog is displayed.

Copying an object to a page from a Library is the reverse of the click and drag procedure.

Objects can also be cut or copied and pasted into the Library, refer to chapter 5, Objects. When the object is pasted with the Graphics Library Editor open, the Add Object To Library dialog is shown.

Modify Library Element

To change the name of a Library object, click on the object in the Library (the object name is highlighted in the Graphics Library Editor), and click on the **Modify Library Element** toolbar button. The Modify Library Element dialog is displayed, as illustrated below:



Enter the new object title, text description and identifier. Click the **OK** pushbutton to add the new object description to the Library, or the **Cancel** pushbutton to cancel the operation.

Delete Object

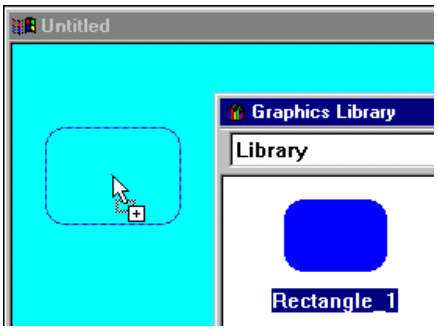
To delete an object from the Library, select the object, (the grab handles are not shown; however, the object name is highlighted in the Graphics Library Editor) and click on the **Delete Object** toolbar button.

A message box is displayed with the associated object name to remove. Click on the **Yes** pushbutton to delete the object or the **No** pushbutton to cancel the operation.

Using a Graphic Library Object in the Graphics Editor

A library object can be added to the Graphics Editor in the same way that the Graphics Editor is used to build libraries, by dragging from one dialog to another. Once a library object is added to the Graphics Editor, it can be further modified since each library object is simply a group of objects.

As an example, a page can be enhanced by using one of the gauges provided in the Gauges_1 default graphic library:



The gauge object can be stretched to suit the needs of the page, and other objects can be applied on top of, or in addition to the gauge. A library object can also be ungrouped by selecting *Ungroup* from the *Edit* menu.

The **Cut**, **Copy** and **Paste** buttons on the toolbar can be used as an alternative to dragging.

Default Graphic Library Objects

CX-Supervisor contains default, ready-to-use libraries. They cannot be added to (this is denoted by the 'READ ONLY' statement at the bottom of the Graphics Library Editor), although they can be applied to a page and tailored in the usual way.

Sharing Graphic Libraries

Graphic Libraries, including the default Graphic Libraries, can be shared by other users at other PCs running CX-Supervisor. Each library has its own *.MAT file (e.g. PANELS.MAT for the panels library). The *.MAT files reside in the same directory as the CX-Supervisor application. Using file utilities on the PC, it is possible to copy one or more *.MAT files onto a diskette or a network, and transfer them to a CX-Supervisor directory on another PC. Consult the *Microsoft Windows User Guide* for details on copying files.

Printing the Graphics Library

Print Setup

The Graphics Library can be printed in the same way pages can. Before printing, ensure that the printer has been set up correctly. To check the printer settings, refer to chapter 3, Pages.

Print Preview

To preview the page before printing, select *Print Preview* from the *File* menu.

Refer to chapter 3, Pages regarding the use of the Print Preview dialog.

Printing

To print the contents of the Graphics Library, select the **Print** button from the toolbar.

Refer to chapter 3, Pages regarding the use of the Print dialog.

CHAPTER 9
Alarms

This chapter describes CX-Supervisor alarms and the procedures associated with the creation, amendment and removal of alarms using the Alarm Editing facility. The use of alarms during the running of a project is also described.

What is an Alarm?

Alarms provide notification of a problem during the execution of an application in runtime. Alarms are defined in the development environment and monitored in the runtime environment. Alarms range from incidental to catastrophic in nature.

In runtime, the occurrence of an alarm condition, and any subsequent change of state, is recorded in a log file known as the Alarm History log.

An operator is alerted to an alarm condition by means of an Alarm Acknowledge dialog, which may also be accompanied by an warning sound. A list of current alarms is also maintained.

Individual alarms are defined in the development environment using the Alarm Editor. General alarm settings are controlled in the development environment using the Alarm Settings dialog.

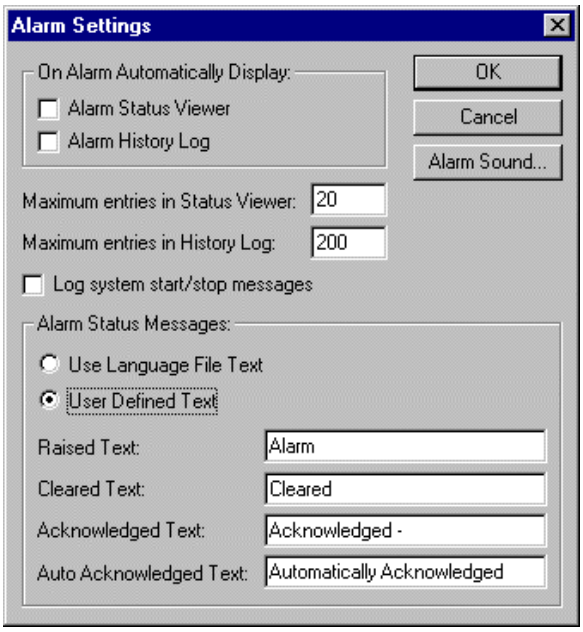
The Alarm Object (refer to chapter 5, Objects) is a graphical object which can be configured to display alarm messages for certain groups of alarms and thus provides a convenient way of filtering alarm messages.

Alarm definitions are made and modified using the Alarm Editor. To use the Alarm Editor, CX-Supervisor must currently have a project open. If no project is currently open, either select *Open Project* from the *Project* menu to open a previously saved project, or select *New Project* from the *Project* menu to create a new project.

Facilities exist to add an alarm, modify an existing alarm, copy an alarm, remove an existing alarm following confirmation, and display the alarm list in name, type or description order.

Alarm Settings

To open the Alarm Settings dialog, select the **Change General Alarm Settings** button from the Alarm Editor toolbar. The dialog is displayed as follows.

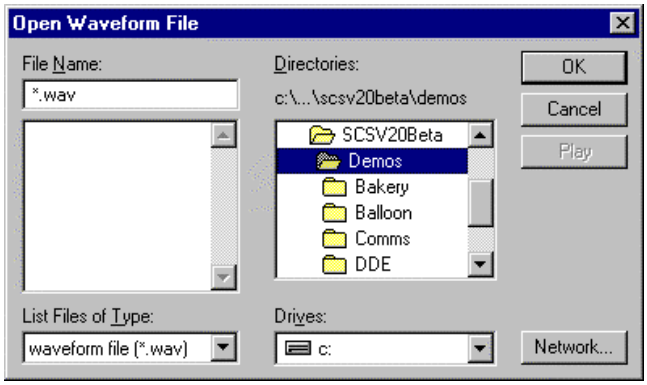


In the *On Alarm Automatically Display* area, set the *Alarm Status Viewer* and *Alarm History Log* settings as required. When these options are set, the Current Alarms dialog or Alarm History dialog (respectively) displays automatically in runtime when an alarm occurs.

Set the *Maximum entries in Status* and *Maximum entries in History Log* fields to the desired values. The numbers specify how many messages are displayed in the respective viewer dialogs in runtime. Select the *Log system start/stop messages* setting to ON if required.

Note: If more messages exist than are requested to be displayed, the most recent messages are displayed in preference to older messages.

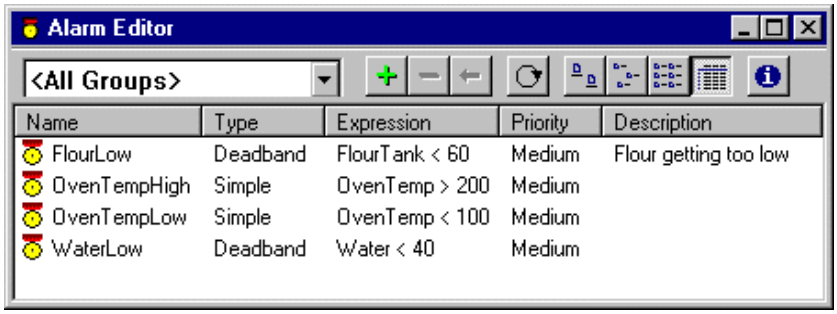
The **Alarm Sound** pushbutton allows the selection of an audible warning which are heard when an alarm is raised. The Open Waveform File dialog is shown below:



Choosing a waveform file with this dialog does not in itself cause the warning sound to be heard when an alarm is raised. To hear the audible warning for any alarm, the *Play Sound* setting in the alarm definition must be ticked. Also, the PC on which CX-Supervisor is running must be equipped with a suitable sound card and audio capability.

Viewing the Contents of the Alarm Database

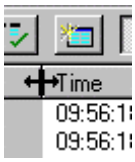
To open the Alarm Editor dialog, click the **Alarm Editor** button on the toolbar. An example of the Alarm Editor dialog is as follows:



Alarms may be segregated into groups. To select a group, pick an entry from the *Group* field.

All alarm definitions can be displayed by selecting <*All Groups*> from this list.

Individual listed alarms are sorted, based on a designated field type, either name, type or description. By selecting the *Name* field, the alarms are sorted alphanumerically by name. The *Type* and *Description* fields, once selected, react in the same way. The Alarm Editor dialog shows the alarms in name order.



The widths of the alarm fields can be widened or narrowed as required using the mouse to drag the column boundaries.

The typeface of the editor can be amended by selecting *Preferences* from the *File* menu. This is especially useful when printing.

The **Change General Alarm Settings** button on the toolbar displays the Alarm Settings dialog, which allows global alarm settings to be modified. Refer to chapter 9, Alarm Header Information.

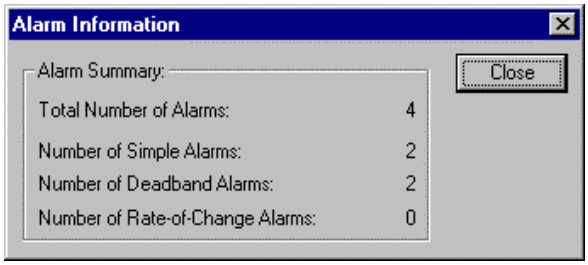
Select the **Large Icons** button to view details with large icons.

Select the **Small Icons** button to view details with normal icons.

Select the **List** button to view details as a list.

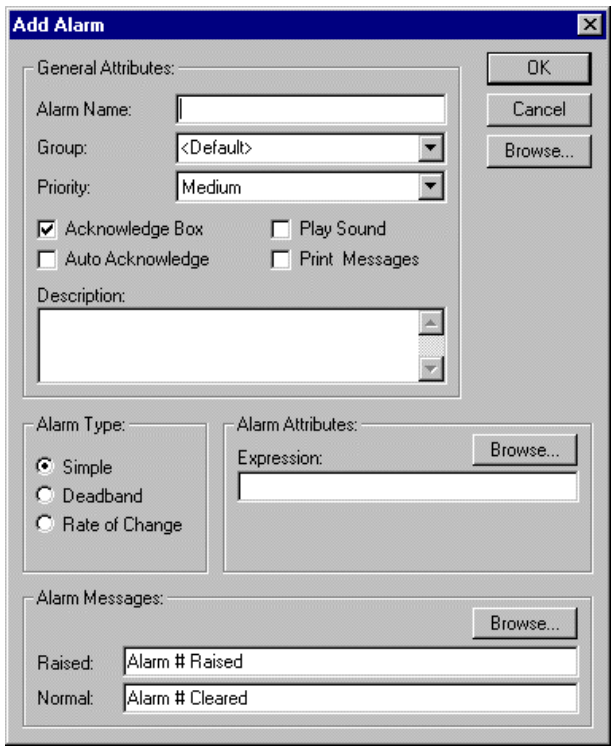
Select the **Details** button to view details as a list including name, type, expression, priority and description information. The details can be sorted in ascending order by clicking once or in descending order by clicking twice, in the appropriate field.

A summary of alarm information is available by selecting the **Display Information on Alarms** button from the toolbar. The resultant dialog shows an overall summary and a breakdown on the number of alarms per type. To exit the dialog, click the **Close** pushbutton. The Alarm Information dialog is shown as follows:



Creating a New Alarm

Open the Alarm Editor dialog, as described in chapter 9, Viewing the Contents of the Alarm Database. To add a new alarm, select the **Add Alarm** button from the toolbar. This results in the Add Alarm dialog being displayed.



Once all the information has been provided for the new alarm, selecting the **OK** pushbutton commits the new alarm to the alarms database, whilst the **Cancel** pushbutton aborts this add operation.

Note: The short-cut keyboard combinations for Cut, Copy and Paste operations are valid within the Add Alarm dialog. Highlight part or all of a field and type <Ctrl>+X to cut the text or <Ctrl>+C to copy the text. Insert the cursor at the desired field and type <Ctrl>+V to paste the text. Since the cut and copy operations store the information in the Windows Clipboard, it may be pasted to another dialog or application.

Alarm Header Information

The name of the alarm is entered in the *Name:* field. The alarm name can be constructed of up to 20 alphanumeric characters. Any other characters, including spaces, generate an audible error, or an *Invalid Alarm Name entered* message. This field is visible from the Alarm Editor dialog.

The group to which this alarm is added is selected from the *Group:* field. To create a new group name, simply type the name of the new group in the *Group:* field. The use of alarm groups allows filtering of alarm messages by group name.

The priority assigned to the alarm is selected from the *Priority:* field.

The *Display Alarm Acknowledge Box* setting determines whether the Acknowledge Alarm dialog is displayed in runtime when the alarm occurs. The dialog notifies the operator of the alarm condition and allows the operator to acknowledge the alarm. The default value is *True*.

Activating the *Auto Acknowledge Alarm* setting causes these messages to be acknowledged without any operator action. Refer to chapter 9, Alarm Acknowledge.

The *Play Sound* setting determines whether an audible warning is sounded when the alarm occurs. The default value is *False*. Note that a waveform file must also have been selected for the warning sound to be heard. The waveform is selected by using the **Alarm Sound** pushbutton on the Alarm Settings dialog.

An alarm description, detailing the possibilities of how the current alarm would be raised, is inserted in the *Description:* field. To move to a new line, press <Ctrl>+<Return>. Any characters are valid, and up to 255 characters may be entered in the text field. This field is visible from the Alarm Editor dialog.

Activating the *Print Alarm Messages* setting causes alarms of this type to be printed automatically when they occur.

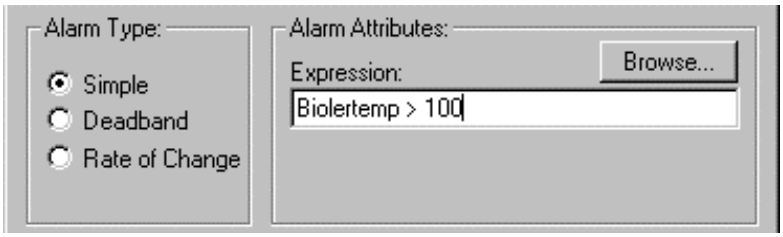
Alarm Type

The alarm type can be either Simple, Deadband or Rate of Change. Select the desired type by clicking on the *Simple, Deadband* or *Rate of Change* settings. This field is visible from the Alarm Editor dialog.

Alarm Attributes

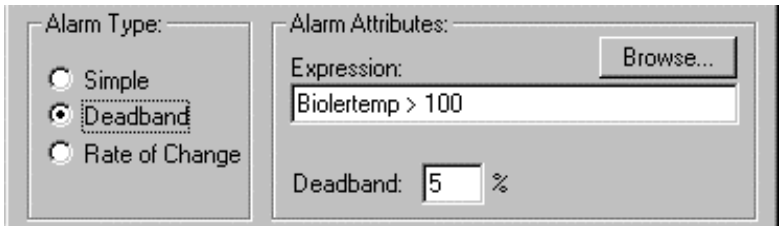
The attributes for an alarm are defined according to its type, as this defines when an alarm reacts. Since *Simple* is the default type, the Simple alarm attributes are initially visible.

For a Simple alarm, the following attributes are displayed:



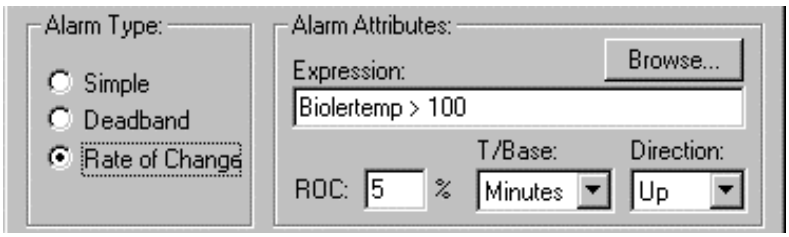
An expression based on a point is entered in the *Expression:* field. The alarm is raised once the point meets the expression. The alarm is cleared when the point value subsequently fails to meet the expression.

For a Deadband alarm, the following attributes are displayed:



An expression based on a point is entered in the *Expression:* field. The alarm is raised once the point meets the expression. The alarm is cleared when the point value falls outside the expression value plus the specified deadband percentage. For the example above an alarm is raised when the boiler's temperature exceeds 100 and is cleared when the boiler temperature falls below 95 (100 minus 5%).

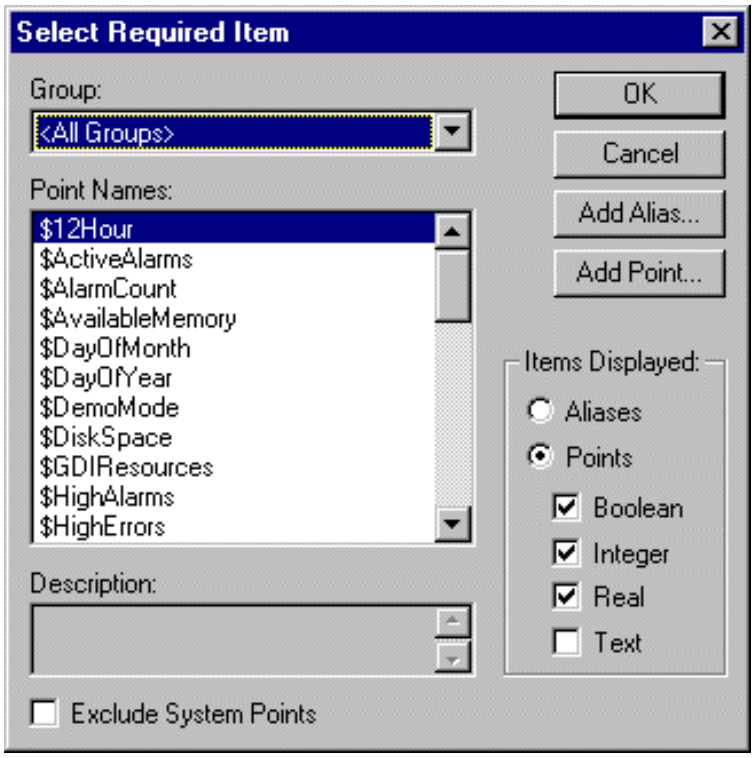
For a Rate of Change alarm, the following attributes are displayed:



An expression based on a point is entered in the *Expression:* field. The alarm is raised if the value exposed by the expression increases or decreases at the speed based on the values of the *ROC:* field, the *T/Base:* field, and the direction based on the *Direction:* field. The alarm is cleared when the rate-of-change is less than the critical rate.

For the above example an alarm is raised when the boiler's temperature increases by 5% or more per minute, and clears when the boiler's temperature increases by less than 5% per minute.

A point may be inserted into any of the alarm types' *Expression:* field by either typing in the point name or by selecting the **Browse** pushbutton, which results in the Select Required Item dialog being displayed, at the position where a point should be inserted.



Only viable points can be viewed from a Select Required Item dialog. The list of items in the *Point Names:* field can be refined by selecting an option from the *Group:* field. Click the **OK** pushbutton to accept the new point or click the **Cancel** pushbutton to leave the point unchanged. Clicking the **Add Point** pushbutton or **Add Alias** pushbutton allows a new point or alias to be created prior to association with the expression. Points are discussed in chapter 4, Points, whilst expression syntax is discussed in the *CX-Supervisor Script Language Reference Manual.*

Alarm Messages

A message pertaining to a raised alarm is entered in the *Raised:* field. The content of the field should be descriptive to provide the user with a reasonable basis for an alarm solution.

The Alarm Editor provides a default raised message. The name of the alarm is substituted for the # character in the message text when the **OK** pushbutton is clicked. The raised message may be changed at any time simply by entering the desired message in the text field.

A message associated with the alarm can also be entered in the *Normal:* field in the same manner to that above; this message is displayed once an alarm condition has been rectified and normal conditions have been resumed.

The Alarm Editor provides a default normal message. The name of the alarm is substituted for the # character in the message text when the **OK** pushbutton is clicked. The normal message may be changed at any time simply by entering the desired message in the text field.

Both alarm messages can include embedded point names via the **Browse** pushbutton, which is replaced at runtime with the value of the point:

Example

```
Boiler temp high: ((BoilerTemp))
```

shows the point value in the alarm message.

Example

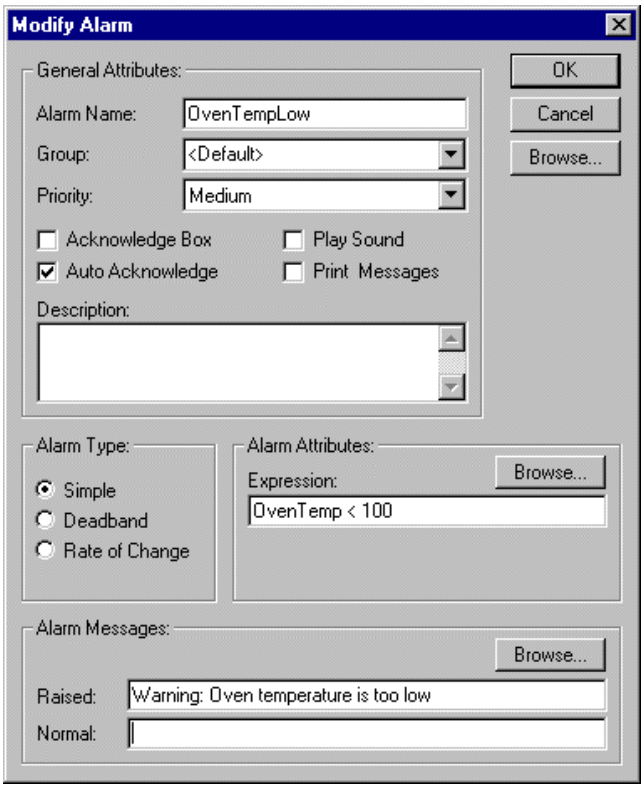
```
Flow exceeded, Pressure = ((Press))
((“Temperature = %2.2f”,temp)).
```

Updating an Existing Alarm

Open the Alarm Editor dialog as described in chapter 9, Viewing the Contents of the Alram Database.

To modify an existing alarm, highlight the alarm entry from the alarm list and select the **Modify Alarm** button from the toolbar.

This results in the Modify Alarm dialog being displayed (a dialog based on the Add Alarm dialog), as shown below:



The selected alarm can be redefined as described in chapter 9, Creating a New Alarm. Once all the information has been provided for the updated alarm, clicking the **OK** pushbutton commits the alarm to the alarms database, whilst the **Cancel** pushbutton aborts this modify operation.

Copying an Existing Alarm Definition

Open the Alarm Editor dialog as described in chapter 9, Viewing the Contents of the Alram Database.

To copy an existing alarm, highlight the alarm from the alarm list and then type <Ctrl>+C. This creates a copy of the alarm definition on the Windows clipboard. To paste the alarm definition back in to the current project, type <Ctrl>+V. The Alarm Editor ensures the name of the alarm is unique by appending a number to the name. For example, if the original alarm name was “Alarm”, the name of the pasted alarm is “Alarm1”. All other properties of the pasted alarm remains the same as the original alarm definition.

It is possible to copy many alarms at once by highlighting all the desired alarms in the alarm list. Press and hold the <Ctrl> key and use the mouse to select alarm definitions one by one, or press and hold the <Shift> key and use the mouse to select blocks of alarm definitions. Once the desired alarms have been highlighted, the alarm definitions may be copied and pasted in the usual way.

Alarm definitions may be pasted into a project other than the original. Care should be exercised when attempting this procedure as the alarm expression may contain references to point names which may have different meaning in the new project.

Deleting an Existing Alarm

Open the Alarm Editor dialog as described in chapter 9, Viewing the Contents of the Alarm Database.

To remove an existing alarm, highlight the alarm from the alarm list and select the **Delete Alarm** button from the toolbar. A confirmation dialog is displayed. Click the **Yes** pushbutton to remove the alarm from the alarms database, or **No** pushbutton to abort the delete operation.

Printing Alarms

Print Setup

The Alarm Editor can be printed in the same way pages can. Before printing, ensure that the printer has been set up correctly. To check the printer settings, refer to chapter 3, Pages.

Print Preview

To preview the page before printing, select *Print Preview* from the *File* menu.

Refer to chapter 3, Pages regarding the use of the Print Preview display.

Printing

To print the contents of the Alarm Editor, click the **Print** pushbutton.

Refer to chapter 3, Pages regarding the use of the Print dialog.

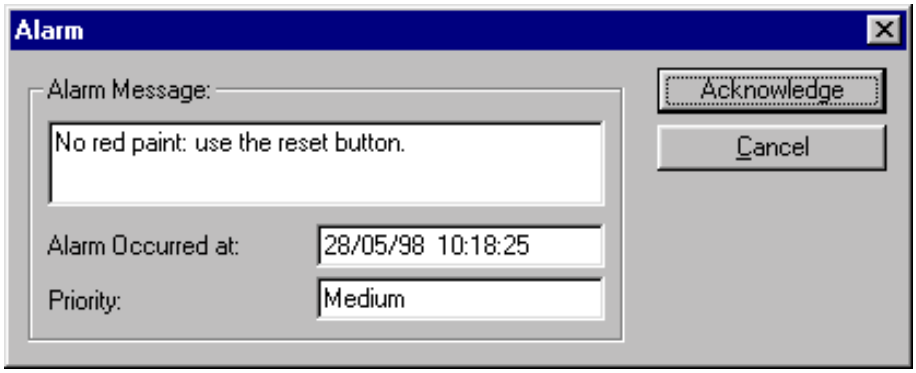
Alarm Reporting In Runtime

An alarm condition which occurs during runtime is brought to the attention of the operator. There are a variety of options available in the way alarms are reported. These options are configured in the development environment. During runtime, there are essentially four ways of examining alarm messages: the Alarm Acknowledge dialog, the Current Alarm dialog, the Alarm History dialog and the Alarm Object.

The Alarm Object is a graphical object which displays alarm messages in a similar way to the alarm status viewer. Refer to chapter 5, Objects for an explanation of how to configure an alarm object to filter alarm messages by group name.

Alarm Acknowledge

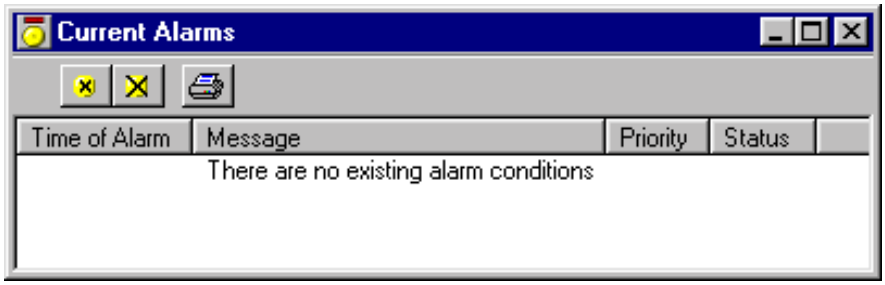
Whenever an alarm is raised during a runtime application, a confirmation dialog is optionally displayed requesting acknowledgement of the alarm. The dialog shows the alarm message, priority, and the date and time the alarm was raised. Click the ***Acknowledge*** pushbutton to close the dialog.



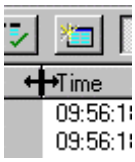
Alarm messages are queued so that as each message is acknowledged, the next in the queue becomes visible. If a new alarm occurs which has higher or equal priority the details are updated to show this newer/more important alarm first. The dialog disappears when there are no further alarm messages to be reported. Each acknowledgement is logged in the alarm history log with the login name of the current user. An unacknowledged alarm does not affect a runtime application.

Current Alarms

A list of current alarms can be viewed by accessing the Current Alarms dialog. (A "current" alarm is one which has been raised but is not yet cleared and acknowledged.) The current alarm status viewer can be accessed in a variety of ways, and is dependant on the setup of the runtime application. Some applications may allow access to the dialog via the context-sensitive floating menu, whilst others may allow access via a pushbutton. Refer to chapter 7, Projects or chapter 10, Animation as appropriate. The Current Alarms dialog is as follows:



The Current Alarm dialog always shows the alarm messages listed in order with the highest priority at the top.



The widths of the alarm fields can be widened or narrowed as required using the mouse to drag the column boundaries.

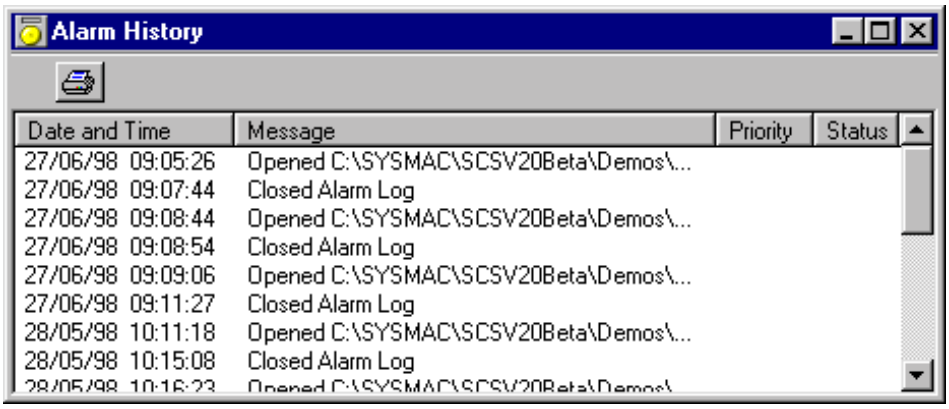
The **Acknowledge Selected Alarm** toolbar button acknowledges the alarm which is currently highlighted in the alarm status dialog. This has no effect if the alarm has already been acknowledged.

The **Acknowledge All Outstanding Alarms** toolbar button unconditionally acknowledges all outstanding alarms. Any unacknowledged alarms become acknowledged. This has no effect on alarms which are already acknowledged.

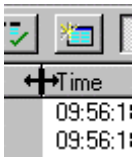
The **Print Contents of Alarm Status View** toolbar button causes the messages in the alarm status dialog to be printed. Before printing, ensure that the printer has been set up correctly.

Alarm History

The occurrence of an alarm condition, and any subsequent change of state, is recorded in the alarm history log. Alarm messages recorded in the log can be displayed using the Alarm History dialog. The Alarm History dialog can be accessed in a variety of ways, and is dependant on the setup of the runtime application. Some applications may allow access to the dialog via the context-sensitive floating menu, whilst others may allow access via a pushbutton. Refer to chapter 7, Projects or chapter 10, Animation as appropriate. The Alarm History dialog is as follows:



This dialog always shows the log listed in date and time order.



The widths of the alarm fields can be widened or narrowed as required using the mouse to drag the column boundaries.

The **Print Contents of Alarm Log View** toolbar button causes the messages in the Alarm History dialog to be printed. Before printing, ensure that the printer has been set up correctly. The alarm log itself is simply a text file (*projectname*.alg) that may be examined or printed using any of the usual utilities available under Windows, such as Microsoft Notepad.

CHAPTER 10
Animation

This chapter describes CX-Supervisor animation and the procedures associated with the creation of a project animation, page animation and object animation, using the Animation Editing facility. The active use of points and how points dictate animations is also described.

Associating Points with Actions and Events

CX-Supervisor provides a facility to greatly enhance the versatility of a runtime application by the use of actions and animations to execute commands and logical expressions based on specified criteria being met. This can take many forms, for instance pressing a button, opening or closing a page or changes in the positioning of objects on a page.

CX-Supervisor achieves this enhanced functionality in two ways: by assigning an expression to a pre-defined action, or executing commands on a linear basis as a basic programming language. In addition, such functionality can be carried out on three levels: object, page, or project, with different objectives at each level.

Animations are actioned using the values or states of one or more points. For example, an integer point is assigned to an object, the colour of the object is black when the value of the point is “0”. The system causes the value of the point to be changed to the value “5”, which changes the colour of the object to red.

To demonstrate, an object’s colour can be changed in the runtime environment from black to white. This can be achieved using actions and animations in the two ways described, with the additional use of points. Firstly, using a pre-defined action, the object can be associated with the ‘Change Colour’ pre-defined action (runtime action). When a Boolean point’s value is “0” the colour is black, when the point’s value is “1” the colour is white. The same result can be achieved using the basic programming language (script). This time, a single command can change the colour from black to white. Finally, either instance can be initiated by the user in the runtime environment, e.g. the user presses a pushbutton to change the object’s colour.

This is a simple example, but underlines how quickly and smoothly a runtime application can be built. This chapter elaborates on all forms of actions and animations that can be applied to CX-Supervisor in the development environment. Also refer to the *CX-Supervisor Script Language Reference Manual* for further syntax details for the application of actions and animations.

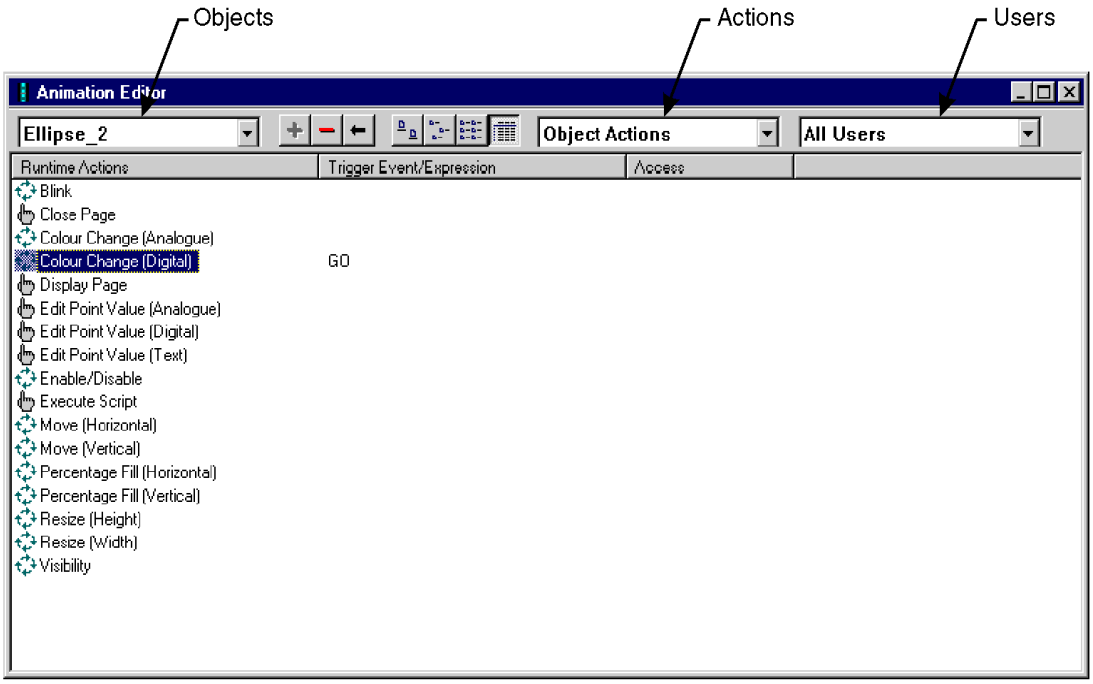
Animation Editor

Actions and animations are created on a project, page or object basis using the Animation Editor.

To use the Animation Editor, CX-Supervisor must currently have a project open. If no project is currently open, select *Open* from the *Project* menu to open a previously saved project, or select *New* from the *Project* menu to create a new project.

To access the Animation Editor, select the **Animation Editor** pushbutton from the toolbar.

The Animation Editor dialog is displayed:



The Animation Editor dialog lists all possible animation actions in the *Runtime Actions* column. Attributable objects for the Runtime Actions are listed in the *Trigger Event/Expression* column.

Animations can be instigated on a Project, Page or Object basis by selecting *Object Actions*, *Page Actions* or *Project Actions* from the *Actions* field. When opening the Animation Editor whilst an object within a page is selected, the *Actions* field defaults to *Object Actions*, and the selected object is shown in the Animation Editor. When accessing the Animation Editor with a page selected, this field defaults to *Page Actions*. When opening the Animation Editor whilst no selection is made, the *Actions* field defaults to *Project Actions*. The actions that may be applied to an object are dependant on the type of object selected. Only one type of action, *Execute Script,* can be applied to a Page or Project script.

The *Users* field allows selection of which users can use the selected page in the Runtime environment. This is used in conjunction with allocating users and allowing them permission to perform tasks; for further information on allocating users refer to chapter 7, Projects.

If *Object Actions* is the current selection for the *Actions* field, an object becomes active in the *Object* (left-most) field. An object within the current page can be selected from the *Object* field. The *Runtime Actions* list is dependant on the object selected from this box. The *Object* field is disabled for Page or Project actions.

Refer to chapter 10, Projects for details regarding Project Actions, chapter 10, Page for details regarding Page Actions, and chapter 10, Objects for details regarding Object Actions.

Individual listed Runtime Actions are sorted, based on a designated field type, either Runtime Actions or Trigger Event/Expression. By clicking on the **Runtime Actions** pushbutton, the points are sorted alphanumerically by Runtime Actions. The **Trigger Event/Expression** pushbutton, once selected, reacts in the same way. The Animation Editor dialog shows the actions associated with 'Polygon_1' sorted in runtime action order.

The typeface of the editor can be amended by selecting *Preferences* from the *File* menu. This is especially useful when printing.

The widths of the animation fields can be widened or narrowed as required using the mouse to drag the column boundaries.

A new action can be added to the list of current actions by clicking the **Add Action** button in the toolbar. An existing action can be removed from the current actions by clicking the **Delete Action** button in the toolbar, whereupon a confirmation dialog is displayed. Click the **OK** pushbutton to delete the action, or click the **Cancel** pushbutton to abort the delete operation. An existing action can be modified from the current actions by clicking the **Modify Action** button in the toolbar.

Note: The short-cut keyboard combinations for Cut, Copy and Paste operations are valid within the Animation Editor dialogs. Highlight part or all of a field and type <Ctrl>+X to cut the text or <Ctrl>+C to copy the text; insert the cursor at the desired dialog field and type <Ctrl>+V to paste the text. Since the cut and copy operations store the information in the Windows Clipboard, it may be pasted to another dialog or application.

View Mode

The list of runtime actions can be viewed in a number of ways, providing simple or comprehensive details as follows:

Select the **Large Icons** button to view details with large icons.

Select the **Small Icons** button to view details with normal icons.

Select the **List** button to view details as a list.

Select the **Details** button to view details as a list including runtime actions, trigger/event expression and access. The details can be sorted in ascending order by clicking once or in descending order by clicking twice, in the appropriate field.

Project

Graphical objects have no relevance at Project level as they cannot be referenced. Scripts can be applied to a project to manipulate points. These scripts are associated with events that occur throughout the operating session. A script is made up of one or more simple statements that together make script code.

Refer to the *Script Language Manual* for explicit details regarding the construction and syntax of script code. Chapter 10, Runtime Actions describes the creation of script code using the Script Editor.

The script is defined using the *Execute Script* entry in the Animation Editor list.

Page

Page scripts are concerned with manipulating points and graphical objects that are used or included within that page. Actions cannot refer to graphical objects that appear in other pages. In other words, page scripts are used to drive a number of actions on the occurrence of a particular event. An example of page script code is as follows:

```
REM ** move the car and transport **

IF start THEN
    Position = position – speed
ENFIF

REM ** if the car is at the start then reset the **
REM ** position ans reset the car colour **
IF position < 0THEN
    position = 800
    POLYGON_11.colour = dark_grey
ENDIF
REM setup the paint spray colour **
IF position < 300 || position > 400 && changepaint THEN
    IF paintblue THEN
      POLYGON_34.colour = dark_blue
  ENDIF
  IF paint green THEN
      POLYGON_34.colour = Dark_green
  ENDIF
    IF paintred THEN
      POLYGON_34.colour = red
  ENDIF
  IF paintpurple THEN
      POLYGON_34.colour = purple
  ENDIF
  IF paintyellow THEN
      POLYGON_34.colour = yellow
  ENDIF
  IF paintwhite THEN
      POLYGON_34.colour = white
  ENDIF
ENDIF
```

Refer to the *Script Language Manual* for explicit details regarding the construction and syntax of script code. 10.3 Runtime Actions describes the creation of script code using the Script Editor.

The script is defined using the *Execute Script* entry in the Animation Editor list.

Objects

One object or a selection of objects defined as a group are animated in a number of ways (refer to chapter 2, Graphics Editor for applicable objects):

- An object can be seen to be blinking.
- An object can be removed from the page.
- An object can change colour.
- A value associated with the object can be displayed.
- Text associated with the object can be displayed.
- An object can appear enabled for selection or disabled for selection.
- An object can move horizontally or vertically.
- An object can be flood-filled.
- An object can change its size, horizontally or vertically.
- An object can rotate.
- An object can have associated user interaction.
- An object can be displayed on the page.

However, it is not feasible for all the objects to be capable of all forms of animation. For instance, a toggle object can only be animated so that it is enabled or disabled, visible or invisible, whilst a text object can be resized, moved, change its colour, blink, rotate, await user interaction, be made visible or invisible, or display an associated value. A list of objects and their available animations is as follows:

Blink	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓						
Close page	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓				
Colour Change (Analogue)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓			✓	✓	✓	✓
Colour Change (Digital)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓			✓	✓	✓	✓
Display page	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓				
Display Value (Analog)	✓																		
Display Value (Digital)	✓																		
Display Value (Text)	✓																		
Edit point value (Analogue)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓				✓
Edit point value (Digital)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓				✓
Edit point value (Text)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓				✓
Enable/Disable	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓				
Execute script	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓				
Move (Horizontal)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Move (Vertical)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Percentage fill (Horizontal)				✓	✓	✓		✓	✓										
Resize (Height)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Resize (Width)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Rotate			✓	✓			✓	✓							✓				
Percentage fill (Vertical)				✓	✓	✓		✓	✓										
Visibility	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

A group object possesses the animation functions common to all objects within the group.

The ticks denote whether the animation function is available for the object. The blank cells denote the animation function is not available for the object. The icons within the table header denote the object created by that icon. Refer to chapter 2, Graphics Editor for further details.

In addition, an object can be animated in the form of a script. A script is made up of one or more statements. An example of object script code is as follows:

```
REM ** SET UP THE COLOUR FLAGS **
Paintblue = TRUE
paintgreen = FALSE
paintred = FALSE
paintpurple = FALSE
paintyellow = FALSE
paintwhite = FALSE
REM ** SET UP THE VALVE POSITION **
Bluevalve = TRUE
greenvalve = FALSE
redvalve = FALSE
Changepaint = TRUE
```

Refer to the *Script Language Manual* for full details regarding the construction and syntax of script code. The script is created by selecting the *Execute Script* entry in the Animation Editor list.

Chapter 10, Runtime Actions describes the application of object animations.

Printing the Animation Editor

Print Setup

The Animation Editor can be printed in the same way pages can. Before printing, ensure that the printer has been set up correctly. To check the printer settings, refer to chapter 3, Pages.

Print Preview

To preview the page before printing, select *Print Preview* from the *File* menu.

Refer to chapter 3, Pages regarding the use of the Print Preview display.

Printing

To print the contents of the Animation Editor, select the **Print** button from the toolbar.

Refer to chapter 3, Pages regarding the use of the Print dialog.

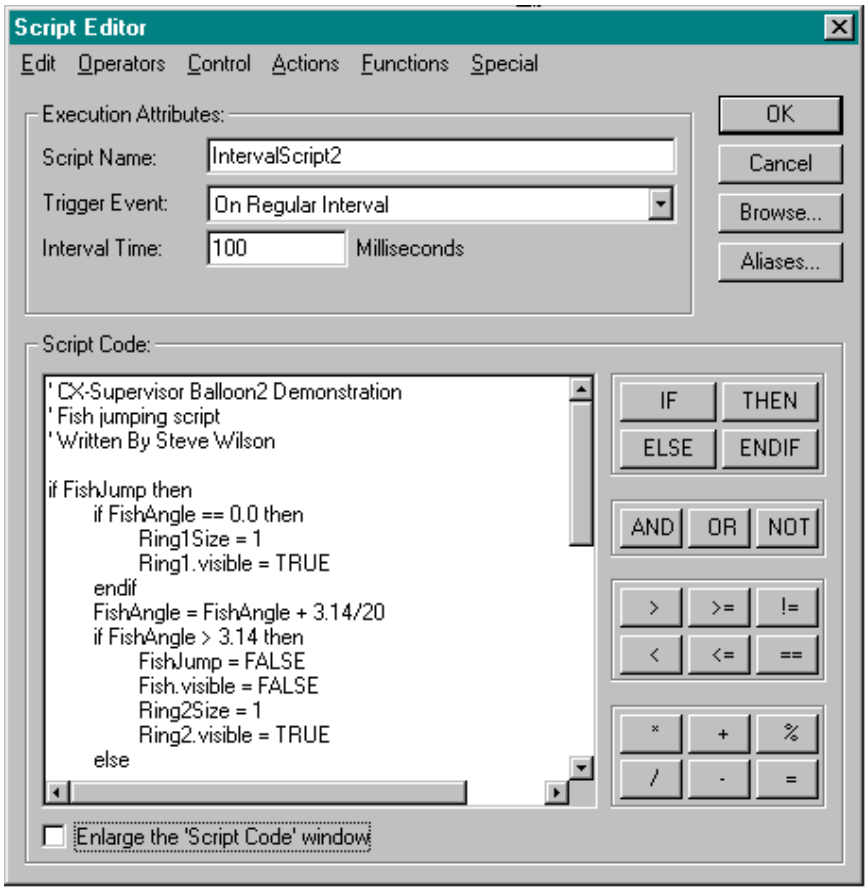
Runtime Actions

Script

A script, controlling the actions of an object, page or project can be created and updated using the Script Editor dialog.

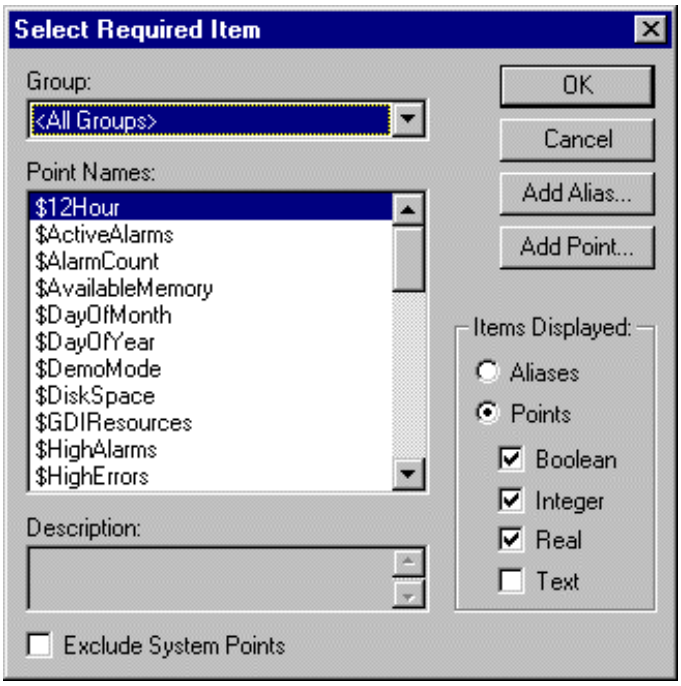
The Script Editor allows script code to be created or amended which carries out the mechanics of the animation operation. To access the Script Editor dialog to add an action, select *Execute Script* from the animation list and click on the **Add Action** button on the toolbar. To access the Script Editor to modify an action, select *Execute Script* from the animation list and click on the **Modify Action** button on the toolbar. Refer to chapter 10, Objects, for a list of the objects to which an Execute Script action is applicable. Page Animations and Project Animations may have an *Execute Script* action.

On selection of the *Execute Script* action, the Script Editor dialog is displayed:



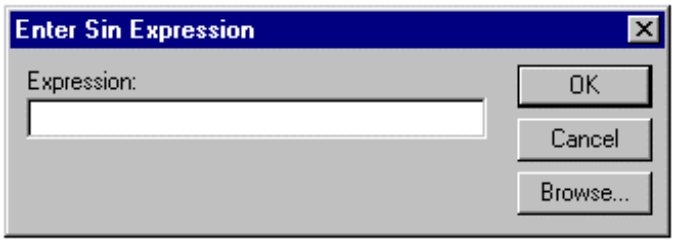
When creating the script choosing an action, function, etc. from the menu may require further information. This subsequent information is provided using some common dialogs: the Select Required Item dialog, the Simple Expression Entry dialog and the Object Selection dialog.

Use the Select Required Item dialog to 'pick' a point to associate with the current action. It is accessed by clicking the **Browse** pushbutton from the current dialog. This results in the Select Required Item dialog being displayed.



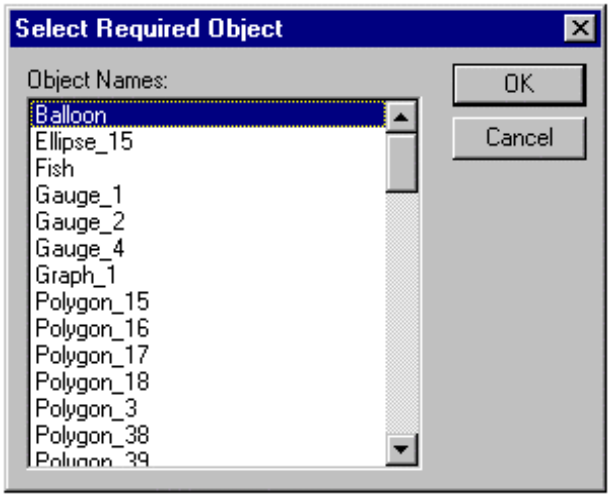
Only relevant points are listed in the *Point Names:* field. Select the desired point from the *Point Names:* list, and click the **OK** pushbutton. Clicking the **Cancel** pushbutton aborts the selection. To add a new point click the **Add Point** pushbutton; for details on adding a point refer to chapter 4, Points.

Use the Simple Expression Entry dialog to assign an expression to an action. It is accessed from an entry in the script code. This results in the Simple Expression Entry dialog being displayed:



Enter the expression in the *Expression:* field. The **Browse** pushbutton can be used to pick a valid point. Click the **OK** pushbutton to proceed, or the **Cancel** pushbutton to abort.

Use the Select Required Object dialog to assign an object to an action. It is accessed from an entry in the script code. This results in the Select Required Object dialog being displayed:



Select an object from the *Object Names:* field. Click the **OK** pushbutton to proceed, or the **Cancel** pushbutton to abort.

Note: The short-cut keyboard combinations for Cut, Copy and Paste operations are valid within the Script Editor. Highlight part or all of a field and type <Ctrl>+X to cut the text or <Ctrl>+C to copy the text; insert the cursor at the desired field and type <Ctrl>+V to paste the text. Since the cut and copy operations store the information in the Windows Clipboard, it may be pasted to another dialog or application.

Aliases

An alias definition can be provided to replace strings in scripts and expressions used throughout CX-Supervisor applications. An associated string replaces the alias when used in a script or expression. Select the **Aliases** pushbutton from the Script Editor dialog. The Alias Definitions dialog is displayed. Refer to chapter 7, Projects for more details on alias definitions.

Execution Attributes

The animation reacts to an event. A script can be associated with an event, depending on whether it is a project script, page script or object script.

For a project or page script, the following events trigger the execution of the script:

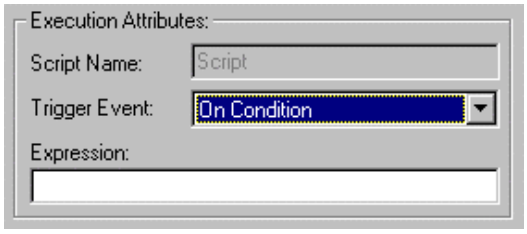
- On a condition, based on a regular expression.
- At a regular interval defined by an interval time.
- At the initialisation of the page or project.
- At the termination of the page or project.

For an object script, the following events trigger the script:

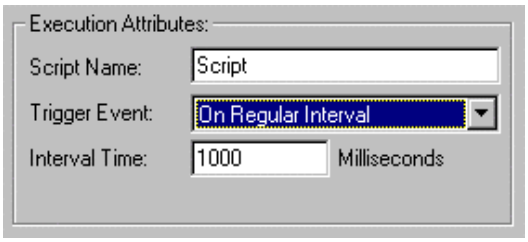
- Following the user clicking once on the left mouse button.
- On a condition, based on a regular expression.

To specify a trigger for the script, select an option from the *Trigger Event:* field.

Note: If *On condition* is specified, a valid relational expression is required in the *Expression:* field. The script is executed every time a variable included in the expression changes value and the result of the expression is 'TRUE'. For example, the expression *$Second* executes every second except when *$Second* is zero; whereas *$Second >= 0* executes every second. If an invalid expression is entered, an error message is displayed when the **OK** pushbutton is clicked.



Note: If *On Regular Interval* is specified, a valid interval is required in the *Interval Time:* field in units of milliseconds. The script is started at the interval specified by this period. If an invalid time is entered, an error message is displayed when the **OK** pushbutton is clicked.



Script Code

Script code is entered in the script code text field. To start a new line, press <Return>.

Refer to the *Script Language Manual* for explicit details regarding the construction and syntax of script code.

Expressions consist of operators and operands:

- Operators are relational, arithmetic, logical and include many functions.
- Operands are constants or point variables.

The script language can also contain Java and Visual Basic script. Refer to the *Script Language Manual* for details.

Scripts can be generated either by typing directly into the script code text field or by using the pull down menu commands. When using the pull down menu commands the user is assisted in the completion of the parameters to the command via a series of dialogs. The dialogs displayed vary according to the type of command being entered.

Points

A point may be inserted into the script code in a number of ways:

- Clicking the **Browse** pushbutton, picking the point off the list and clicking the **OK** pushbutton.
- Typing the name of the point

System points form part of the points list.

Undo Last Action

The last edit performed can be undone, if required, in a number of ways:

- Selecting *Undo* from the *Edit* menu.
- Pressing <Ctrl>+Z in the script code text field.

Cut to Clipboard

An area of script code can be moved to the Microsoft Windows Clipboard in a number of ways:

- Selecting the script code to cut, followed by *Cut* from the *Edit* menu.
- Selecting the script code to cut in the script code text field and pressing <Ctrl>+X.

Copy to Clipboard

An area of script code can be copied to the Clipboard, if required, in a number of ways:

- Selecting the script code to copy, followed by *Copy* from the *Edit* menu.
- Selecting the script code to copy from the script code text field and pressing <Ctrl>+C.

Paste from Clipboard

An area of script code can be copied from the Clipboard, if required, in a number of ways:

- Placing the I-beam cursor at the desired point in the script code field, followed by Paste from the Edit menu.
- Placing the I-beam cursor at the desired point in the script code field and then pressing <Ctrl>+V.

Insert Tab Code

A tab character can be inserted into the script code, if required, in a number of ways:

- Placing the I-beam cursor at the desired point in the script code field, followed by Tab from the Edit menu.
- Placing the I-beam cursor at the desired point in the script code field and then pressing <Ctrl>+<Tab>.

Finding and Replacing Text

Text can be found and replaced within the current script as follows:

- Select Find/Replace from the Edit menu and type appropriate text in the Find what and Replace with fields. Press the Find pushbutton to initiate the search and <Return> to execute text replacement.

Clear Script Code Field

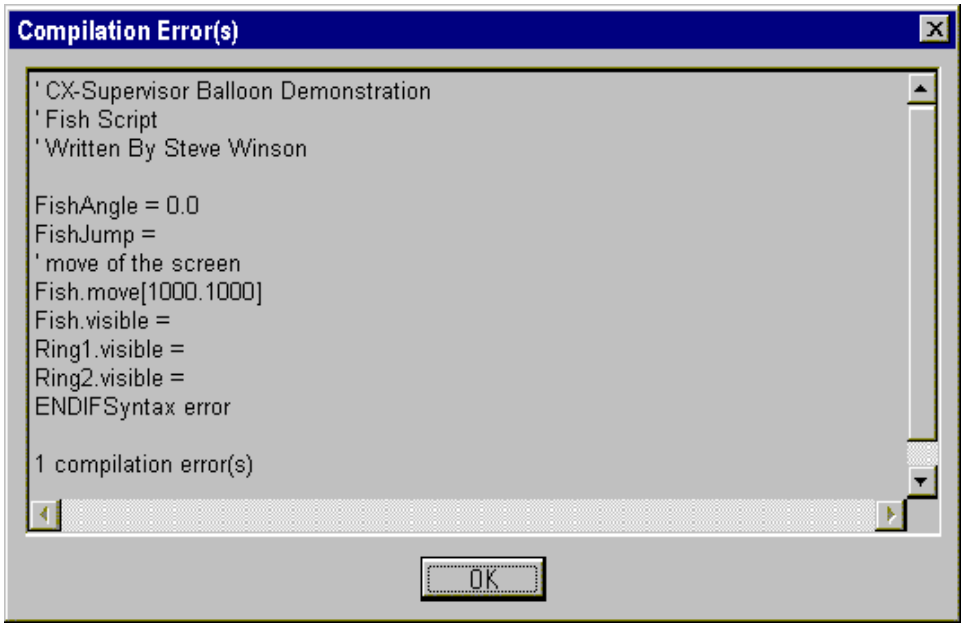
The script code field can be cleared, if required:

- Selecting Clear All from the Edit menu.

Script Completion

Once script entry or script modification is complete, click the **OK** pushbutton. To abort the Script Editor prior to completing the task, click the **Cancel** pushbutton.

If there is an error in the script, the Compilation Error(s) dialog is displayed.



In this example, the error is caused by a spurious 'ENDIF'.

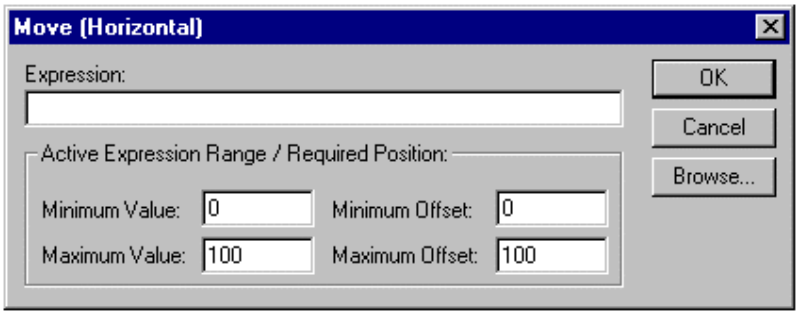
This dialog informs the user where an error has occurred and its type. If necessary, use the scroll bars to see the whole error message. Click the **OK** pushbutton to remove the Compilation Error(s) dialog and return to the Script Editor to fix the error.

Horizontal Move

Objects can be animated by moving either left or right. This is specified using the Move (Horizontal) dialog.

To access the Move (Horizontal) dialog to add an action, select *Move (Horizontal)* from the animation list and click the **Add Action** button on the toolbar. To access the Move (Horizontal) dialog to modify an action, select *Move (Horizontal)* from the animation list and click the **Modify Action** button on the toolbar. Refer to chapter 10, Objects, for a list of the objects to which this action is applicable.

On selection of the *Move (Horizontal)* action, the Move (Horizontal) dialog is displayed:



To define the animation, an expression consisting of a number of operators and operands (which may be based on the status of a point) must be entered in the *Expression:* field. The boundaries in which the object moves are inserted into the *Active Expression Range/Required Position:* fields. The *Maximum Offset* specifies the number of pixels to the right (from its initial position) that the object moves when the result of the expression reaches the *Maximum Value*. The *Minimum Offset* specifies the number of pixels to the left (from its initial position) that the object moves, when the result of the expression reaches the *Minimum Value.* A value within the maximum and minimum values results in a proportionate movement between the left and right positions.

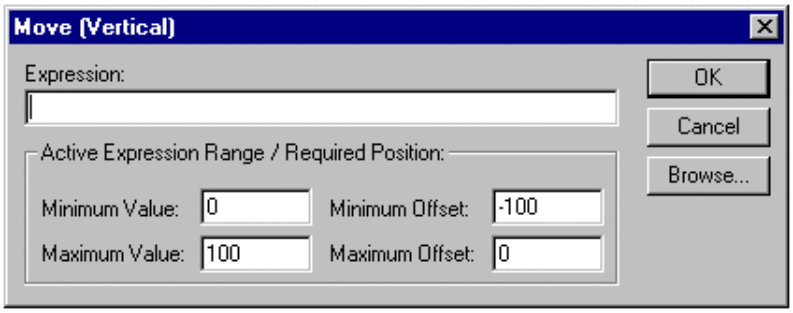
To abort the Horizontal Move definition, click the **Cancel** pushbutton. By clicking the **Browse** pushbutton, a point may be directly specified, as described in chapter 10, Runtime Actions. Once completed, click the **OK** pushbutton. If invalid data has been inserted into any field, a descriptive error message is displayed.

Vertical Move

Objects can be animated by moving either up or down. This can be specified via the Move (Vertical) dialog.

To access the Move (Vertical) dialog to add an action, select *Move (Vertical)* from the animation list and click the **Add Action** button on the toolbar. To access the Move (Vertical) dialog to modify an action, select *Move (Vertical)* from the animation list and click the **Modify Action** button on the toolbar. Refer to chapter 10, Objects, for a list of the objects to which this action is applicable.

On selection of the *Move (Vertical)* action, the Move (Vertical) dialog is displayed:



To define the animation, an expression based on the status of a point must be entered in the *Expression:* field. The boundaries in which the object moves are inserted into the *Active Expression Range/Required Position:* fields. The *Maximum Offset* specifies the number of pixels upwards (from its initial position) that the object moves, when the result of the expression reaches the *Maximum Value.* The *Minimum Offset* specifies the number of pixels downwards (from its initial position) that the object moves, when the result of the expression reaches the *Minimum Value.* A value within the maximum and minimum values results in a proportionate movement between the top and bottom positions.

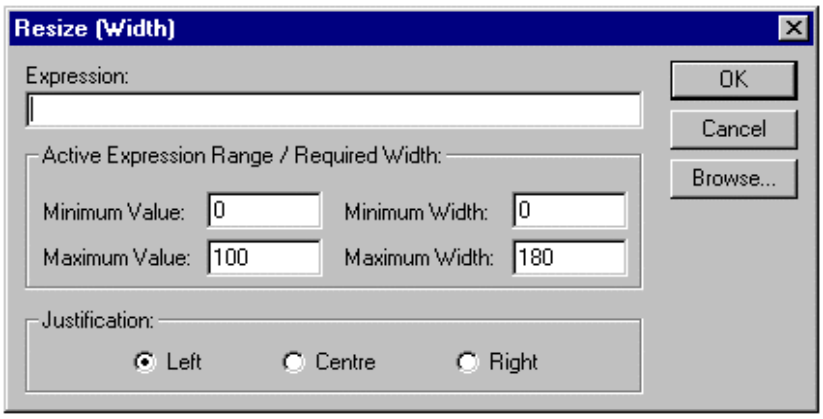
To abort the Vertical Move definition, click the **Cancel** pushbutton. By clicking the **Browse** pushbutton, a point may be directly specified, as described in chapter 10, Runtime Actions. Once completed, click the **OK** pushbutton. If invalid data has been inserted into any field, a descriptive error message is displayed.

Resize Width

Objects can be animated by shrinking or expanding horizontally. This can be specified via the Resize (Width) dialog.

To access the Resize (Width) dialog to add an action, select *Resize (Width)* from the animation list and click the **Add Action** button on the toolbar. To access the Resize (Width) dialog to modify an action, select *Resize (Width)* from the animation list and click the **Modify Action** button on the toolbar. Refer to chapter 10, Object, for a list of the objects to which this action is applicable.

On selection of the *Resize (Width)* action, the Resize (Width) dialog is displayed:



To define the animation, an expression consisting of a number of operators and operands (which may be based on the status of a point) must be entered in the ***Expression:*** field.

The boundaries in which the object moves are inserted into the *Active Expression Range/Required Width:* fields. The *Maximum Width* specifies the required width in pixels of the object when the result of the expression reaches the *Maximum Value*. The *Minimum Width* specifies the required width in pixels of the object when the result of the expression reaches the *Minimum Value***.** A value within the maximum and minimum values results in a proportionate width between the minimum and maximum widths. The resizing also requires an anchor and direction in which to stretch or shrink. This can be specified as the left of the object, right of the object or centrally to the object, by selecting the appropriate *Justification:* setting.

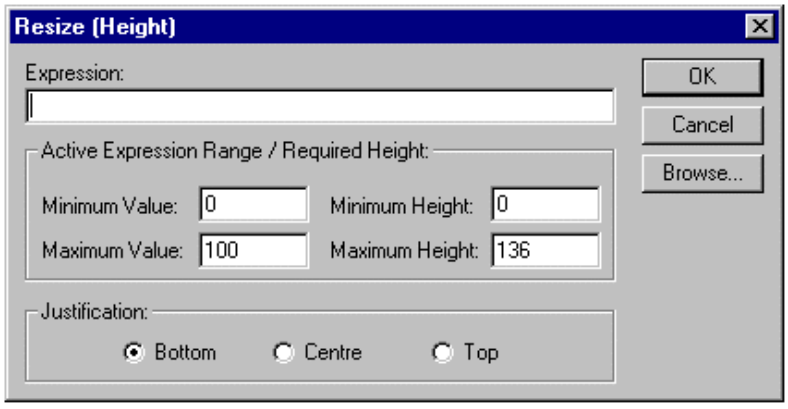
To abort the Resize Width definition, click the **Cancel** pushbutton. By clicking the **Browse** pushbutton, a point may be directly specified, as described in chapter 10, Runtime Actions. Once completed, click the **OK** pushbutton. If invalid data has been inserted into any field, a descriptive error message is displayed.

Resize Height

Objects can be animated by shrinking or expanding vertically. This can be specified via the Resize (Height) dialog.

To access the Resize (Height) dialog to add an action, select *Resize (Height)* from the animation list and click the **Add Action** button on the toolbar. To access the Resize (Height) dialog to modify an action, select *Resize (Height)* from the animation list and click the **Modify Action** button on the toolbar. Refer to chapter 10, Objects, for a list of the objects to which this action is applicable.

On selection of the *Resize (Height)* action, the Resize (Height) dialog is displayed:



To define the animation, an expression consisting of a number of operators and operands (which may be based on the status of a point) must be entered in the *Expression:* field.

The boundaries in which the object moves are inserted into the *Active Expression Range/Required Height:* fields. The *Maximum Height* specifies the required height in pixels of the object when the result of the expression reaches the *Maximum Value*. The *Minimum Height* specifies the required height in pixels of the object when the result of the expression reaches the *Minimum Value.* A value within the maximum and minimum values results in a proportionate height between the minimum and maximum heights The resizing also requires an anchor and direction in which to stretch or shrink.

This can be specified as the top of the object, bottom of the object or centrally to the object, by selecting the appropriate *Justification:* setting.

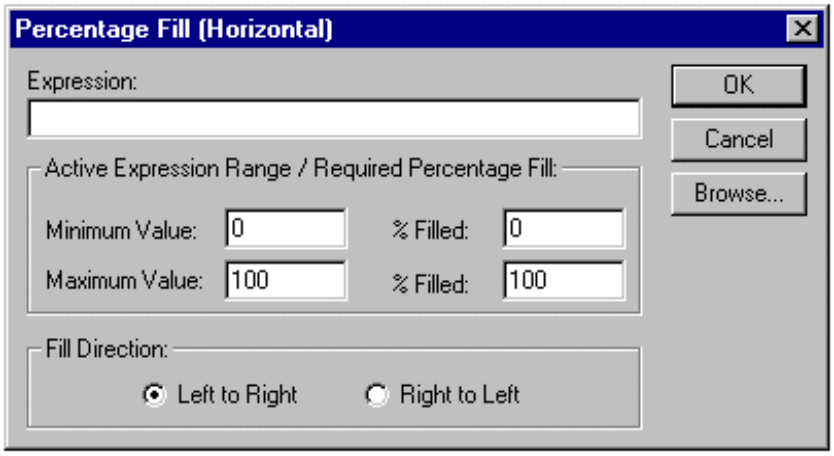
To abort the Resize Height definition, click the **Cancel** pushbutton. By clicking the **Browse** pushbutton, a point may be directly specified, as described in chapter 10, Runtime Actions. Once completed, click the **OK** pushbutton. If invalid data has been inserted into any field, a descriptive error message is displayed.

Horizontal Percentage Fill

Closed objects can be flood-filled along a horizontal axis. This can be specified via the Percentage Fill (Horizontal) dialog.

To access the Percentage Fill (Horizontal) dialog to add an action, select *Percentage Fill (Horizontal)* from the animation list and click the **Add Action** button on the toolbar. To access the Percentage Fill (Horizontal) dialog to modify an action, select *Percentage Fill (Horizontal)* from the animation list and click the **Modify Action** button on the toolbar. Refer to chapter 10, Objects, for a list of the objects to which this action is applicable.

On selection of the *Percentage Fill (Horizontal)* action, the Percentage Fill (Horizontal) dialog is displayed:



To define the animation, an expression consisting of a number of operators and operands (which may be based on the status of a point) must be entered in the *Expression:* field.

The boundaries associated with the percentage fill are inserted into the *Active Expression Range/Required Percentage Fill:* fields. The *% Filled* fields specify the percentage of the object to fill when the expression reaches its maximum and minimum values. The flood-fill also requires a direction. This can be specified as left to right or right to left, by selecting the appropriate *Fill Direction:* setting.

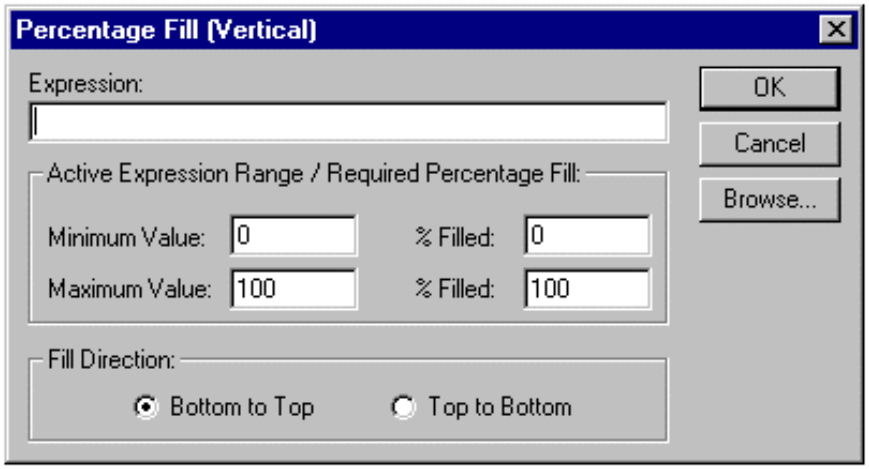
To abort the Horizontal Percentage Fill definition, click the **Cancel** pushbutton. By clicking the **Browse** pushbutton, a point may be directly specified, as described in chapter 10, Runtime Actions. Once completed, click the **OK** pushbutton. If invalid data has been inserted into any field, a descriptive error message is displayed.

Vertical Percentage Fill

Closed objects can be flood-filled along a vertical axis. This can be specified via the Percentage Fill (Vertical) dialog.

To access the Percentage Fill (Vertical) dialog to add an action, select *Percentage Fill (Vertical)* from the animation list and click the **Add Action** button on the toolbar. To access the Percentage Fill (Vertical) dialog to modify an action, select *Percentage Fill (Vertical)* from the animation list and click the **Modify Action** button on the toolbar. Refer to chapter 10, Objects, for a list of the objects to which this action is applicable.

On selection of the *Percentage Fill (Vertical)* action, the Percentage Fill (Vertical) dialog is displayed:



To define the animation, an expression consisting of a number of operators and operands, which may be based on the status of a point, must be entered in the *Expression:* field.

The boundaries in which the object moves are inserted into the *Active Expression Range/Required Percentage Fill:* fields. The *% Filled* fields specify the percentage of the object to fill when the expression reaches its maximum and minimum values. The flood-fill also requires a direction. This can be specified as top to bottom or bottom to top, by selecting the appropriate *Fill Direction:* setting.

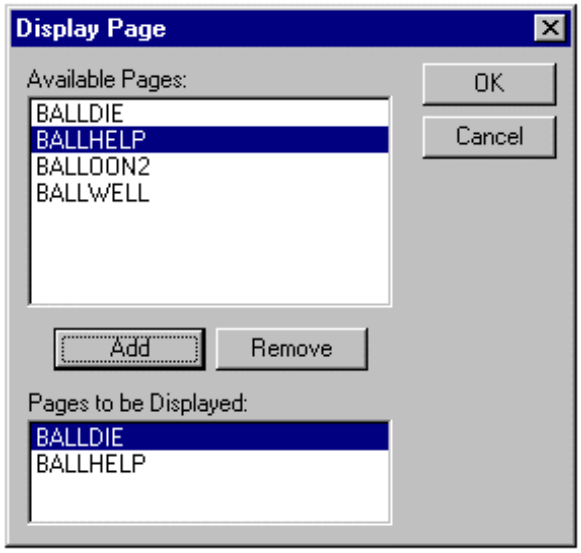
To abort the Vertical Percentage Fill definition, click the **Cancel** pushbutton. By clicking the **Browse** pushbutton, a point may be directly specified, as described in chapter 10, Runtime Actions. Once completed, click the **OK** pushbutton. If invalid data has been inserted into any field, a descriptive error message is displayed.

Show Page

CX-Supervisor allows the specification of pages within a project for display. This is set up using the Display Page dialog.

To access the Display Page dialog to add an action, select *Display Page* from the animation list and click the **Add Action** button on the toolbar. To access the Display Page dialog to modify an action, select *Display Page* from the animation list and click the **Modify Action** button on the toolbar. Refer to chapter 10, Objects, for a list of the objects to which this action is applicable.

On selection of the *Display Page* action, the Display Page dialog is displayed:



To specify a page for display, select a page from the *Available Pages:* list and click on the **Add** pushbutton. The page entry now appears in the *Pages to be Displayed:* list. More than one page can be selected for display. If a selected page is no longer required, select the entry from the *Pages to be Displayed:* list, and click on the **Remove** pushbutton.

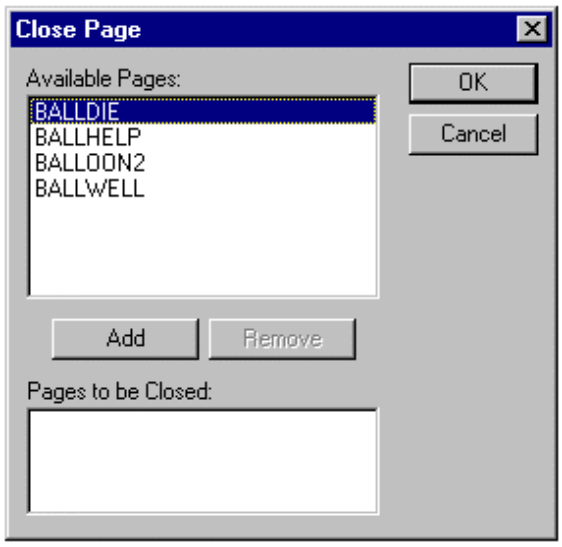
Once completed, click the **OK** pushbutton. To abort the Display Page edit, click the **Cancel** pushbutton.

Close Page

CX-Supervisor allows the specification of pages within a project to be removed from the display. This is set up using the Close Page dialog.

To access the Close Page dialog, select *Close Page* from the animation list and click the **Add Action** button on the toolbar. To access the Close Page dialog to modify an action, select *Close Page* from the animation list and click the **Modify Action** button on the toolbar. Refer to chapter 10, Objects, for a list of the objects to which this action is applicable.

On selection of the *Close Page* action, the Close Page dialog is displayed:



To specify a page for removal, select a page from the *Available Pages:* list and click on the **Add** pushbutton. The page now appears in the *Pages to be Closed:* list. Multiple pages can be selected for removal. If a selected page for removal is no longer required for that purpose, select the page from the *Pages to be Closed:* list, and click on the **Remove** pushbutton.

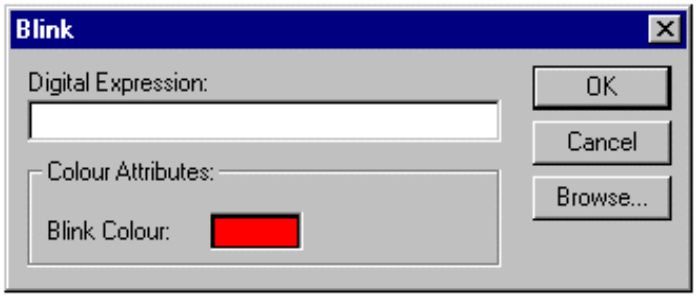
Once completed, click the **OK** pushbutton. To abort the Close Page edit, click the **Cancel** pushbutton.

Blink

Objects can be animated so that they blink. This is achieved using the Blink dialog.

To access the Blink dialog to add an action, select *Blink* from the animation list and click the **Add Action** button on the toolbar. To access Blink dialog to modify an action, select *Blink* from the animation list and click the **Modify Action** button on the toolbar. Refer to chapter 10, Objects, for a list of the objects to which this action is applicable.

On selection of the *Blink* action, the Blink dialog is displayed:



Enter a Boolean expression in the *Digital Expression:* field. Arithmetic, logical and relational expressions may also be entered as long as the result of the expression is zero or non-zero, i.e. the result equates to 'TRUE' or 'FALSE'. When the result of the expression is 'TRUE' the object(s) blinks.

To select a colour for the blink animation, click in the *Blink Colour:* field. The Colour Palette dialog is displayed so that a colour can be supplied to the object. The object blinks between its current colour and the chosen blink colour. The Colour Palette dialog is described in chapter 10, Common Colour Palette.

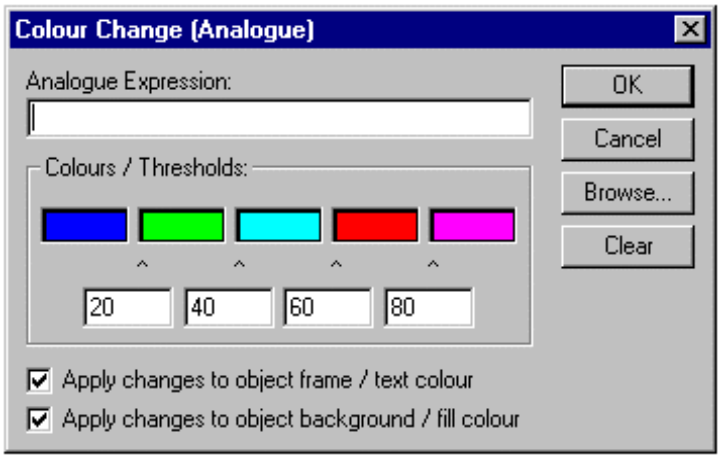
Once completed, click the **OK** pushbutton. To abort the Blink operation, click the **Cancel** pushbutton. By clicking the **Browse** pushbutton, a point may be directly specified, as described in chapter 10, Runtime Actions.

Colour Change (Analogue)

Objects can be animated so they change between a variety of colours at a variety of intervals. This is achieved using the Colour Change (Analogue) dialog.

To access the Colour Change (Analogue) dialog to add an action, select *Colour Change (Analogue)* from the animation list and click the **Add Action** button on the toolbar. To access the Colour Change (Analogue) dialog to modify an action, select *Colour Change (Analogue)* from the animation list and click the **Modify Action** button on the toolbar. Refer to chapter 10, Objects, for a list of the objects to which this action is applicable.

On selection of the *Colour Change (Analogue)* action, the Colour Change (Analogue) dialog is displayed:



Enter an expression in the *Analogue Expression:* field which results in a real or integer value. Only when the result of the expression reaches a value identified as a threshold does the object change colour.

The object can have one of five colours depending on the value of the expression. It changes between these colours at the thresholds. For example, choose the colour blue for the first colour, and the value 20 for the first threshold. The object then changes to blue until the value reaches 20, at which point it changes to the second colour. To apply the change to the frame of the object, select the *Apply colour changes to object frame* setting. To apply the change to the object background, select the *Apply colour changes to object background* setting.

On selection of a colour in the Colour Change (Analogue) dialog, the Colour Palette dialog is displayed. The Colour Palette dialog is described in chapter 10, Common Colour Patette.

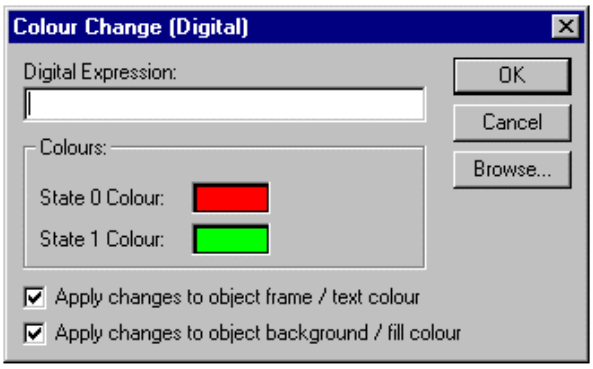
Click the **Clear** pushbutton to reset all colours and re-start. To abort the Colour Change (Analogue) edit, click the **Cancel** pushbutton. By clicking the **Browse** pushbutton, a point may be directly specified, as described in chapter 10, Runtime Actions. Once completed, click the **OK** pushbutton. If invalid data has been inserted into any field, a descriptive error message is displayed.

Colour Change (Digital)

Objects can be animated so they change between two colours. This is achieved using the Colour Change (Digital) dialog.

To access the Colour Change (Digital) dialog to add an action, select *Colour Change (Digital)* from the animation list and click the **Add Action** button on the toolbar. To access Colour Change (Digital) dialog to modify an action, select *Colour Change (Digital)* from the animation list and click the **Modify Action** button on the toolbar. For a list of the objects to which this action is applicable refer to chapter 10, Objects.

On selection of the *Colour Change (Digital)* action, the Colour Change (Digital) dialog is displayed:



To specify a change in an object's colour, enter a Boolean expression in the *Digital Expression:* field. Non-Boolean expressions may be entered as long as the result is 'TRUE' or 'FALSE'.

The colours are specified in the *Colour Attributes:* fields for Boolean State 0 and Boolean State 1. To apply the change to the frame of the object, select the *Apply colour changes to object frame* setting. To apply the change to the object background, select the *Apply colour changes to object background* setting.

On selection of a colour in the Colour Change (Digital) dialog, the Colour Palette dialog is displayed. The Colour Palette dialog is described in chapter 10, Common Colour Palette.

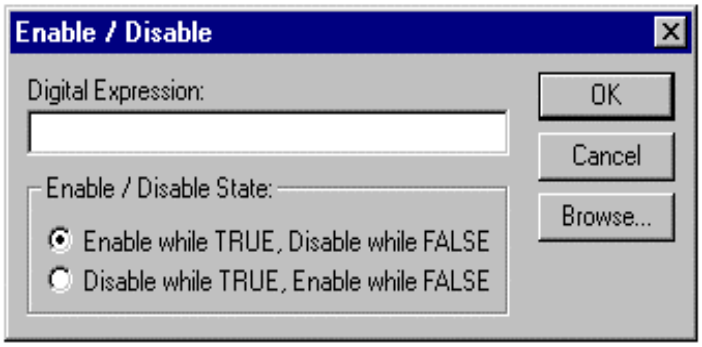
To abort the Colour Change (Digital) edit, click the **Cancel** pushbutton. By clicking the **Browse** pushbutton, a point may be directly specified, as described in chapter 10, Runtime Actions. Once completed, click the **OK** pushbutton. If invalid data has been inserted into any field, a descriptive error message is displayed.

Enable/Disable

Objects can be enabled or disabled. This is achieved using the Enable/Disable dialog.

To access the Enable/Disable dialog to add an action, select *Enable/Disable* from the animation list and click the **Add Action** button on the toolbar. To access the Enable/Disable dialog to modify an action, select *Enable/Disable* from the animation list and click the **Modify Action** button on the toolbar. For a list of the objects to which this action is applicable refer to chapter 10, Objects.

On selection of the *Enable/Disable* action, the Enable/Disable dialog is displayed:



To specify a change in the enabled/disabled state of an object, enter a Boolean expression in the *Digital Expression:* field. Non-Boolean expressions may be entered as long as the result is 'TRUE' or 'FALSE'. Whether the object is enabled or disabled when the expression is 'TRUE' is chosen with the **Enable/Disable State** settings.

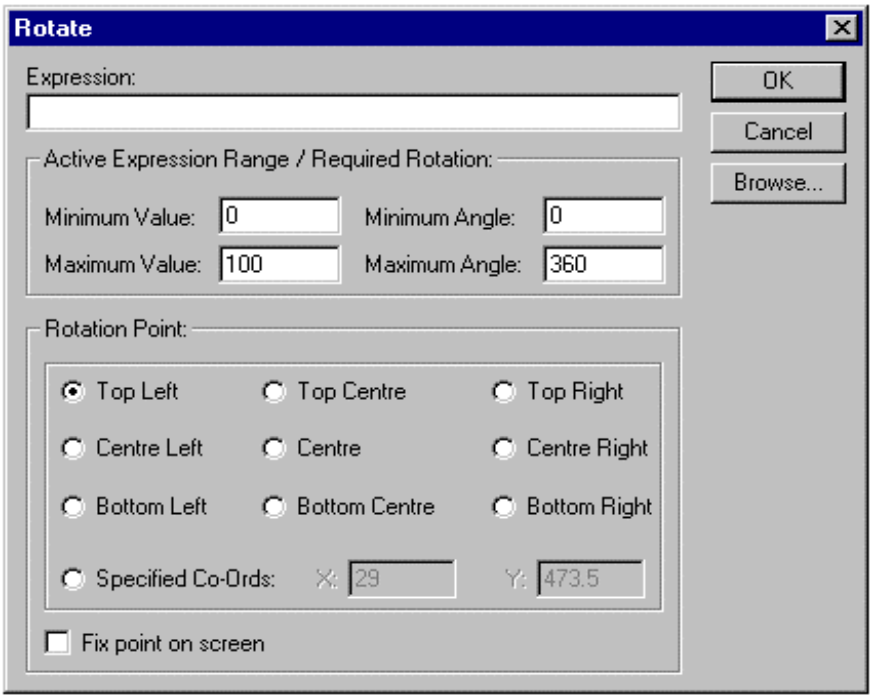
Once completed, click the **OK** pushbutton. To abort the **Enable/Disable** operation, click the **Cancel** pushbutton. If invalid data has been inserted into any field, a descriptive error message is displayed. By clicking the **Browse** pushbutton, a point may be directly specified, as described in chapter 10, Runtime Actions.

Rotate

An object can be rotated about its centre. Specify this using the Rotate dialog.

To access the Rotate dialog to add an action, select *Rotate* from the animation list and click the **Add Action** button on the toolbar. To access the Rotate dialog to modify an action, select *Rotate* from the animation list and click the **Modify Action** button on the toolbar. For a list of the objects to which this action is applicable refer to chapter 10, Objects.

On selection of the *Rotate* action, the Rotate dialog is displayed:



Enter an arithmetic expression in the *Expression:* field. The constraints of the rotation animation are specified in the *Active Expression Range/Required Rotation:* fields. Rotation is clockwise and the angle is specified in degrees..

Enabling the *Fix point on screen* option ensures that the rotation point remains at the same location even if the object moves.

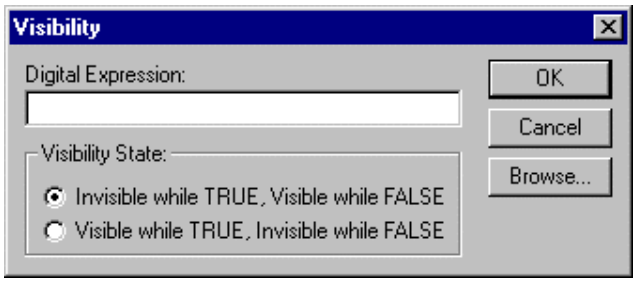
To abort the Rotate edit, click the **Cancel** pushbutton. By clicking the **Browse** pushbutton, a point may be directly specified, as described in chapter 10, Runtime Actions. completed, click the **OK** pushbutton. If invalid data has been inserted into any field, a descriptive error message is displayed.

Visibility

Objects can be rendered visible or invisible. Specify this using the Visibility dialog.

To access the Visibility dialog to add an action, select *Visibility* from the animation list and click the **Add Action** button on the toolbar. To access the Visibility dialog to modify an action, select *Visibility* from the animation list and click the **Modify Action** button on the toolbar. For a list of the objects to which this action is applicable refer to chapter 10, Objects.

On execution of the *Visibility* action, the Visibility dialog is displayed:



To specify a change in an objects' visibility, enter a Boolean expression in the *Digital Expression:* field. Non-Boolean expressions may be entered as long as the result is 'TRUE' or 'FALSE'. Whether the object is rendered visible or invisible when the expression is 'TRUE' is specified with the *Visibility State* settings.

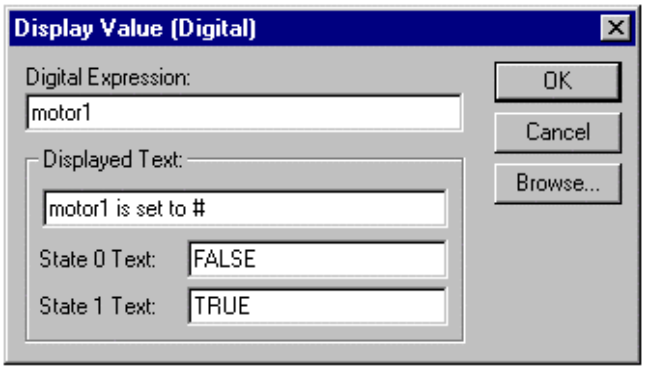
To abort the Visibility edit, click the **Cancel** pushbutton. By clicking the **Browse** pushbutton, a point may be directly specified, as described in chapter 10, Runtime Actions. Once completed, click the **OK** pushbutton. If invalid data has been inserted into any field, a descriptive error message is displayed.

Display Value (Digital)

The state of a Boolean point may be displayed using the Display Value (Digital) dialog.

To access the Display Value (Digital) dialog to add an action, select *Display Status Text* from the animation list and click the **Add Action** button on the toolbar. To access the Display Value (Digital) dialog to modify an action, select *Display Status Text* from the animation list and click the **Modify Action** button on the toolbar. For a list of the objects to which this action is applicable refer to chapter 10, Objects.

On selection of the *Display Value (Digital)* action, the Display Value (Digital) dialog is displayed:



An expression based on Boolean point must be entered. This expression is typed into the *Digital Expression:* field. A text string to coincide with the display of a Boolean value can be entered in the *Displayed Text:* field. The position of the displayed value within the text field is specified by entering a '*#*' character into the *Displayed Text:* field.

Note: To include a '#' character as part of the text, insert it as an escape character. For example, to display 'Box # 1' type 'Box \# #'. Only hashes to be displayed to the left of the # required for value display need escape characters, as the first hash without a meta character is taken to be the point at which the value should be displayed.

Text for Boolean State 0 and Boolean State 1 are entered in the *State 0 Text:* field and *State 1 Text:* field.

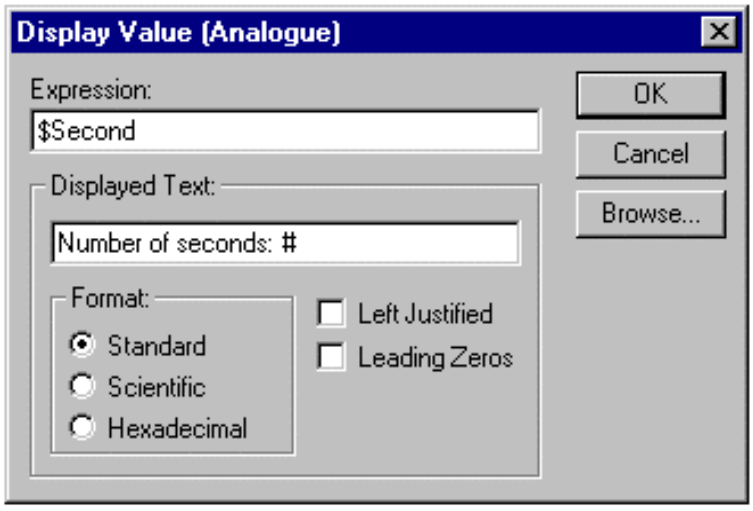
To abort the Display Status Text edit, click the **Cancel** pushbutton. By clicking the **Browse** pushbutton, a point may be directly specified, as described in chapter 10, Runtime Actions. Once completed, click the **OK** pushbutton. If invalid data has been inserted into any field, a descriptive error message is displayed.

Display Value (Analogue)

The state of a Real or Integer point may be displayed using the Display Value (Analogue) dialog.

To access the Display Value (Analogue) dialog to add an action, select *Display Value* from the animation list and click the **Add Action** button on the toolbar. To access the Display Value (Analogue) dialog to modify an action, select *Display Value* from the animation list and click the **Modify Action** button on the toolbar. For a list of the objects to which this action is applicable refer to chapter 10, Objects.

On selection of the *Display Value* action, the Display Value (Analogue) dialog is displayed:



An expression based on Real or Integer point must be entered. This expression is typed into the *Expression:* field. A text string to coincide with the display of a Real or Integer value can be entered in the *Displayed Text* field (this field can be updated using the Graphics Editor). The position of the displayed value within the text field is specified by entering a *"#"* character into the *Displayed Text:* field. The value can be displayed in its decimal form, in scientific notation, or in hexadecimal, by selecting a *Format:* settings.

The number of decimal places displayed can be specified by adding a "#" character for each required place after a decimal point, e.g. #.## indicates 2 decimal places.

The text can also be left justified by setting the *Left Justified* setting.

Note: To include a '#' character as part of the text, insert it as an escape character. For example, to display 'Box # 1' type 'Box \# #'. Only hashes typed to the left of the # required for value display need escape characters, since the first hash without an escape character is taken to be the point at which the value should be displayed.

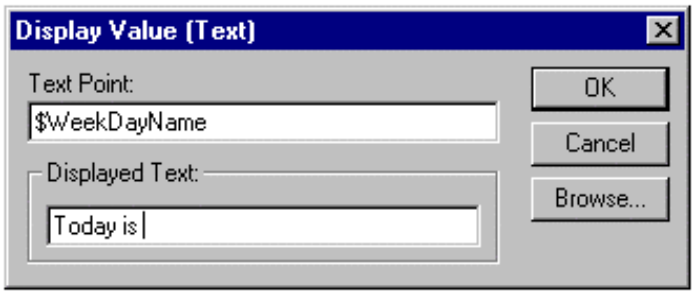
To abort the Display Value edit, click the **Cancel** pushbutton. By clicking the **Browse** pushbutton, a point may be directly specified, as described in chapter 10, Runtime Actions. Once completed, click the **OK** pushbutton. If invalid data has been inserted into any field, a descriptive error message is displayed.

Display Value (Text)

Text may be displayed using the Display Value (Text) dialog.

To access the Display Value (Text) dialog to add an action, select *Display Text Point* from the animation list and click the **Add Action** button on the toolbar. To access the Display Value (Text) dialog to modify an action, select *Display Text Point* from the animation list and click the **Modify Action** button on the toolbar. For a list of the objects to which this action is applicable refer to chapter 10, Objects.

On selection of the *Display Text Point* action, the Display Value (Text) dialog is displayed:



An expression based on a text point must be entered. This expression is typed into the *Text Point:* field. A text string to be displayed can be entered in the *Displayed Text:* field (this field can be updated using the Graphics Editor). The position of the displayed text within the text field is specified by entering a *"#"* character into the *Displayed Text:* field.

Note: To include a '#' character as part of the text, insert it as an escape character. For example, to display 'Box # 1' type 'Box \# #'. Only hashes typed to the left of the # required for value display need escape characters, since the first hash without an escape character is taken to be the point at which the value should be displayed.

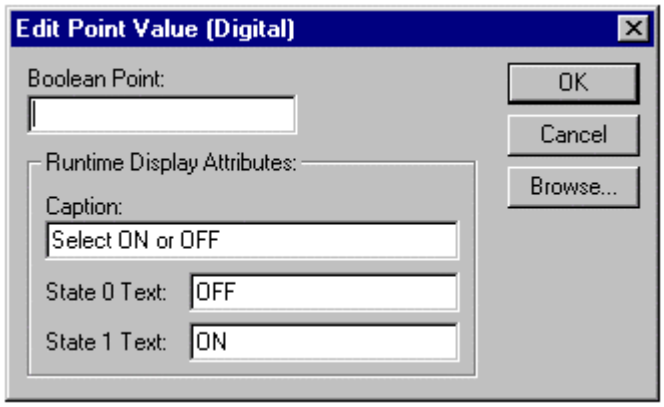
To abort the Display Text Value edit, click the **Cancel** pushbutton. By clicking the **Browse** pushbutton, a point may be directly specified, as described in chapter 10, Runtime Actions. Once completed, click the **OK** pushbutton. If invalid data has been inserted into any field, a descriptive error message is displayed.

Edit Point Value (Digital)

The value of a Boolean point may be issued to the user for amendment during runtime, defined using the User Input (Digital) dialog.

To access the **User Input (Digital)** dialog to add an action, select *Edit Point Value (Digital)* from the animation list and click the **Add Action** button on the toolbar. To access the User Input (Digital) dialog to modify an action, select *Edit Point Value (Digital)* from the animation list and click the **Modify Action** button on the toolbar. For a list of the objects to which this action is applicable refer to chapter 10, Objects.

On selection of the *Edit Point Value (Digital)* action, the User Input (Digital) dialog is displayed:



A Boolean point must be entered. This is typed into the *Boolean Point:* field. A text string to use as the caption of a user dialog can be entered in the *Caption:* field. The range of input for the value, and the representations of Boolean State 0 and Boolean State 1 are specified in the *State 0 Text:* field and *State 1 Text:* field.

To abort the Edit Point Value (Digital) edit, click the **Cancel** pushbutton. By clicking the **Browse** pushbutton, a point may be directly specified, as described in chapter 10, Runtime Actions. Once completed, click the **OK** pushbutton. If invalid data has been inserted into any field, a descriptive error message is displayed.

During runtime, selecting the user input object by clicking the left mouse button results in the runtime User Input (Digital) dialog being displayed, based on the contents of the development version.

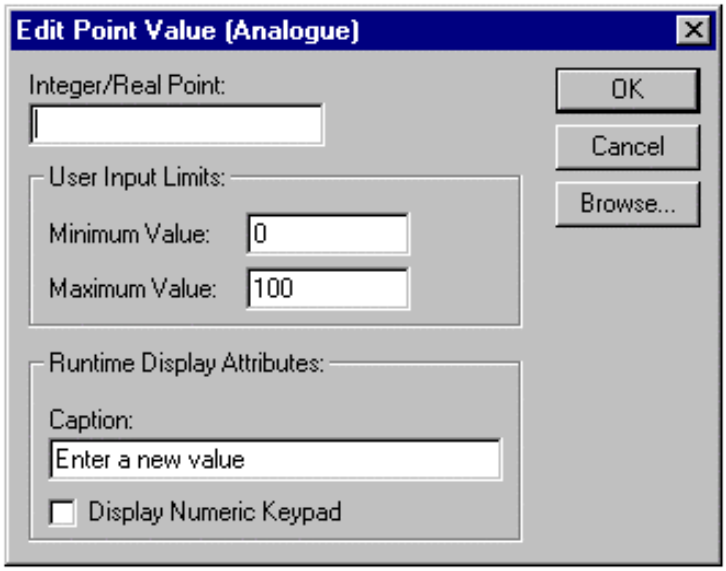
The user is provided with an instruction, based on the *Runtime Display Attributes:* field (in this example 'Select New State'), and *On* and *Off settings*, based on the *State 0 Text:* and *State 1 Text:* fields. The user clicks the **Cancel** pushbutton to abort the operation.

Edit Point Value (Analogue)

The value of a Real or Integer point may be issued to the user for amendment during runtime, defined using the User Input (Analogue) dialog.

To access the User Input (Analogue) dialog to add an action, select *Edit Point Value (Analogue)* from the animation list and click the **Add Action** button on the toolbar. To access the User Input (Analogue) dialog to modify an action, select *Edit Point Value (Analogue)* from the animation list and click the **Modify Action** button on the toolbar. For a list of the objects to which this action is applicable refer to chapter 10, Objects.

On selection of the *Edit Point Value (Analogue)* action, the User Input (Analogue) dialog is displayed:

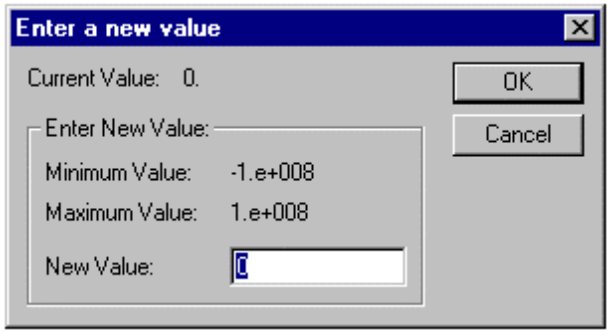


A Real or Integer point must be entered. This is typed into the *Integer/Real Point:* field. A text string for the caption of a user dialog can be entered in the *Runtime Display Attributes:* field. The limits imposed on the user for the value of the input are specified in the *User Input Limits:* fields.

The *Display Numeric Keypad* option is useful if the runtime system does not have a keyboard, i.e. it is controlled by a touch screen or tracker ball. When a value is edited, a Numeric Keypad dialog is displayed which allows editing by clicking on screen.

To abort the Edit Point Value (Analogue) edit, click the **Cancel** pushbutton. By clicking the **Browse** pushbutton, a point may be directly specified, as described in chapter 10, Runtime Actions. Once completed, click the **OK** pushbutton. If invalid data has been inserted into any field, a descriptive error message is displayed.

During runtime, selecting the user input object by clicking the left mouse button results in the runtime User Input (Analogue) dialog being displayed, based on the contents of the development version.



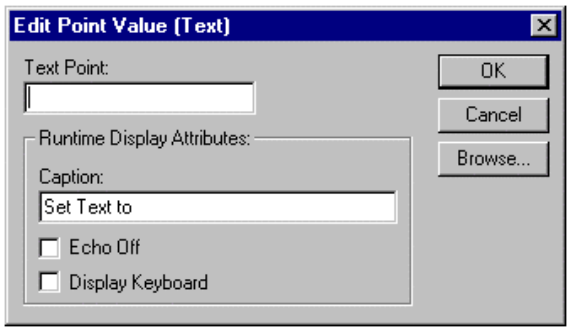
CX-Supervisor provides an instruction based on the *Runtime Display Attributes:* field, the minimum and maximum values allowed, based on the *User Input Limits:* fields, and a *New Value:* field, in which the user types the desired Real or Integer value. Click the **OK** pushbutton to accept the value, or the **Cancel** pushbutton to abort the operation. An invalid entry in the *New Value* field is exposed as an error once the **OK** pushbutton has been clicked.

Edit Point Value (Text)

A text point may be issued to the user for amendment during runtime, defined using the User Input (Text) dialog.

To access the User Input (Text) dialog to add an action, select *Edit Point Value (Text)* from the animation list and click the **Add Action** button on the toolbar. To access the User Input (Text) dialog to modify an action, select *Edit Point Value (Text)* from the animation list and click the **Modify Action** button on the toolbar. For a list of the objects to which this action is applicable refer to chapter 10, Objects.

On selection of the *Edit Point Value (Text)* action, the *User Input (Text)* dialog is displayed:

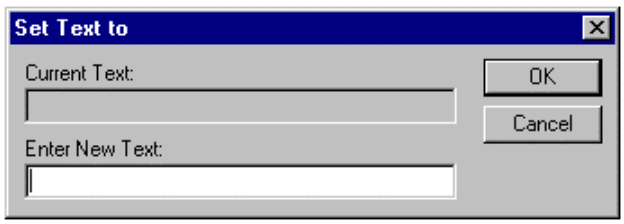


A text point must be entered. This is typed into the *Text Point:* field. A text string to use as the caption of a user dialog can be entered in the *Caption:* field. Selecting the *Echo Off* setting ensures that text typed at runtime appears hidden as asterisks.

The *Display Keyboard* option is useful if the runtime system does not have a keyboard, i.e. it is controlled by a touch screen or tracker ball. When a value is edited, a Keyboard dialog is displayed which allows editing by clicking on screen.

To abort the Edit Point Value (Text) edit, click the **Cancel** pushbutton. By clicking the **Browse** pushbutton, a point may be directly specified, as described in chapter 10, Runtime Actions. Once completed, click the **OK** pushbutton. If invalid data has been inserted into any field, a descriptive error message is displayed.

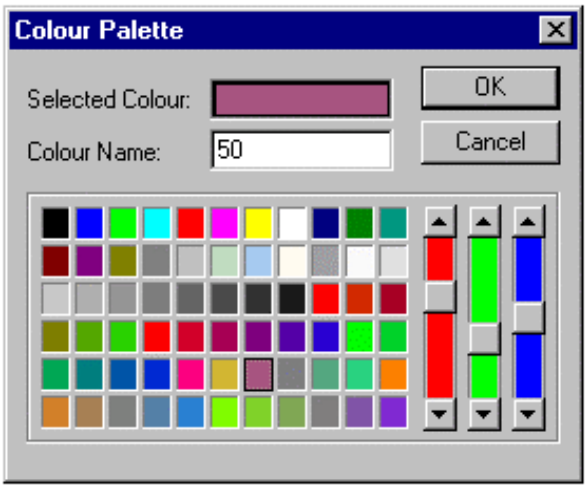
During runtime, selecting the user input object by clicking the left mouse button results in the runtime User Input (Text) dialog being displayed, based on the contents of the development version.



The user is provided with an instruction based on the *Runtime Display Attributes:* field, and a field in which the user enters the desired text. Click the **OK** pushbutton to accept the value, or the **Cancel** pushbutton to abort the operation. An invalid entry typed in the editable field is exposed as an error once the **OK** pushbutton has been clicked.

Common Colour Palette

If an object or action has a colour associated with it, the colour can be changed by clicking on the sample of the colour in the dialog which describes the object or action. The Colour Palette dialog is displayed so that a new colour can be specified.



A colour can be selected by clicking on one of the palette colours. This becomes the selected colour, and is denoted as such in the *Selected Colour:* field. Alternatively, a colour can be selected by specifying a colour name or number in the *Colour Name:* field. The selected colour within the palette can be mixed by using the red, blue and green scroll bars to the right of the palette.

Each colour in the colour palette is numbered from 0 to 65, number 0 located in the top-left position of the palette, with numbers reading consecutively across, then down, with colour number 65 in the bottom-right position of the palette. Additionally, colour numbers 0 to 19 are named — for instance, colour number 0 is named “black”.

Colours 0 to 15 inclusive are system colours and cannot be mixed. Although it is possible to mix new colours using the scroll bars, it is not possible to save such changes from this palette. To ensure new colours are saved, use *General Settings* from the *Project* menu.

Note: Using a 16 colour-based screen resolution (consult the Microsoft Windows documentation for further information) colours 16 to 65 are dithered from the sixteen base colours. Higher colour-based resolutions are not dithered.

CHAPTER 11
Recipes

This chapter describes CX-Supervisor recipes and the procedures associated with the creation, amendment and removal of recipes using the Recipe Editing facility. The use of recipes during the running of a project is also described.

What is a Recipe?

A recipe is a means of preparing a sequence of steps which can be repeated verbatim as and when required. A typical use for a recipe is to initialise some point data values prior to the commencement of a particular operation under the control of a CX-Supervisor project.

A CX-Supervisor recipe consists of one or more *ingredients,* each of which relates to a point. Each ingredient assigns a value to a point by means of a *target value*.

A suite of CX-Supervisor recipes may be created for any project. In runtime, the recipes are a great time-saver that eliminate mistakes that may otherwise be made were the repetitive tasks they perform left to human endeavour.

It is possible to achieve simple point initialisation using the CX-Supervisor script language. This approach works perfectly well for relatively straight-forward applications. However, further functionality is provided using the recipe system, such as the ability to modify a recipe while the CX-Supervisor project is being executed in runtime.

Recipe Components

Before proceeding any further with the description of recipes, some basic recipe terminology must be introduced:

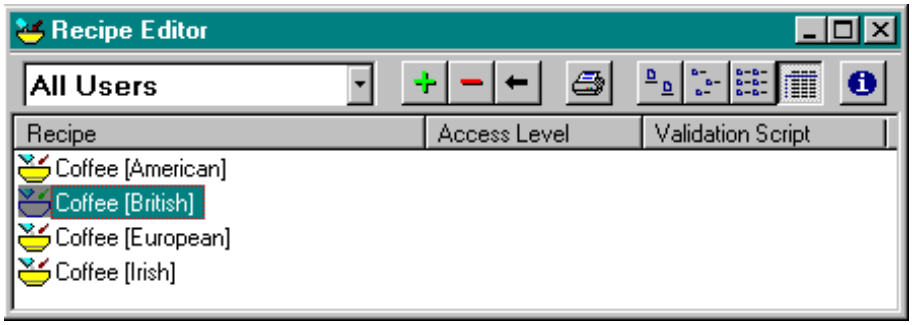
- *Recipe*. A recipe is a set of pre-defined steps used to perform a particular task. A CX-Supervisor project may contain none or many. Recipes are defined in the development environment and executed, or downloaded, in the runtime environment.
- *Ingredient*. Each recipe consists of at least one ingredient. Each ingredient must be related to an existing point.
- *Target Value*. An ingredient must specify a target value for its related point. This is the value to which the point is set in runtime when the recipe is downloaded.
- *Validation Code*. Recipe validation code is CX-Supervisor script code which is used to check point values before downloading a recipe.
- *Download*. A recipe is downloaded during runtime. This process involves identifying the appropriate recipe and executing the validation code, if any exists. The download is complete when each ingredient has set its point to the target value.

Viewing Recipes in the Recipe Editor

The Recipe Editor allows the creation, editing, copying and deletion of recipe definitions. To use the Recipe Editor, CX-Supervisor must currently have a project open. If no project is currently open, select *Open* from the *Project* menu to open a previously saved project, or select *New* from the *Project* menu to create a new project.

To open the Recipe Editor dialog, click the **Recipe Editor** button on the toolbar.

Display the Recipe Editor as described in the previous chapter. An example of the Recipe Editor dialog is shown below:



Recipes are displayed in three columns: *Recipe, Access Level* and *Validation Script.* Recipes are usually listed in alphabetical order by recipe name, although the ordering can be changed so that the entries are listed according to any of the three column titles.

For example, to see the recipes listed alphabetically by security access level, simply click on the *Access Level* field.

The widths of the recipe fields can be widened or narrowed as required using the mouse to drag the column boundaries.

Select the **Large Icons** button to view details with large icons.

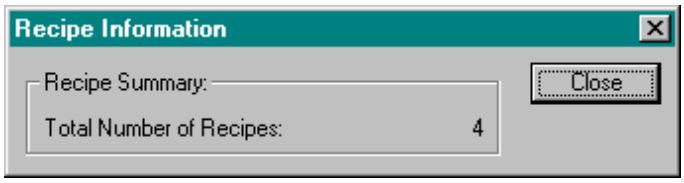
Select the **Small Icons** button to view details with normal icons.

Select the **List** button to view details as a list.

Select the **Details** button to view details as a list including recipe, access level and validation script. The details can be sorted in ascending order by clicking once or in descending order by clicking twice, in the appropriate field.

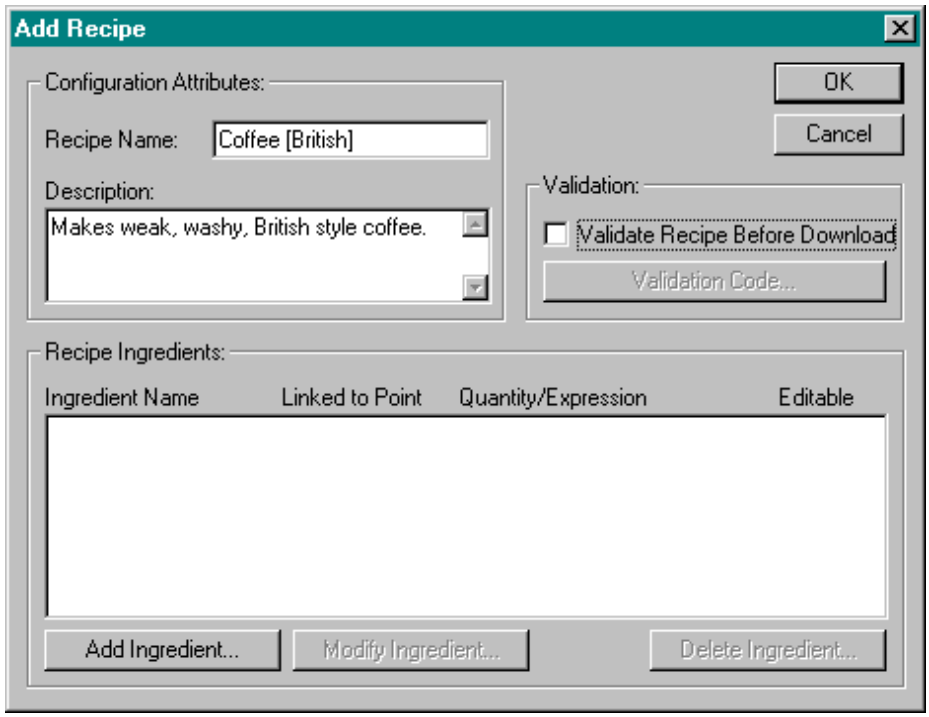
A summary of recipe information is available by selecting the **Recipe Information** button from the toolbar.

The resultant dialog shows the overall number of recipes in the project. To exit the dialog click the **Close** pushbutton. The Recipe Information dialog is shown as follows:



Creating a New Recipe

Open the Recipe Editor as described in chapter 11, Viewing Recipes in the Recipe Editor. To add a new recipe, select the **Add Recipe** button from the toolbar. This results in the Add Recipe dialog being displayed.



Once all the information has been provided for the new recipe, selecting the **OK** pushbutton adds the new recipe definition to the project, whilst the **Cancel** pushbutton aborts this add operation.

Note: The short-cut keyboard combinations for Cut, Copy and Paste operations are valid within the Add Recipe dialog. Highlight part or all of a field and type <Ctrl>+X to cut the text or <Ctrl>+C to copy the text; insert the cursor at the desired field and type <Ctrl>+V to paste the text. Since the cut and copy operations store the information in the Windows Clipboard, they may be pasted to another dialog or application.

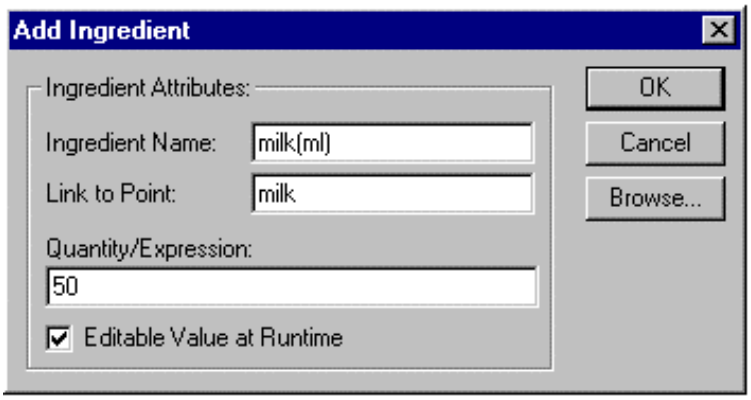
Recipe Configuration Attributes

The name of the recipe is entered in the *Recipe Name:* field. The recipe name can be constructed using any alphanumeric characters. This field is visible from the Recipe Editor dialog.

A recipe description may be inserted in the *Description:* field. To start a new line, press <Ctrl>+<Return>. Any characters are valid and up to 255 characters may be entered in the text field. This field is also visible from the Recipe Editor dialog.

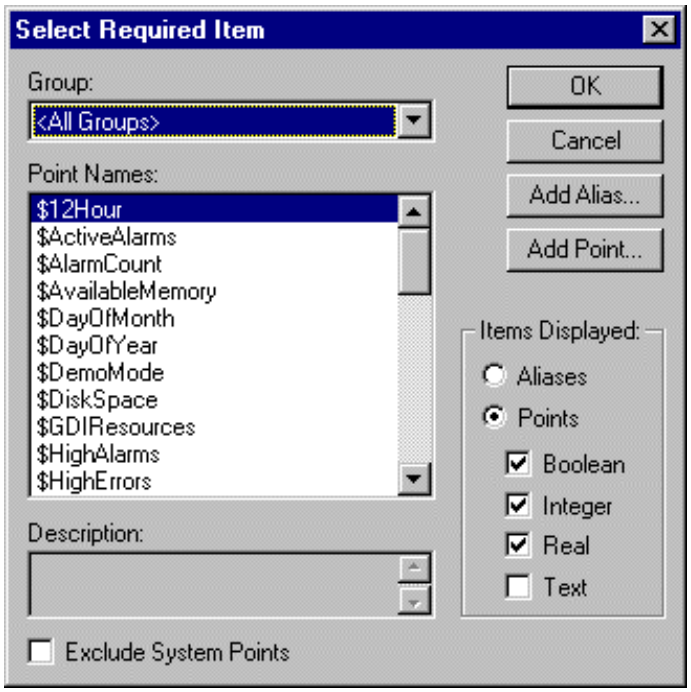
Recipe Ingredients

The recipe ingredients are added using the **Add Ingredient** pushbutton in the Add Recipe dialog to display the Add Ingredient dialog, as follows:



Enter a suitable ingredient name in the *Ingredient Name:* field. This name should be unique and meaningful and identify the particular ingredient being added to the recipe.

Enter the name of a point which is initialised by this ingredient in the *Link to Point:* field. The adjacent **Browse** pushbutton may be used to display the Select Required Item dialog, which provides a list of points from which the selection may be made. The Select Required Item dialog also provides an **Add Point** pushbutton which allows a new point to be added. See also chapter 4, Points. The *Quantity/Expression* field is used to define the value which is assigned to the point by this ingredient. This may be a fixed value, such as 50 as in the above expression, or it may be any valid CX-Supervisor script language expression featuring one or more point names.



The *Editable Value at Runtime* setting determines whether the target expression may be changed at runtime when the recipe is downloaded. Only expressions featuring a fixed value may be edited in this way; expressions featuring point names may not be edited at runtime.

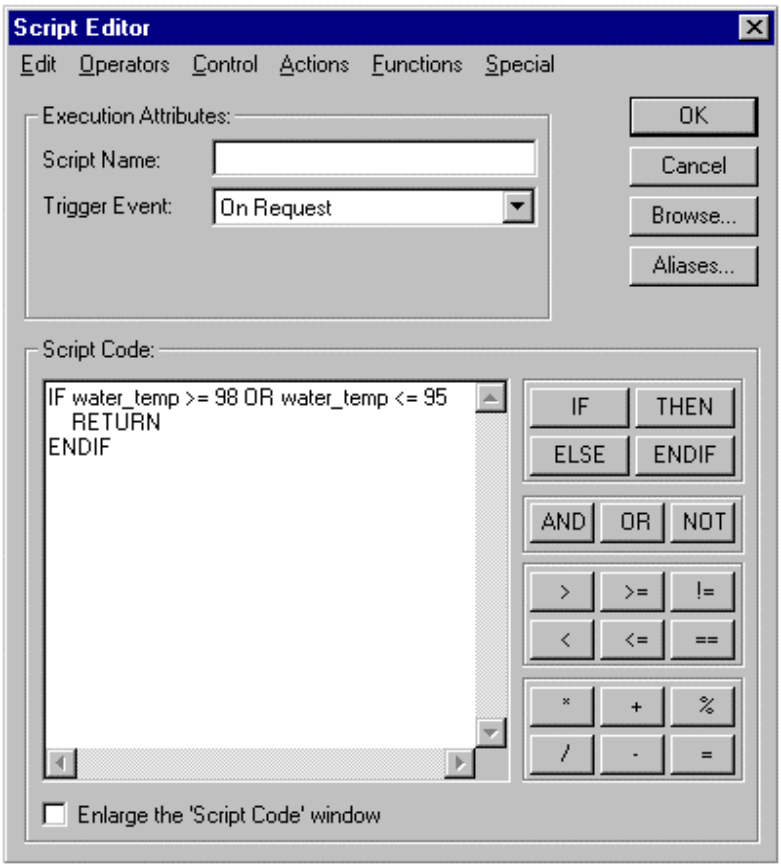
Select the **OK** pushbutton to add the ingredient to the recipe, or the **Cancel** pushbutton to abort this part of the operation.

Recipe Validation

Recipe validation is an optional safety check which may be made in runtime as the recipe is about to be downloaded. If the validation fails, the recipe is not downloaded.

If no validation is required, make sure the *Validate Recipe Before Download* setting is set to 'OFF'.

If validation is required, check this box and then click the **Validation Code** pushbutton to display the Script Editor dialog:



Enter the recipe validation code using any standard CX-Supervisor script language constructs. The validation code should check any possible invalid point value or error condition. The point value being checked is the value of the ingredient about to be downloaded, or the current point value if the point is not an ingredient of the recipe being downloaded.

In the event of a failure, the script language should perform a premature <Return>. This has the effect of failing the recipe validation check and abort the attempt to download the recipe.

The recipe validation code should **not** contain any command which requires user input (e.g. a Message command). This is because the validation script would not have been completed (and appropriate action taken) at the time that user input is requested. Instead, if a message box is required, then a point should be used as an error status value, and set to an appropriate value. This point can then be checked in an 'on condition' script and the appropriate message displayed from there.

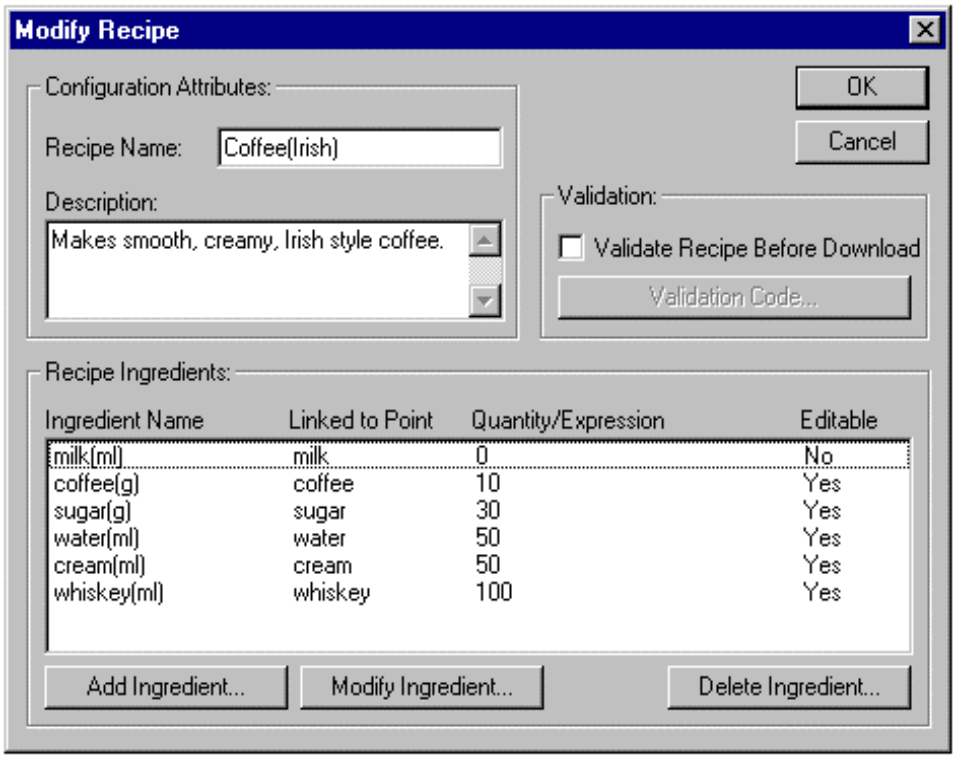
If the validation code exits normally, the recipe is downloaded in the normal way.

Updating an Existing Recipe

Open the Recipe Editor dialog as described in chapter 11, Viewing Recipes in the Recipe Editor.

To modify an existing recipe, highlight the recipe entry from the recipe list and select the **Modify Recipe** button from the toolbar.

This results in the Modify Recipe dialog being displayed, a dialog based on the Add Recipe dialog, as shown below:



The selected recipe can be redefined as described in chapter 11, Creating a New Recipe.

The **Modify Ingredient** and **Delete Ingredient** pushbuttons on this dialog respectively allow the highlighted ingredient to be modified, or deleted (following confirmation).

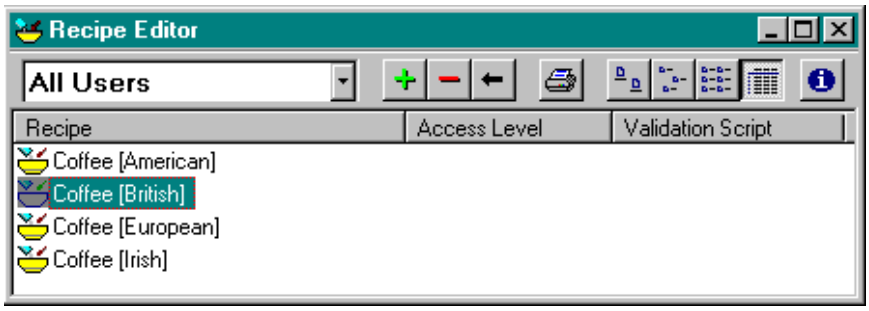
Once all the information has been provided for the updated recipe, clicking the **OK** pushbutton saves the recipe details, whilst the **Cancel** pushbutton aborts this modify operation.

Copying an Existing Recipe Definition

Open the Recipe Editor dialog, as described in chapter 11, Viewing Recipes in the Recipe Editor.

To copy an existing recipe, highlight the recipe from the recipe list and then type <Ctrl>+C. This creates a copy of the recipe definition on the clipboard. To paste the recipe definition back in to the current project, type <Ctrl>+V. The cut, copy and paste operations in the *Edit* menu may also be used. The Recipe Editor ensures the name of the recipe is unique by appending a number to the name. For example, if the original recipe name was “Recipe”, the name of the pasted recipe is “Recipe1”. All other properties of the pasted recipe remains the same as the original recipe definition.

It is possible to copy many recipes at once by highlighting all the desired recipes in the recipe list. Press and hold the <Ctrl> key and use the mouse to select recipe definitions one by one, or press and hold the <Shift> key and use the mouse to select blocks of recipe definitions. Once the desired recipes have been highlighted, the recipe definitions may be copied and pasted in the usual way.



Deleting an Existing Recipe

Open the **Recipe Editor** dialog, as described in chapter 11, Viewing Recipes in the Recipe Editor.

To remove an existing recipe, highlight the recipe from the recipe list and select the **Delete Recipe** button from the toolbar.

A confirmation dialog is displayed. Click the **Yes** pushbutton to remove the definition, or the **No** pushbutton to abort the delete operation.

Recipe Security Levels

A recipe may be assigned a security level governing which level of users are allowed to download the recipe in runtime. The available security levels are shown below in descending order:

- Designer;
- Manager;
- Supervisor;
- Operator;
- All Users.

To assign a security level to a recipe, display the Recipe Editor dialog. Then select the recipe to which the security level is applied. With the recipe highlighted from the list, click the *Security Level* field on the toolbar.

Select the required security level from the list. The selected security level is then applied to the recipe. To change the security level, click the *Security Level* field again and choose a different security level from the list.

Printing Recipes

Print Setup

The Recipe Editor can be printed in the same way pages can. Before printing, ensure that the printer has been set up correctly. To check the printer settings, refer to chapter 3, Pages.

Print Preview

To preview the page before printing, select *Print Preview* from the *File* menu.

Refer to chapter 3, Pages regarding the use of the Print preview display.

Printing

To print the contents of the Recipe Editor, select the **Print** button from the toolbar.

Refer to chapter 3, Pages regarding the use of the Print dialog.

It is possible to print the details of a recipe including a list of all the ingredients, points and expressions which comprise the recipe. To do this, display the Recipe Editor dialog as described earlier and then highlight the appropriate recipe from the list of recipes. Click the **Print Recipe** button on the toolbar to send a copy of the recipe to the printer. The recipe is formatted similar to the following example:

```
Recipe: Coffee(British)
Description: Makes weak, washy, British style coffee.
Access Level: All Users

Ingredient          Point          Expression        Editable
milk(ml)            milk           50                Yes
coffee(g)           coffee         3                 Yes
sugar(g)            sugar          0                 Yes
water(ml)           water          250               Yes
```

Using Recipes in Runtime

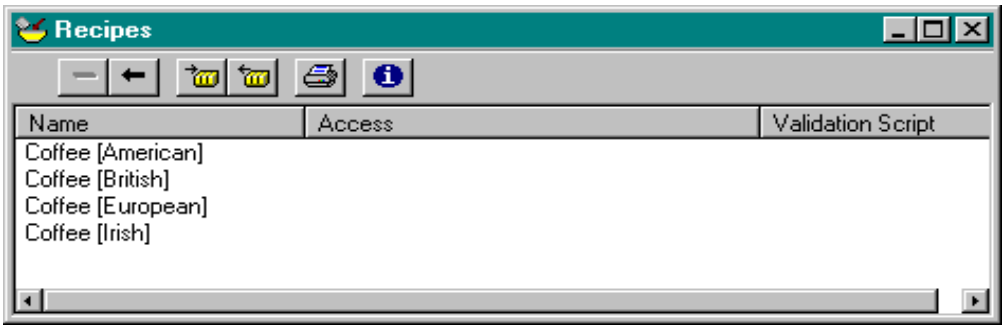
Recipes defined using the Recipe Editor in the development environment can be accessed in runtime using the Recipe Viewer. Recipes may be downloaded using the Recipe Viewer.

Recipe Viewer

The Recipe Viewer can be displayed in one of two ways in the runtime environment. It may be displayed by any CX-Supervisor script code attached, for example, to a pushbutton. The function call is simply 'ViewRecipes()'.

The Recipe Viewer may also be displayed using the floating menu. The floating menu needs to be configured to display the *Recipes* option. This is done in the development environment and explained in chapter 7, Projects.

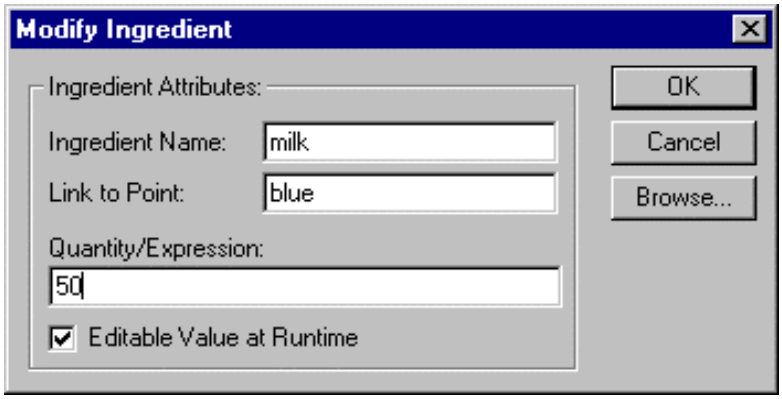
The Recipes dialog is displayed as follows:



The Recipe Viewer is similar to the Recipe Editor, however there are some differences in functionality and appearance:

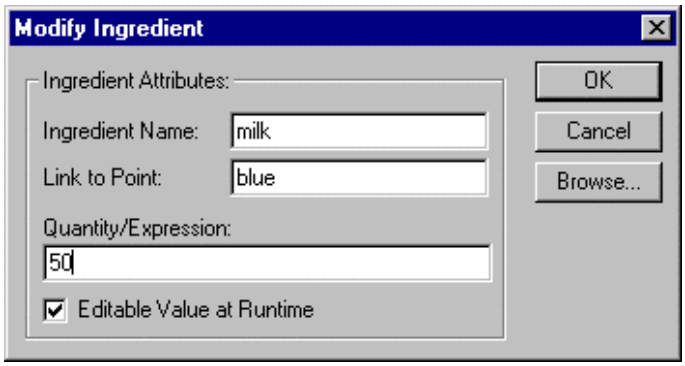
To remove an existing recipe, highlight the recipe from the recipe list and select the **Delete Recipe** button on the toolbar. A confirmation dialog is displayed. Click the **Yes** pushbutton to remove the definition, or the **No** pushbutton to abort the delete operation. Note that recipes created in the development environment may *not* be deleted in the runtime environment. The delete operation only affects recipes copied and saved in the runtime environment.

To modify an existing recipe, highlight the recipe from the recipe list and select the **Modify Recipe** button from the toolbar. The Modify Recipe dialog is displayed as follows:



This runtime version of the dialog is rather more limited in the power it offers than the equivalent dialog in the development environment; this is so that recipes which have been painstakingly created in the development environment cannot be accidentally overwritten or destroyed in the runtime environment. The two pushbuttons unique to this version of the dialog are **Modify Target** and **Save Recipe As**.

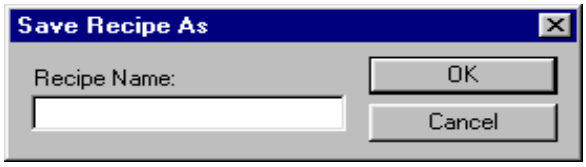
With the appropriate ingredient selected from the list, clicking the **Modify Target** pushbutton allows the target value to be modified by means of the Modify Ingredient dialog, shown below:



The target value for this ingredient may be changed by entering the new value in the *New Target:* field. Selecting the **OK** pushbutton accepts the change, choosing the **Cancel** pushbutton aborts the change.

Note: The new target value is applied *only* to this recipe download. No permanent change is made to the recipe definition itself.

The **Save Recipe As** pushbutton displays a simple dialog prompting for a name to use for the new recipe.



Clicking the **OK** pushbutton creates a new recipe with the name specified. Choosing the **Cancel** pushbutton aborts the save operation. A recipe created using this dialog is added to the available list of entries displayed in the recipe dialog. The newly saved recipe is also available in the development environment using the Recipe Editor.

Note that it is possible to change the name of an existing recipe in runtime simply by typing a new name in the *Recipe Name:* field of the Modify Recipe dialog and then clicking the **OK** pushbutton. The re-named recipe appears in the available list of entries displayed in the Recipes dialog and is also available in the development environment using the Recipe Editor.

To download an existing recipe, highlight the recipe from the recipe list and select the **Download Recipe** button from the toolbar. See chapter 11, Downloading a Recipe for more information.


Click the **Print Recipe** toolbar button to send a copy of the recipe to the printer. See chapter 11, Printing Recipes for a typical example of the formatted output.


Select the **Large Icons** button to view details with large icons.


Select the **Small Icons** button to view details with normal icons.


Select the **List** button to view details as a list.


Select the **Details** button to view details as a list including name, access and validation script. The details can be sorted in ascending order by clicking once or in descending order by clicking twice, in the appropriate field.

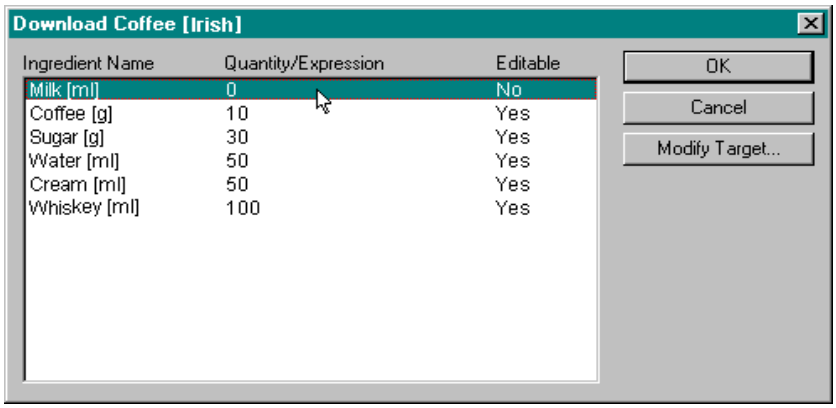

A summary of recipe information is available by selecting the **Recipe Information** button from the toolbar. The Recipe Information dialog is displayed (see chapter 11, Viewing Recipes in the Recipe Editor for an example).

Downloading a Recipe

There are two ways of downloading a recipe definition in runtime. The first method is to use a CX-Supervisor script function attached to a graphical object on a page, such as a push button. The function call is:

```
DownLoadRecipe("<NameOfRecipe>")
```


The other way to download a recipe, is to display the Recipe Viewer as described in the previous chapter. Highlight the desired recipe from the recipe list and click the **Download Recipe** pushbutton. The Download Recipe dialog is displayed as follows:



The **Modify Target** pushbutton allows the target value for an ingredient to be modified by means of the Modify Ingredient dialog (shown above). An ingredient must already be selected from the list of ingredients for this recipe. Any change to the target value is of a temporary nature and is not permanently changed in the recipe definition. Any number of ingredients may be modified in this way before the recipe is downloaded.

Selecting the **OK** pushbutton attempts to download the recipe. If for some reason the recipe definition can't be found, the following error message appears: *"Unable to find recipe".*

One recipe download must be completed before another recipe download is started. If a recipe download is already in progress when another is started, the following error message appears: “A recipe download is currently in progress”.

If any *validation code* has been entered for this recipe, the validation is conducted first. If the validation is successful, the recipe is downloaded. If the validation fails, the recipe is not downloaded and the following error message appears: “Unable to download selected recipe”.

If there is no validation code to execute, the recipe is downloaded anyway. The download process consists of setting each ingredient to its specified target value.

The download may fail at this stage if there are problems communicating with a PLC. A communications failure results in the error message *“Downloading recipe failed”.* A delay in response from the PLC of more than one minute results in the error message *“Recipe transfer timed out”.*

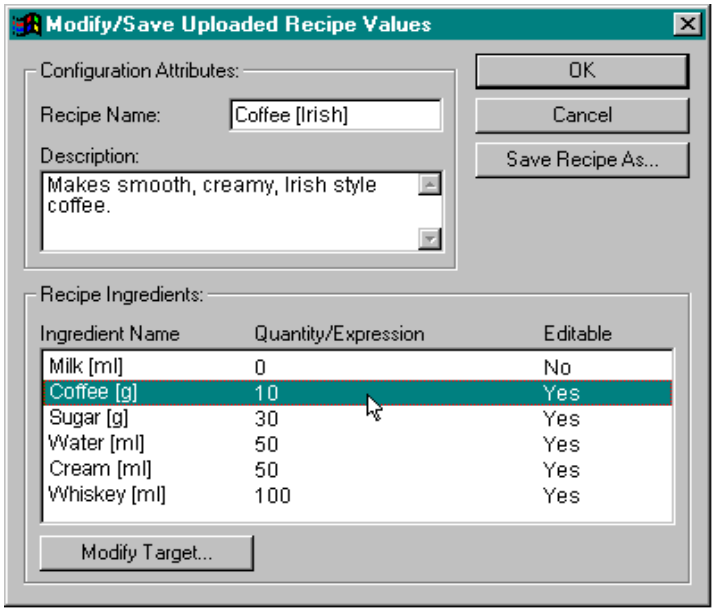
When the recipe download is complete, all the ingredients are saved and the CX-Supervisor runtime environment continues to run in the normal manner. An event is logged stating that the recipe was successfully downloaded.

Uploading a Recipe

There are two ways of uploading a recipe definition in runtime. The first method is to use a CX-Supervisor script function attached to a graphical object on a page, such as a push button. The function call is:

```
UpLoadRecipe(“<NameOfRecipe>“)
```

The other way to upload a recipe, is to display the Recipe Viewer as described in the previous chapter. Highlight the desired recipe from the recipe list and click the **Upload Recipe** pushbutton. The Modify/Save Upload Recipe dialog is displayed as follows:



The **Modify Target** pushbutton allows the target value for an ingredient to be modified by means of the Modify Ingredient dialog. An ingredient must already be selected from the list of ingredients for this recipe. Any change to the target value is saved in the recipe definition. Any number of ingredients may be modified in this way when the recipe is uploaded.

Selecting the **OK** pushbutton will upload the recipe. If for some reason the recipe definition can't be found, the following error message appears: *"The recipe failed its validation checks. Upload aborted".*

Each recipe upload must be completed before another can be started. If a recipe upload is already in progress when another is started, the following error message appears: "A recipe Upload or Download is currently in progress".

The upload may fail at this stage if there are problems communicating with a PLC. A communications failure results in the error message *"Uploading recipe failed".* A delay in response from the PLC of more than one minute results in the error message *"Recipe transfer timed out".*

When the recipe upload is complete, all the ingredients are saved and the CX-Supervisor runtime environment continues to run in the normal manner. An event is logged stating that the recipe was successfully uploaded.

CHAPTER 12
Data Logging

This chapter describes the CX-Supervisor data logging facilities including how to configure items to be logged, the logging of data and the viewing and exporting of recorded data.

What is Data Logging

The concept of the Data Logger is the ability to define a number of points and expressions during development which may be recorded while the CX-Supervisor project is being executed in runtime. These events may be viewed at runtime and recorded for future evaluation. They may also be exported to other programs such as Microsoft Excel.

The recorded events are stored in one or more Data Sets which can then be viewed using the Data Log Viewer. The events to be recorded are defined by the developer and any number of Data Sets may be used to record specific areas or types of events either automatically at runtime or as specified by the developer.

As an aid to viewing a number of particular events in isolation Data Sets can be subdivided into data Groups. Specific areas of related data can then be stored in these groups which can then be viewed either singly or with other groups within a Data Set.

The main elements of the CX-Supervisor Data Logger are:

- **Data Logger Editor:** used to configure items to be logged
- **Data Logging at Runtime:** the actual logging of the data
- **Data Log Viewer:** used to view the logged data
- **Remote Data Viewer:** enables viewing separately from the runtime system
- **Data Log Export facility:** enables export to other programs (e.g. MS Excel)
- **Script Functions:** gives full control over the logging process

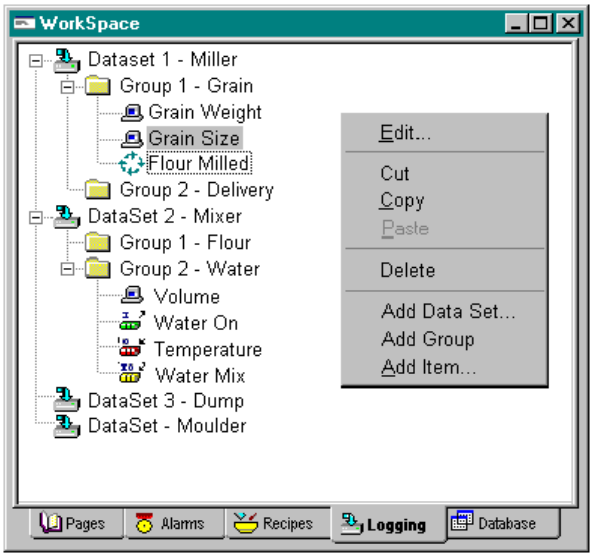
Data Log Editor

Configuring Data Sets and Logging Settings

The Data Sets, data Groups and Items to log are configured from the Logging Tab on the Workspace editor which is accessed by selecting the logging button in the bottom of the Development WorkSpace window. Items are edited using a right mouse-button context sensitive menu. The option available from the menu are:

- Edit: enable the parameters of the selected Data Set, Group or Item to be edited.
- Cut, Copy, and Paste: enables the selected Item to be cut or copied and then pasted into a Data Set or Group.
- Delete: will delete the selected entry.

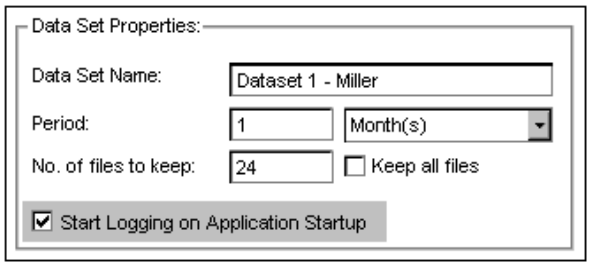
- Add DataSet, Add Group and Add Item: enables new Data Sets, Groups and Items to be added to the selected entry.



The functionality of the Items is determined by their expression. If the expression is a single point name, the item is shown as the same type as the point as configured in the point editor, i.e. memory, input, output or input/output. If the expression contains calculations, constants and/or multiple point names, the item is shown as a script calculation.

Adding/Editing Data Set Properties

The **Add/Modify Data Set** properties dialog is displayed when either the **Add Data Set** or the **Edit** (an existing Data Set) option is selected from the menu.



Data Set Properties

The *Data Set Name* field enables the Data Set to be referenced with a meaningful description both in the Workspace view, and also from the script language. It also forms the prefix for the file name. A maximum of 26 characters is allowed.

The *Period* fields allow a period to be entered in Hours, Days, or Months and defines the period of data to be grouped into a single file. For example, if the Period is set to 1 month, any data logged for the current month is saved to the same data file, even when the system is stopped and restarted. When logging spans a Month boundary the data file is closed, and a new file started and given sequential file name. This allows easy archiving and backup of the logged data. The start of a new data file is always synchronised to a natural boundary, e.g. for months - the 1st of the month, for days – 24.00 hours and for hours - on the hour.

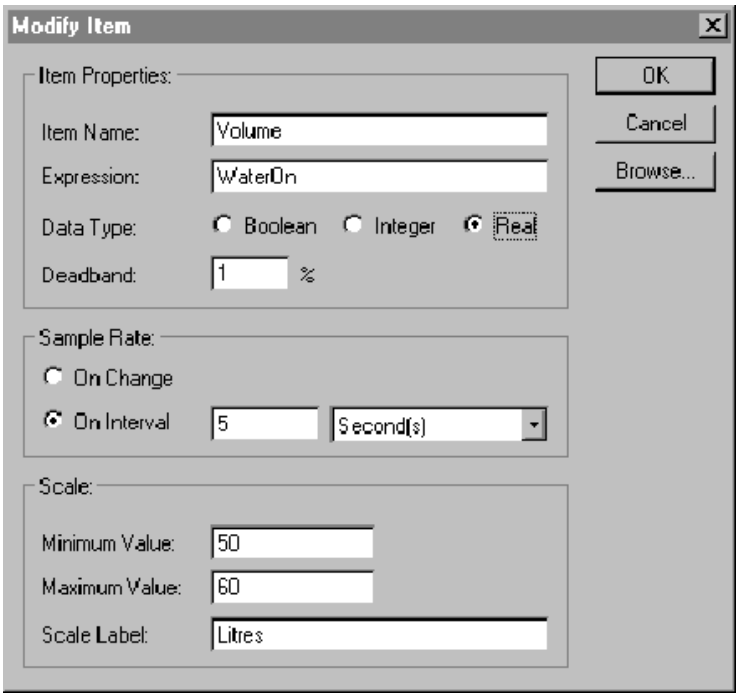
The *No. Of Files to Keep* entry determines the maximum number of data files that are to be kept. Once the number of files kept has reached the value entered, as each new file is created the oldest file is deleted. For example, to keep process data for 2 years, you could keep 24 files of 1 month period. The file names are generated automatically based on the Data Set name, plus a suffix which is incremented by one as each new file is generated.

If the *Keep all Files* option is checked the data files management is disabled and no files will be deleted.

The *Start Logging on Application Startup* checkbox controls the logging of the Data Set. When selected, all the Items in the Data Set start logging when the system is started, and stop logging when the system is stopped. If this option is not selected, then logging must be controlled by the Start/Stop logging script functions as required by the developer.

Editing Item Properties

The **Add/Modify Item** properties dialog is shown when adding a new **Item**, or editing an existing one.



Item Properties

These options enable an items name and associated expression to be entered. It's data type can be selected and if required a deadband value can be applied to the measured value.

The *Item Name* field allows the Item to be given a meaningful name. The entry should be kept short but also be logical for clarification. A maximum of 26 characters is allowed.

The *Expression* field defines the point name or expression that will be logged. The Browse button allows easy point selection. For details on how expressions or points are formulated Refer to chapter 4, Points.

The *Data Type* field determines the type of data to be logged. Select either Boolean, Integer or Real. For points, this is automatically picked up from the points database. For expressions, the required type must be selected.

The *Deadband* field enables a percentage limit or 'Deadband' to be applied to the logging expression. This allows the value of the expression to change within the percentage limit without being logged. This is particularly useful when logging analogue values which are subject to noise. Each sample is checked (when the value changes for 'On Change' sampling, or every log period for 'On Interval') against the last logged value. While the value varies within the deadband, the values are ignored. Immediately the value exceeds the deadband limits the new value will be logged. This may dramatically reduce file size, and ease analysis.

Entering a value of 0%, i.e. no deadband, will cause every sample to be logged.

Sample Rate

The sample rate options are used to determine how data will be recorded, select either on change or on interval. The default is interval.

When the *On Change* option is selected data will be logged only when the value actually changes. This ensures all transient information is logged - even if changes occur faster than maximum sample rate, and also ensures periods of inactivity do not generate duplicated data.

The *On Interval* sample rate option enables the data values to be logged at regular intervals. Enter the interval as a number and from the pick list select the form, e.g. '5 Second'. This method guarantees the value is checked and recorded at every interval. However transients occurring between sample periods are not recorded, which depending on the application may be a benefit.

Scale

The scale fields enable the graph upper and lower limits to be set and a scale label entered for the selected item.

Enter the *Minimum value* as the lower limit to be shown on the graph for this item.

Enter the *Maximum value* as the upper limit to be shown on the graph for this item.

Enter the *Scale Label* to be displayed. This is a text field the contents of which are displayed by the Y scale of the graph. The entry should be kept short but also be logical for clarification.

Editing Items

Copy, Cut, Paste Options

The Copy, Cut and Paste options follow the windows convention and enable a selected Item to be copied or cut from one Data Set Group and then pasted into another. As Item names within a Data Set must be unique, when a copied Item is pasted back into the same Data Set the name is given a numerical suffix.

New or existing Items can be renamed and have their parameters edited by high lighting the Item and then selecting the **Edit** option from the popup menu. When the Modify Item dialog appears edit the appropriate parameters in the normal way.

Adding/Renaming Groups

The adding or renaming of Data Set groups follows the windows convention. New Groups are added by selecting the Data Set to which the group is to be added and then selecting the **Add Group** option from the popup menu. The new Group is automatically placed in the correct position in the Data Set and given a default group number. New or existing Groups can be renamed by first high lighting the current group name and then selecting the **Edit** option from the popup menu. When the edit box is displayed the name can then be edited in the normal way. A maximum of 26 characters is allowed.

Unwanted groups can only be Deleted, they can not be cut and pasted.

Data Logging at Runtime

Overview

All data logging is performed on Items, which are stored in a Data Set. The System can contain many Data Sets and each Data Set can contain many Items. Each Data Set will have its own set of files when the System is run (see the chapter 12, File Management). The amount of data that is stored in a single Data Set file is determined by the specified period when the Data Set is created.

File Management

Data Logging Directory

All data log files are stored in the directory “Data Logging” separate from the CX-Supervisor files. This directory is created automatically when the project runs for the first time. A sub-directory is used as a safeguard against the accidental deletion of important files by the automatic purge mechanism and to prevent the project directory from becoming cluttered with data files.

For example, if the CX-Supervisor project is in a directory called **C:\CX-Supervisor\Project** then, when the project runs for the first time a new directory called **C:\CX-Supervisor\Project\Data Logging** will be created to hold the data log files.

Data Logging Files

Each Data Set has its own set of files. The following conventions have been adopted in order to identify the various files and add time and date information.

Data Log files are assigned the file extension .dlv “Data Log Values” and the format of the filename is:

```
<Data Set Name><Time Stamp>.dlv
```

The Time Stamp is in the format: [YYYY MM DD HH]”

where YYYY = Year in the form 1999

MM = Month in the form 01 (January)

DD = Day of the month in the form 01 – 31

HH = Hours in the form 00 –23

Daylight time saving is automatic.

For example: `Data Set 1 Miller[1999012015].dlv`

A new log file will be created automatically whenever the preceding file has expired the timestamp. The timestamp is also used to distinguish between files in the same Data Set. The time period for each file is determined by the options selected when the Data Set was created. The minimum time period for a Data Set file is one hour commencing on the hour.

Note: Do not rename any log files while they are in the Data Logging directory or the File Management System will not work correctly. The File Management System relies on the strict format of the Data Log files to determine which file to open as Live and which file(s) to delete during purging and also for performing ‘previous/next’ file searches in the Data Log Viewer.

Note: Additional files should never be copied into the Data Logging directory as the automatic purging mechanism may delete all the log files.

Number of files in a Data Set

When a Data Set starts logging a file will be created to hold the logged items, this file is known as a ‘Live’ or ‘Active’ log file (There is only one Live file in a Data Set file set). When the time period for a Data Set log file expires a new file is created with a more recent Timestamp, this file then becomes the ‘Live’ file and the previous file is now known as a ‘Dead’ log file. Over a period of time there can be many ‘Dead’ files in a Data Set but only one live one. If a limit has been set on the number of dead files to be kept when this number is reached the oldest file will be purged automatically as each new file is created.

The number of dead files to be kept for a particular Data Set is managed automatically by specifying the ‘Number of Files to Keep’ from the Data Set Properties Parameters when a Data Set is created. This field is only enabled when the ‘Keep all files’ check box is ‘unchecked’.

Note: There will always be one Live file for each Data Set.

For example. if the number of files to keep is set to 24 then there the system will keep 24 Dead files and one Live file, i.e. 25 files in total.

WARNING: No backups are taken when a file is purged. If you wish to keep any data you must ensure that backups are taken before purging occurs.

If the 'Keep all files' check box is checked no automatic purging will take place and the System will store all the Dead files created until the disk is full.

Dead files can be copied, moved, deleted etc. as they will not be written to again by the System.

Live files may be copied (i.e. backed up to another directory) while the Log file is open but they cannot be moved or deleted as they are locked by the System. In order to delete or move a live file it must first be closed. See Opening and Closing Log Files.

Invalid Data Log Files

Data log files generated during one project sessions will continue to be used in subsequent sessions, if they are still live. For example, if a system runs during the day and is shut down at night, then a Data Set with a duration of 7 days will use the same file for the whole 7 days.

If a session is halted and Data Set Items changed, deleted or new ones added it is not valid to continue using the existing file. When the session is restarted and Data Set file opened CX-Supervisor checks to see if there are any differences between the current Data Set and the Data Set stored in the file. If any differences are detected the System will mark the existing file as invalid by altering the Timestamp brackets from "[ ]" to "{{ }}" and create a new file.

For example, if a file **`Batch1[2000032922].dlv`** is detected as being invalid it will be renamed **`Batch1{{2000032922}}.dlv.`** A new **`Batch1[2000032922].dlv`** file will then be created to log the new data.

If the file **`Batch1{{2000032922}}.dlv`** already exists then the current invalid file will be renamed **`Batch1{{2000032922}}_1.dlv`** and so on.

This is most likely to occur during the development of an application when Data items are continually being amended and tested.

Invalid files are not part of the Data Set files and can not be purged or found by the File Management 'next' or 'previous' searches. The data recorded in these files is not lost and can be viewed using the Data Log Viewer and exported from them using Export Log. Invalid files can only be deleted using Windows explorer.

Data Set Period Examples

The following examples show how the specified period (Hour(s), Day(s), Month(s)) is implemented while the System is running:

1) Data Set period = Hours

If a Data Set named CV500 starts logging at 12:30 on the 7th March 1999 with a period of 6 hours, the following files will be created:

```
CV500[1999030712].dlv
```

If the s7stem is left running the Data Logging directory will contain the following files:

```
CV500[1999030712].dlv
CV500[1999030718].dlv
CV500[1999030800].dlv
CV500[1999030806].dlv
....
....
```

The first file will only contain 5.5 hours of Data because the minimum resolution is one hour and the file was created on the half-hour, all subsequent files will contain the full six hours of data.

2) Data Set period = Days

If a Data Set named Batch1 starts logging at 23:00 on the 29th December 1999 with a period of 1 Day, the following files will be created:

```
Batch1[1999122923].dlv
```

If the system is left running the Data Logging directory will contain the following files:

```
Batch1[1999122923].dlv
Batch1[1999123000].dlv
Batch1[1999123100].dlv
Batch1[2000010100].dlv
....
....
```

The first file will only contain 1 hour of data, all subsequent files contain the full 24 hours of data.

3) Data Set period = Months

If a Data Set named Shifts starts logging at 22:00 on 29th February 2000 with a period of 2 Months, the following file will created:

```
Shifts1[2000032922].dlv
```

If the system is left running the Data Logging directory will contain the following files:

```
Shifts[2000050100].dlv
Shifts[2000070100].dlv
....
....
```

The first file will only contain 1 month and 2 hours of data, all subsequent files contain the full 2 Months of data.

Data Records

There are two types of records that are stored in a Data Log file for each Item logged these are **Events** (or breaks) and the **Actual Data**.

Event/Break Records

Event records currently consist of the following fields:

Event, Date, Time

Event = Open | Close | Clear | Start | Stop

Events have no associated data

Data Records

Data records currently consist of the following fields:

Type, Date, Time, Milliseconds, Data

Type = Normal | Error

Data = Boolean | Integer | Real

Data Log Viewer Component

Invoking the Data Log Viewer

The Data Log Viewer can be invoked by

Selecting Data Log Viewer from the popup menu (if privileged) in the runtime.

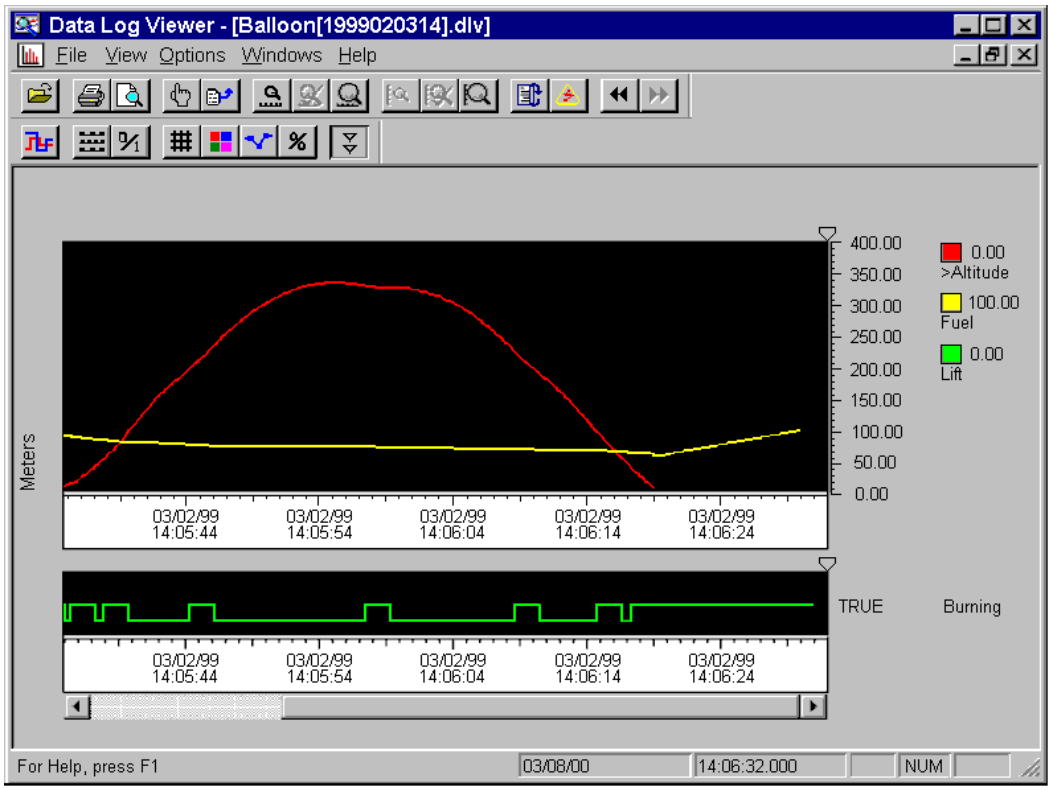
From script function 'OpenLogView' with the Data Set and Traces to show as arguments, and also closed by 'CloseLogView' script function.

From an external program.

Viewing Logged Files

The Data Log Viewer looks like this:

The window shows a graphical representation of the recorded data.



Features:

- The Data Set viewed is the name passed as an argument with the script function, or a user-selected Data Set.
- On start-up, a dialog allowing selection of traces to view from the Data Set will be shown. Up to 10 analogue traces (and 50 digital traces) may be shown at once. Alternatively, script parameters can be used to automatically select the traces to show.
- On display, the viewer displays:
  - the latest data file for this Data Set
  - the X axis set to the Data Set's period
  - Y Axis set to full scale for the first trace.
- The selected analogue traces are shown overlaid.
- Boolean points are displayed in a separate view
- The X Axis shows true Date and Time, as the local time on the logging system. Remote analysis within different time zones will show the same dates and times. Logging of local time means adjustment of PC time and daylight saving are handled.

- Key shows trace colour, name, value at the cursor. Selected trace has a ">" before the name. Clicking on other trace details selects other traces.
- Scale shows Minimum value, Maximum value and scale label of selected trace, with intermediate scales.
- A cursor allows data to be read off the graph. Pressing Ctrl and cursor keys allows moving between logged data.
- A Zoom In and Zoom Out facility (Time and Range), plus X & Y axis scrolling, are available.
- 'Previous' () and 'Next' () buttons load data files for the previous and next time period.
- The 'Refresh' button reloads the file from disk.
- A 'Live' option is used to show the latest data, and keep it up to date.
- Data can be exported to CSV files or to text.
- The current screen can be printed, or print previewed, in colour.
- The traces shown using trace selection dialog as shown initially can be changed using the "Select item" facility.

Remote Data Log Viewer

Data log files are not restricted to a machine that has CX-Supervisor installed on it. CX-Supervisor is supplied with a "Data Log Viewer" application that enables all the View and Export facilities (with the exception of Live updates) to be carried out on .dlv files that have been transferred to a stand alone machine.

Data Log Export Facilities

Exporting Data via the Export Dialog

All the export facilities described in the ExportLog function can be carried out from the Export dialog, which can be invoked from the CX-Supervisor right menu, script or the Data Log Viewer:

Options include the following:

`USE GENERATED FILES`

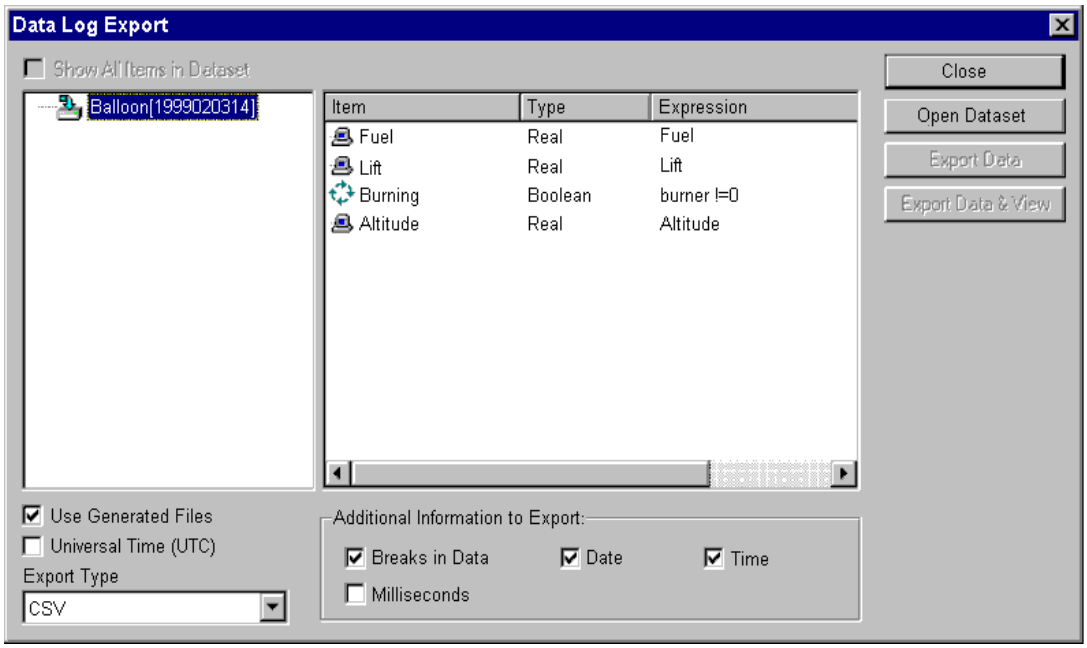
If this option is checked, then filenames will be automatically created, otherwise a "Save File As" dialog will be displayed.

`EXPORT TYPE`

Controls whether export should be as comma-separated values files or as text.

`ADDITIONAL INFORMATION TO EXPORT`

Controls whether breaks, date, time and milliseconds are exported.



Generation of Comma Separated (CSV) Files

Both the ExportLog script function and the Export Dialog use the following conventions for automatically generating comma-separated values files for export:

All generated CSV filenames will contain at least the **<Data Set name> + <timestamp>** and a .CSV extension. CSV is a format that is recognised directly by spreadsheet packages such as Excel and can therefore be opened and viewed with this application.

```
e.g.   MyData Set1999011214.csv
```

No [ ] characters are used in the timestamp. This is for two reasons:

A. Applications like Excel seem to complain about them being there.

B. Less likely to be confused will .dlv files during searches/purges

During the generation of files then obviously duplication of names can occur. To avoid this the following convention is used:

"_nnn" will be appended to any duplicate filenames, to make them unique, where nnn = 1 to 999. (If you run out numbers the export will fail, tidying up will remedy the problem).

Generated names depend on whether a single item, or multiple items, are selected for export:

Single Selections

If a single item is selected for export i.e. “Item3” in the root directory of “MyData Set” then the following file will be generated:

```
MyData Set1999011214Item3.csv
```

Multiple Selections

On Interval Items

If a multiple selection of “on interval” items with the same interval is made then the name of the parent directory will be used e.g if the items live in “Group1” the following file will be generated:

```
MyData Set1999011214Group1.csv
```

The file will contain a column for each item selected and they will share the Date and Time fields.

Note: The milliseconds field will only be valid for one of the Items, and should therefore be filtered out for this type of grouping.

If a multiple selection of “on interval” items, with different intervals is made then any items with the same interval will be grouped together in the same file. The same convention will be used as above except using the duplicate filenames rules described above. If an item does not share any interval with any other Item then its name will be used in the filename.

For example:

If Items “I1”, “I2”, “I3”, “I4”, “I5”, “I6” are selected from Group1 of Data Set *MyData Set* and Items “I1”, “I3” & “I6” share intervals and “I2” and “I5” share a different interval then the following files will be generated.

`MyData Set1999011210Group1.csv`	contains “I1”, “I3” & “I6”
`MyData Set1999011210Group1_1.csv`	contains “I2” & “I5”
`MyData Set1999011210I4.csv`	contains “I4”

On Change Items

All on change items will have their own filename generated regardless of any multiple selections made, because it is not possible to determine any common time interval with these type of Items.

If a multiple selection of ‘On Interval’ and ‘On Change’ Items is made then the above conventions still apply.

Generation of Text Files

Whereas CSV files only contain limited information e.g. Breaks, Date, Time, Milliseconds and Value, Text files contains all the information stored on selected Items/Groups i.e the expression, label, deadband etc. The multiple selection rules apply as described in the previous paragraph, with the exception that On Change items can be grouped together.

Data Logging

Overview

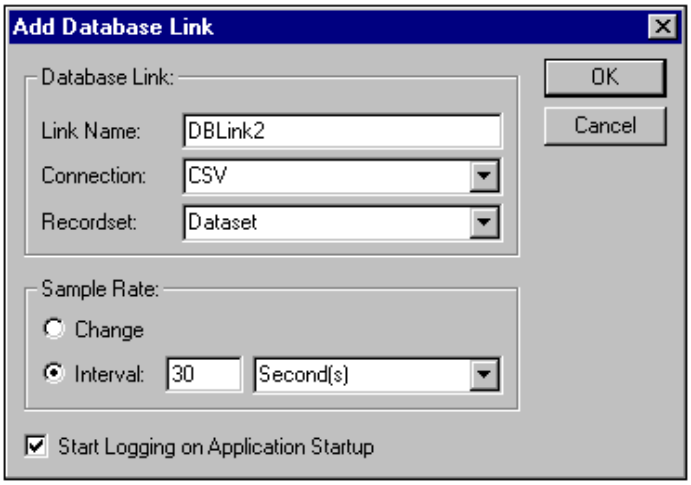
As well as the inbuilt datalogging features, it is also possible to log data directly to an existing Database. This provides direct storage of data in third party format, allowing for easy analysis using familiar tools, and there is no need for scripts to export data. However slower speed means logging to a database may be unsuitable for tasks with large data throughput or high logging speed. Also, unlike the standard Datalog files, there is no standalone viewer for instant viewing. The ADO interface used to access Data Sources does not provide any mechanism for creating Databases or Tables, therefore, it is not possible to automatically create a data source. Unpopulated data sources for use in Database Logging, must first be created using the specific software for your choice of data source e.g. "MS-Access".

To configure CX-Supervisor to log to a database:

- Create an 'unpopulated' data source or 'template' for use in Database logging.
- Create a Database connection in the Workspace Database editor to the database created above. Add a recordset with a read/write lock, and fields with 'Field Property' configured as 'Add' so records can be added.
- Create a Database Link in the Workspace Logging editor, by selecting 'Add Db Link...' from the popup menu to show the Add Database Link dialog.
- Create Field Links for each field to log by selecting 'Add Db Field...' from the popup menu to show the Add Field Link dialog.

Add Database Link Dialog

The Add Database Link dialog show below is show when the 'Add Db Link...' menu option is selected from the Data Log editor, and the identical Modify Database Link dialog when the 'Edit' menu is selected.



Link Name

For convenience, a unique Database Link name is created automatically. This can be changed to give a more meaningful description, if required.

Connection

Select the Database Connection to link to from the list showing configured Database connections.

Recordset

Select the Recordset to create a link to from the list showing Recordsets configured in the selected Connection.

Sample Rate

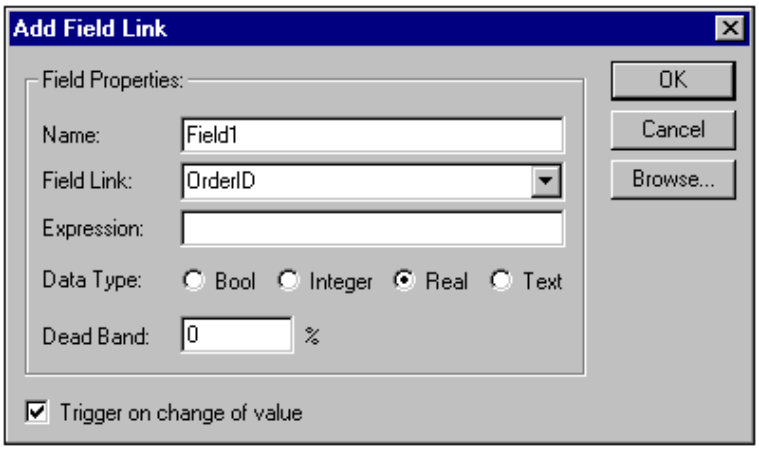
Select whether field links defined within this Database Link are logged when their expression changes or on a regular interval, for example every 30 seconds.

Start Logging on Application Startup

When unchecked, logging must be started and stopped using script commands. When checked, the logging of all associated fields starts automatically when the application is started.

Add Field Link Dialog

The Add Field Link dialog show below is show when the 'Add Field Link...' menu option is selected from the Data Log editor, and the identical Modify Field Link dialog when the 'Edit' menu is selected.



Name

For convenience, a unique Field Link name is created automatically. This can be changed to give a more meaningful description, if required.

Field Link

Select the Field to link to from the list showing fields configured in the chosen Recordset.

Expression

Enter the point name or expression that will be logged. The Browse button allows easy point selection.

Data Type

Set the type of the data to be stored. For a point, this is automatically set to the same as the point type when selected using the Browse button. However, for an expression this must be specified, for example, an expression $Second / 3 will create a Real value, but the required data may be just the integer part, so the Data Type would be set to Integer.

Deadband

This allows the value of the expression to change within the percentage limit without being logged. This is particularly useful when logging analogue values that are subject to noise. Each sample is checked (when the value changes for 'On Change' sampling, or every log period for 'On Interval') against the last logged value. While the value varies within the deadband, the values are ignored. When the value exceeds the deadband limits the new value will be logged. This may dramatically reduce file size, and ease analysis.

Entering a value of 0%, i.e. no dead band, will cause every sample to be logged.

Trigger on change of value

This option is only used when the Sample Rate is set to 'On Change'. When unchecked, every time the expression changes a new record is written. If a record consists of many fields that may be read or calculated at different times, a new record is written every time any one field changes. However, the desired action may be to change several fields, and then log the new values to a single record. To achieve this action, the 'Trigger on change of value' should be checked for all fields within a record that may be read or calculated at different times. Only when all checked fields have been changed is the record logged. If however, while waiting for remaining fields to change before writing, a field is changed for a second time, the record is written with all current field values including unchanged fields, before the field value is changed for a second time.

Note: There is a risk when using fields with 'Trigger on change of value' checked that the new value of a field may not actually change its value i.e. the new value happens to be the same as the old value. Because the field has not changed, the record is not written until the value is changed again. This can produce unexpected results as fields with 'Trigger on change of value' unchecked are written with their current values at the time of writing, not the value at the time of initial change. This may also occur when a Deadband is used.

CHAPTER 13
Data Bases

Overview

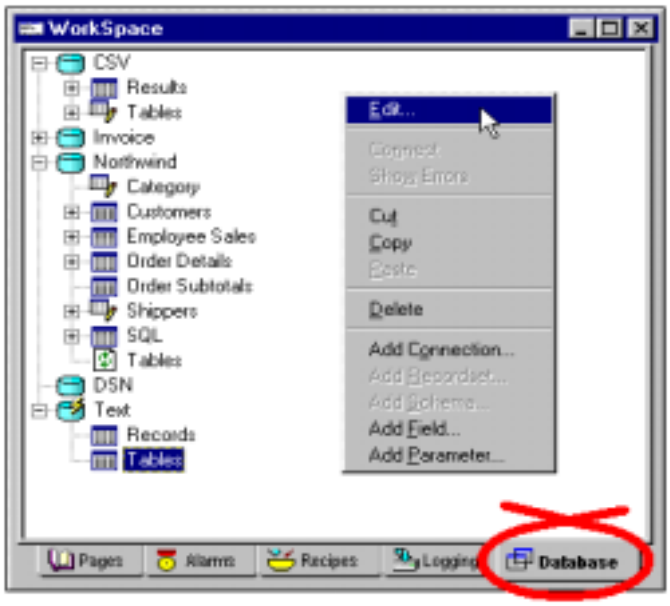
CX-Supervisor Database facilities provide fast, transparent access to many different data sources, via a database technology called ADO. Database design is not covered here, as it is a large subject explained fully in any of the many books available. It is assumed that developers using these database facilities have a working knowledge of databases. Comprehensive Database Script Functions allow complete database access.

The data sources which can be accessed depends on the Data Providers installed, but may include:

- MS-Access
- MS-Excel
- Visual FoxPro
- dBase
- ODBC for Oracle
- Paradox
- SQL Server
- Text files (in TXT and CSV format)

Database Connection Editor

The Database connection editor in the Development Workspace, enables users to create Connections, Recordsets, Field association, Parameter association and Schema objects in a familiar Tree View (hierarchical) format, using the popup menu.



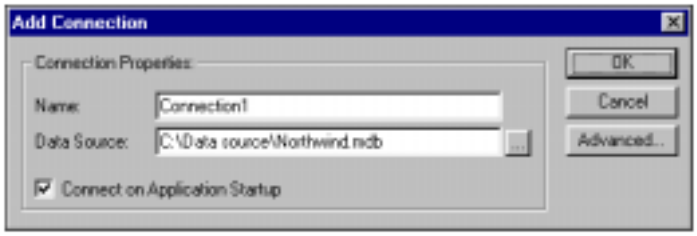
This editor is unique in CX-Supervisor, in that actual database connections can be tested online in the Development Environment. The ability to connect online also has the added benefit of providing assistance in creating objects lower down in the hierarchy. This editor has been designed to enable a large proportion of the database functionality, to be performed automatically (i.e. without the need for Script functions), although a comprehensive set of Database Script functions are available.

Configuring a Connection

Connections to existing databases are added to the Workspace by using a right mouse-button context sensitive menu option ‘Add Connection...’ which invokes the Add/Modify Database connection dialog. They can be modified later by selecting the 'Edit...' option from the menu.

Add/Modify Database connection dialog

The Add Connection dialog show below is show when the 'Add Connection...' menu option is selected from the Database connection editor, and the identical Modify Connection dialog when the 'Edit' menu is selected.



Name

For convenience, a unique Connection name is created automatically. This can be changed to give a more meaningful description of the connection, if required.

Data Source

Enter the database file to be used as a Data Source, or locate using the Browse button. The following data source file types are supported:

- MS-Access Files (*.mdb)
- MS-Excel Files (*.xls)
- Text Files (*.txt, *.csv)
- FoxPro Files (*.dbf)
- Data Source Names (*.dsn)

A Data Source Name file stores information about a database connection in a file. See Creating a Data Source Name file for more information.

Note: Connecting to CSV or Text files is slightly different from an actual Database connection. Only the 'Directory' that contains the required files should be supplied as a Data Source - if a file is selected, the connection will fail. The actual file to be used is specified later when configuring the Recordset. For example, if a collection of text or csv files are contained in the directory C:\Text then a valid connection 'Data Source' is "C:\Text\".

Note: Connections to CSV or Text files using the Provider installed with ADO version 2.0 are read only. Records can not be added or amended. To create a read/write connection to a CSV or Text file see chapter 13, Creating a Read/Write connection to CSV/Text file.

Connect on Application Start-up

The checkbox 'Connect on Application Start-up' provides the option of automatically connecting to the Database when the Runtime application is started.

Advanced

Shows the Connection String dialog, allowing the automatically generated connection string to be manually edited.

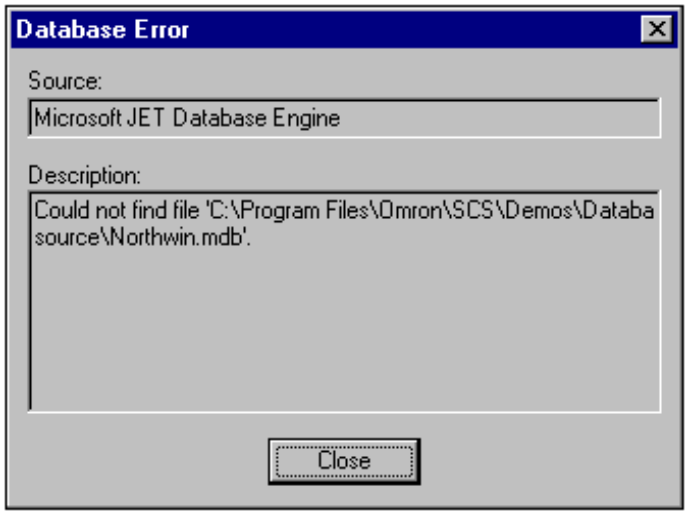
Testing Connections in the Development Environment

A connection to a Database can be made in the Development Environment by selecting the required Connection in the Tree View and then selecting the right-menu option 'Connect'. If a Connection contains Recordsets that are set to auto open, these will also be opened by the 'Connect' option. If all goes well and a valid connection is made, the Database Connection Icon will be adorned with a 'lightning bolt'. If not, then this is probably due to an error in the 'Connection String'.

Database Errors

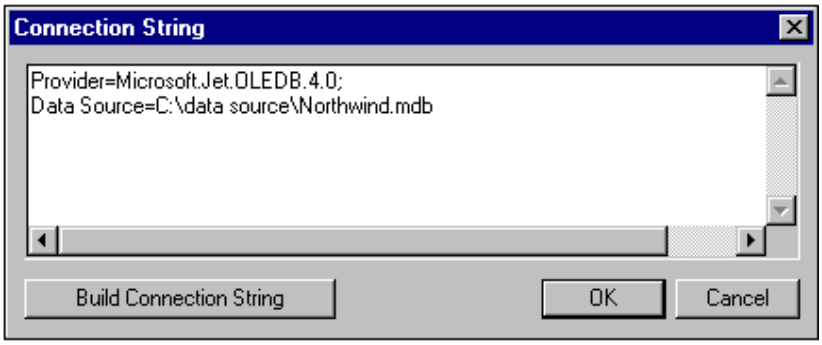
A detailed description of what type of error occurred (supplied by the underlying Data Provider) can be viewed, by ensuring that the right-menu option 'Show Error' is 'checked'. Whenever an error is generated by a Data Provider a description of the error and its source will be displayed in a Dialog. The 'Show Error' option is specific to each Connection.

Example: The following error was generated by the 'Jet Database Engine' (due to a typo in the Database name):



Database Connection String dialog

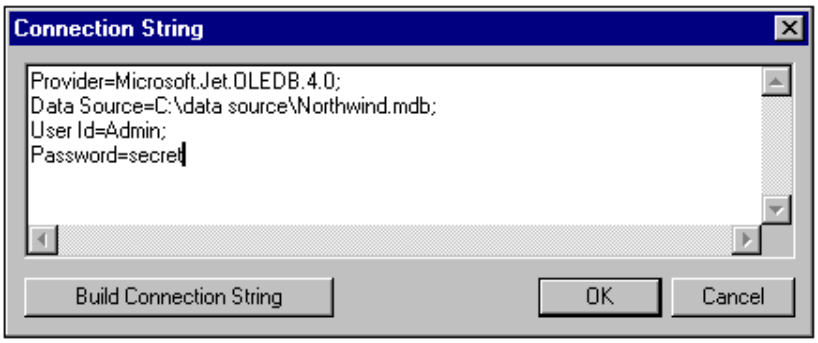
Connection to a Database is performed by means of a 'Connection String'. Because different Data Providers require different information to connect you to a data store, these strings can be quite complex and cumbersome. For this reason CX-Supervisor will automatically create a valid connection string for your selected data source (if its supported). This string can be viewed and modified via the Connection String dialog shown below, when 'Advanced' is pressed on the Add/Modify Database Connection dialog.



If your data source is not supported, or you have your own drivers for a particular database, the 'Connection String' can be modified using this dialog (consult your database documentation for the required connection string).

User Id and Passwords

If a connection to a database requires a user id or password, this can be supplied by means of the connection string, which can be modified via the Advanced Dialog as follows:



If you make a mistake while editing the 'connection string', the original string can be restored by selecting the 'Build Connection String' button. A new connection string will also be built automatically each time a change of Data Source is made.

Example Connection Strings

Listed below are some example connections strings for the listed providers:

Jet	"Provider=Microsoft.Jet.OLEDB.3.5.1; Data Source=c:\dbname.mdb"
SQL Server	"Provider=SQLOLEDB; Data Source=server_name; Initial Catalog=dbname; User Id=user_id; Password=user_password"
Index Server	"Provider=MSIDXS; Data Source=catalog_name"
DSN	"DSN=data_source_name"
FILEDSN	"FILEDSN=filename.dsn"
MSDASQL	"Driver={Microsoft Excel Driver (*.xls)}; DBQ=c:\Database\Invdb.xls"

Data providers installed with ADO V2.0

Type	Provider Name	Description
Jet 3.51	Microsoft.Jet.OLEDB.3.51	For Microsoft Access databases
Directory Services	ADSDSOObject	For resource data stored, such as Active Directory, this will become more important when NT5.0 is available.

Index Server	MSIDXS	For Microsoft Index Server.
ODBC Drivers	MSDASQL	For existing ODBC Drivers, this ensures that legacy data is not omitted.
Oracle	MSDAORA	Native Oracle driver simplifies access to existing Oracle data stores.
SQL Server	SQLOLEDB	For Microsoft SQL Server.
Data Shape	MSDataShape	For hierarchical recordsets, this allows the creation of master/detail type recordsets, which allow drilling down into detailed data.
Persisted Records	MSPersist	For locally saved recordsets.
Simple Provider	MSDAOSP	For creating your own providers for simple text data.

The above is just the list of standard providers supplied by Microsoft. Other vendors are actively creating their own.

Creating a Data Source Name file

A Data Source Name file (or DSN for short) stores information about a database connection in a file. The file has the extension .DSN and by default is stored in the the "$\Program Files\Common Files\ODBC\Data Sources" directory. This type of file can be viewed with a suitable text editor e.g. "Notepad". One advantage of using a DSN file over specifying the full path of the database is that the DSN file remains unchanged while its contents can be re-configured to reflect any changes in directory or database file name etc.

Creating a New DSN

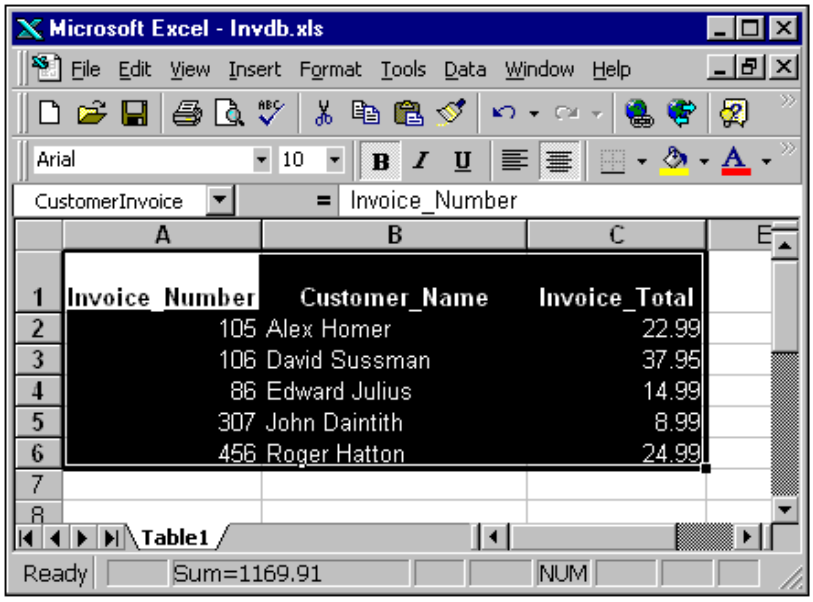
- From your Windows ‘Control Panel’, select the ODBC Data Sources icon. This will show the ODBC Data Source Administrator dialog box.
- Click on the 'File DSN' tab. Any Data Source Names already defined will be listed.
- Click on 'Add' to create a new Data Source Name file. This will invoke the Create New Data Source dialog box with a list of available drivers (only drivers that are installed on your machine will be shown).
- Choose the driver to access the data source and select ‘Next >’.
- You will then be prompted to name your Data Source. Type a suitable name and select ‘Next >’
- Verify the information shown and select 'Finish' to complete this part of the operation.
- Depending on the driver selected, you may be prompted for details of the database you wish to connect to.
- A new DSN file will now exist which can be used by CX-Supervisor to Create a Connection.

Creating a Read/Write connection to CSV/Text file

Connections to CSV or Text files using the Provider installed with ADO version 2.0 are read only hence Records can not be added or amended. CSV and Text files can be updated by converting the data into an Excel spreadsheet and accessing the file via the ODBC DSN driver. This is achieved by carrying out the following steps:

- Create a File DSN for the required CSV/Text file with the following options (see 13.3.5 Creating a Data Source Name file)
- Select the Microsoft Excel Driver (*.xls). If this option does not exist, you will need to install the Microsoft ODBC driver for Excel from the Excel setup.
- Ensure that the "Read Only" check box is clear.
- Load the CSV/Text data into an Excel spreadsheet and create a table to access the data by creating a Named Range as follows:
- Highlight the row(s) and column(s) area where your data resides (including the header row).
- On the 'Insert' menu, point to 'Name', click 'Define' and enter a name for your range.
- Create a connection in the Workspace specifying the File DSN as its source.
- Add a Recordset to the connection and select the Named Range (which will appear in the list of available tables, if the connection is live) as the Table name, records in this table can now be added or modified as with any other database table (Note: If records are added to this type of table the Named Range will increase in size accordingly).

The example below demonstrates a valid range selection named: "CustomerInvoice":



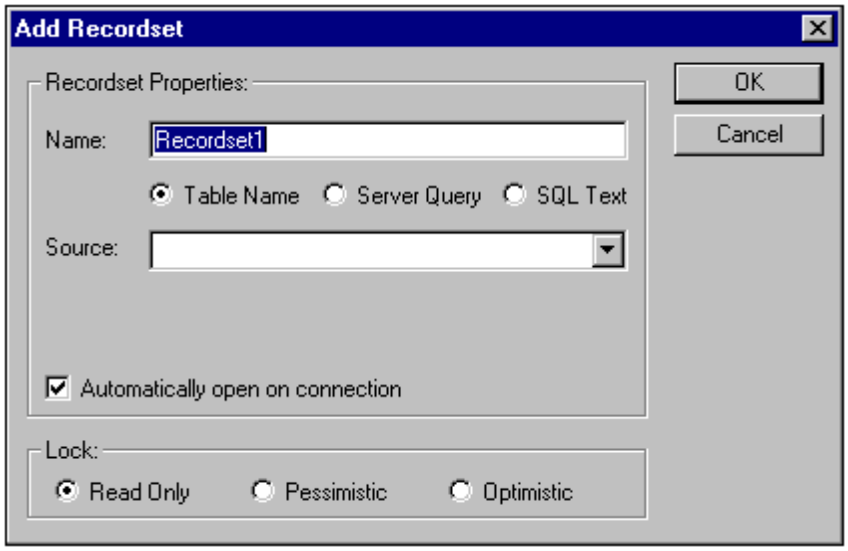
Note: The first row of the range is assumed to contain the Column Headings. When updating files the column headings cannot contain numbers or spaces, for example "Column1" or "Invoice Total" are invalid. Also some words are reserved and can not be used, for example a column heading of "Number" will cause an error. These restrictions do not apply when only reading these files.

Note: Make sure that all the cells in a column are of the same data type. The Excel ODBC driver cannot correctly interpret which data type the column should be if a column is not of the same type, or you have types mixed between "text" and "general".

Note: This type of querying and updating information in an Excel Spreadsheet does not support multi-user concurrent access.

Configuring Recordsets

The Recordset is the heart of the Database facility, it contains all of the columns and rows returned from a specific action. The Recordset is used to navigate a collection of records, and update, add, delete or modify records. Once a Connection has been added to the Workspace, the right menu option 'Add Recordset...' will be enabled. Selecting this option will invoke the following dialog:



Name

A unique Recordset name will be automatically provided. This can be modified to provide a more meaningful name if required.

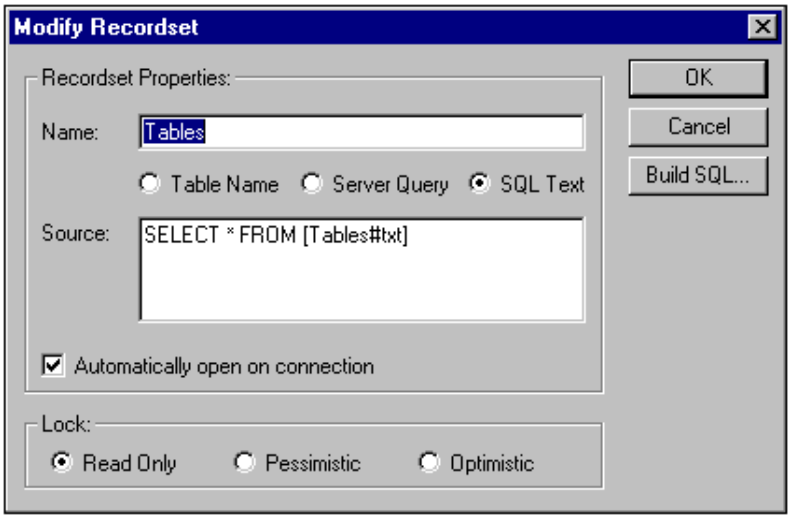
Recordset Type

The Recordset can be 1 of 3 types:

Table Name	The Recordset is the name of an actual table in the Database.
Server Query	The Recordset is the results of a pre-defined Server Query stored in the database.
SQL Text	The Recordset is the results of an SQL query executed when the Recordset is opened.

Note: It is more efficient to run a Server Query than an SQL query.

Note: For Database connections all three of the above options are available, but for Text or CSV connections only one option is available, namely 'SQL Text'. For convenience, a facility is provided for automatically building the required SQL Text for this type of connection. This facility is invoked from the 'Build SQL...' button shown below:



This will bring up a dialog with a list of all valid files in the 'Directory' specified for the Connection. After choosing a file and exiting from the 'Build SQL' dialog the required SQL Text is built. In the above example, the file 'Tables.txt' was chosen, but this will be written as Tables#txt in the SQL Text as most Providers will not accept the '.' character, because it is used as a delimiter.

Source

The source field shows the Table name, Server Query or SQL text as selected above which the Recordset is linked to.

Automatically open on connection

If this checkbox is ticked the Recordset will be automatically opened when the Connection is opened. If this is unchecked, the Recordset must be open with a script command.

Lock

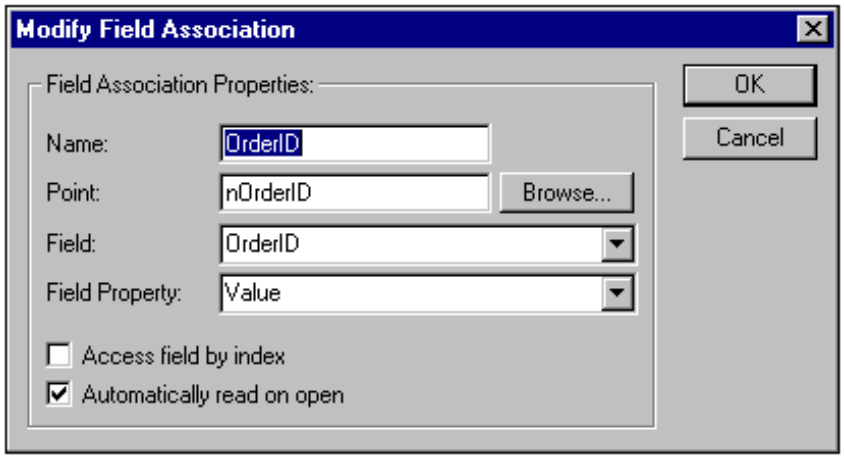
The lock option enables the Recordset to be opened in either read only or read/write modes, there are two type of read/write locks as defined below:

Read Only	The default lock is read only i.e. data cannot be changed.
Pessimistic	Locks records when you start editing and releases the lock when Update() (or Cancel()) is called, no need to worry about a conflict with other users, but can cause records to be locked for long periods of time preventing other users from accessing the same records.
Optimistic	Locked only when the Update() method is called, therefore changes can be made to records without creating a lock, conflicts have to be catered for because someone else might have changed the record between the time you started editing and the time you called Update().

Note: If the Connection is open when a Recordset is added the Combo boxes for 'Table Name' and 'Server Query' will be automatically populated with valid entries for the selected Database. When the 'Add Recordset...' dialog is closed an attempt will be made to open the newly configured Recordset.

Configuring Field Associations

Field associations provide a means of connecting CX-Supervisor Points with fields (i.e. columns of data) in a Recordset, thus enabling data transfers to be made between Points and Records. By creating a Field Association for each field in a record, data can easily be read from a record in the database to its associated points, and written from the points to the current record in the database. Once a Recordset has been added to a Connection in the Workspace, the right menu option 'Add Field...' will be enabled. Selecting this option will invoke the following dialog:



Name

A unique Field name will be automatically provided. This can be modified to provide a more meaningful name if required.

Point

The name of the point that will be used in data transfers. The Browse button may be used to select a current point, or add a new one.

Field

The name of the Recordset field to be associated with the above point. If the Recordset is open, this list will automatically show all available fields.

Field Property

The type of information from the field to be transferred, the following options are available:

Value	default - the assigned value of the field
Name	the name of the field / column title
Type	the fields Data Type
Size	the maximum width of the field
Add	used to add new fields to a record

Note: The Name, Type and Size properties are fixed for all entries of the column, whereas the field value depends on the current position of the Recordset.

Note: The 'Add' property is specifically designed to enable fields to be added together to create new records. They are not involved in any read operations, as with the other field property types. For this reason, the 'Automatically read on open' checkbox is disabled when this type is applied. When creating configurations to add new records you will need to create a 'Add' association for every field required to 'create' a valid record i.e. primary keys, non-null values etc. need to be catered for. See DBAddNew() for more details.

Access field by index

When checked, a numeric index is used to identify a particular field instead of its name. This is useful if you want to configure generic field associations.

Automatically read on open

When checked, the data is transferred from the Recordset field to the associated point, when the Recordset is opened.

Field Paging

You can work with a single record at a time by associating points with the required fields, and process the data one record at a time. However, if the point specified is an Array point the whole array will be processed i.e. multiple fields will be read, written or added. This concept is called Paging. Paging is supported by the Database script functions, enabling you to manipulate and navigate the database a page at a time. CX-Supervisor determines the page size, by using the number of elements in the Array point used in Field Associations, i.e. if an array point with 10 elements is used then a page size of 10 will be used. In order for paging to work sensibly, you should ensure that all array points used in multiple field associations for a particular Recordset are of the same size. If arrays, of differing length are used, the smallest array size will be adopted as the page size.

Note: Paging only operates on Field Associations that have the Property Type 'Value' selected, this enables you to have Field Associations with a Property Type of 'Name' or 'Add' associated with single points in the same Recordset, without effecting the page size determined by the array points.

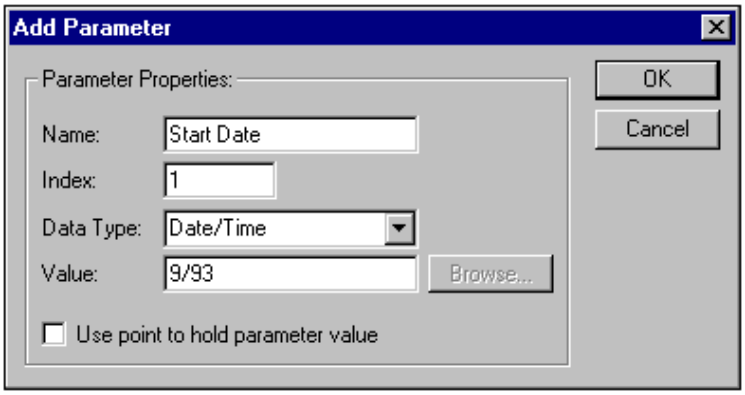
Note: Paging is designed to operate at the Recordset level (the concept of levels is explained in the chapter on DB Script functions). If you perform a Read operation on a recordset that has paging in force, then a 'page' of records will be read into all the Field Associations connected to the Recordset. In contrast to performing a read operation at the Field level which will override the page size and use the individual fields length.

Configuring Parameter Associations

When a Recordset which is defined as a Server Query is opened, the query is executed, and the set of records produced. The Server Query may be defined in the database as requiring parameters to be passed which allow criteria to be passed to the query. Recordsets defined in CX-Supervisor as Server Queries may have Parameter Associations added to the recordset. Recordsets defined as a Table Name or SQL Text do not use parameters, hence any Parameter Associations are ignored.

Parameter associations provide a means of supplying values to parameters whenever a Server Query is run. Each required parameter defined within the query is associated with a point or constant value. At the time the Query is run, the current value of the point (or the constant value) is passed to the query. Under the Development Environment the points default value is used.

Parameter Associations are added by right-clicking the Recordset and selecting 'Add Parameter...' from the popup menu. The following dialog is shown:



Name

A unique Parameter Association name will be automatically provided. This can be modified to provide a more meaningful name if required. By convention, this is made the same as the name of the parameter defined within the database but this is not essential.

Index

The index is used to determine which parameter in the Query to associate the value with. The index is automatically incremented for each parameter that is added to the Recordset.

Data Type

The Data Type list will be populated with a selection of available data types. The correct data type for the parameter being configured must be selected, otherwise the Recordset will fail to open.

Use point to hold parameter value

When unchecked, the constant Value specified is passed as the parameter to the query. When checked, the current value of the point is passed as the parameter.

Point

The name of the point to be used. The Browse button may be used to select a current point, or add a new one.

Value

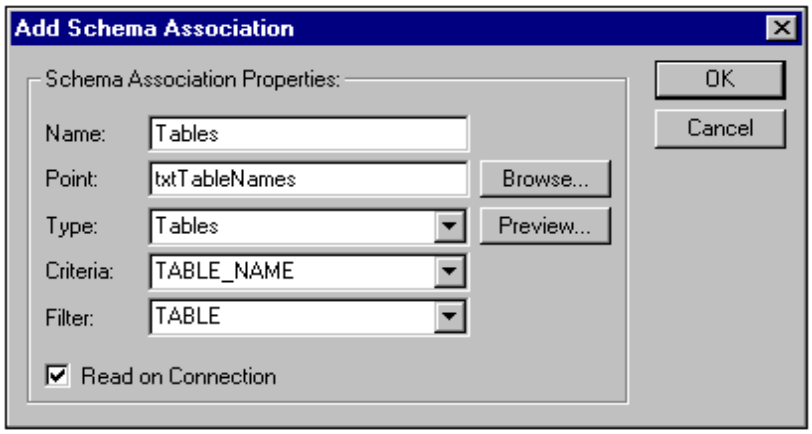
The constant value to be used.

Configuring Schemas

Schemas enable information about a Database to be obtained from a Provider. There are a large number of Schema Types available. The most useful feature of schemas is the ability to obtain Table and Query names from the Database, in fact schemas are used by the Development Environment to populate the Combo boxes when working with 'live' connections.

The information to be returned from the Provider is determined by specifying a Schema Type and a Criteria. The Criteria argument is an array of values that can be used to limit the results of a schema query. Each Schema type has a different set of Criteria that it supports.

A Schema is configured by selecting the desired Connection and choosing the right menu option 'Add Schema...' to invoke the following dialog:



Name

A unique Schema name will be automatically provided. This can be modified to provide a more meaningful name if required.

Point

The name of an array point which will hold the results of the schema request. The Browse button may be used to select a current point, or add a new one.

Type

The Type list will be populated with a selection of available Schema Types.

Criteria

The Criteria list shows the available Criteria for the given Schema Type.

Filter

The Filter list is used with certain Schema types to reduce the information returned.

Read on Connection

If checked, the Schema results are automatically obtained when successful connection to the database is achieved.

Preview

If the Connection is live, then the Preview button will be enabled on the dialog, which allows you to view the results of the configured Schema.

The Schema 'Type', 'Criteria' and 'Filter' values can be modified at Runtime via the DBSchema() function.

Database Schema Types

The Database Schema types supported in ADO are:

Schema Type values	Criteria Values
Schema Asserts	CONSTRAINT_CATALOG CONSTRAINT_SCHEMA CONSTRAINT_NAME
Schema Catalogs	CATALOG_NAME
Schema Character Sets	CHARACTER_SET_CATALOG CHARACTER_SET_SCHEMA CHARACTER_SET_NAME
Schema Check Constraints	CONSTRAINT_CATALOG CONSTRAINT_SCHEMA CONSTRAINT_NAME
Schema Collations	COLLATION_CATALOG COLLATION_SCHEMA COLLATION_NAME
Schema Column Domain Usage	DOMAIN_CATALOG DOMAIN_SCHEMA DOMAIN_NAME COLUMN_NAME
Schema Column Privileges	TABLE_CATALOG TABLE_SCHEMA TABLE_NAME COLUMN_NAME GRANTOR GRANTEE

Schema Type values	Criteria Values
Schema Columns	TABLE_CATALOG TABLE_SCHEMA TABLE_NAME COLUMN_NAME
Schema Constraint Column Usage	TABLE_CATALOG TABLE_SCHEMA TABLE_NAME COLUMN_NAME
Schema Constraint Table Usage	TABLE_CATALOG TABLE_SCHEMA TABLE_NAME
Schema Foreign Keys	PK_TABLE_CATALOG PK_TABLE_SCHEMA PK_TABLE_NAMEFK_TABLE_CATALOG FK_TABLE_SCHEMA FK_TABLE_NAME
Schema Indexes	TABLE_CATALOG TABLE_SCHEMA INDEX_NAME TYPE TABLE_NAME
Schema Key Column Usage	CONSTRAINT_CATALOG CONSTRAINT_SCHEMA CONSTRAINT_NAME TABLE_CATALOG TABLE_SCHEMA TABLE_NAME COLUMN_NAME
Schema Primary Keys	PK_TABLE_CATALOG PK_TABLE_SCHEMA PK_TABLE_NAME
Schema Procedure Columns	PROCEDURE_CATALOG PROCEDURE_SCHEMA PROCEDURE_NAME COLUMN_NAME
Schema Procedure Parameters	PROCEDURE_CATALOG PROCEDURE_SCHEMA PROCEDURE_NAME PARAMTER_NAME
Schema Procedures	PROCEDURE_CATALOG PROCEDURE_SCHEMA PROCEDURE_NAME PROCEDURE_TYPE
Schema Provider Specific	See Remarks

Schema Type values	Criteria Values
Schema Provider Types	DATA_TYPE BEST_MATCH
Schema Referential Constraints	CONSTRAINT_CATALOG CONSTRAINT_SCHEMA CONSTRAINT_NAME
Schema Schemata	CATALOG_NAME SCHEMA_NAME SCHEMA_OWNER
Schema SQL Languages	<none>
Schema Table Constraints	CONSTRAINT_CATALOG CONSTRAINT_SCHEMA CONSTRAINT_NAME TABLE_CATALOG TABLE_SCHEMA TABLE_NAME CONSTRAINT_TYPE
Schema Table Privileges	TABLE_CATALOG TABLE_SCHEMA TABLE_NAME GRANTOR GRANTEE
Schema Tables	TABLE_CATALOG TABLE_SCHEMA TABLE_NAME TABLE_TYPE
Schema Translations	TRANSLATION_CATALOG TRANSLATION_SCHEMA TRANSLATION_NAME
Schema Usage Privileges	OBJECT_CATALOG OBJECT_SCHEMA OBJECT_NAME OBJECT_TYPE GRANTOR GRANTEE
Schema View Column Usage	VIEW_CATALOG VIEW_SCHEMA VIEW_NAME
Schema View Table Usage	VIEW_CATALOG VIEW_SCHEMA VIEW_NAME
Schema Views	TABLE_CATALOG TABLE_SCHEMA TABLE_NAME

Note: The actual schemas are defined by the OLE DB specification and Providers are not required to support all of the OLE DB standard schema queries. Specifically, only 'Schema Tables', 'Schema Columns', and 'Schema Provider Types' are required by the OLE DB specification. However, the provider is not required to support the Criteria constraints listed above for those schema queries.

Using Transactions

Modifications of data in the database i.e. adding, modifying and deleting records, can be grouped so that all modifications take place at the same time. This group of modifications is called a Transaction. A Transaction includes any modifications to data in a connection, regardless of the Recordset. A transaction is started by calling DBExecute with the 'BeginTrans' command. From that point, any request to add, modify or delete records are stored instead of being immediately processed. The Transaction is completed either by calling DBExecute with the 'CommitTrans' command, which processes all the stored requests in one go, or by calling DBExecute with the 'RollbackTrans' command, which discards all the stored requests leaving the database as it was when the Transaction started.

Nested Transactions

Transactions may be nested, that is a new transaction may be started before the preceeding transaction has been completed. In this case, any 'CommitTrans' or 'RollbackTrans' commands relate to the most recently started transaction, and any further 'CommitTrans or 'RollbackTrans' commands relate to the transaction begun before it.

Note: Care should be taken to ensure that each 'BeginTrans' is matched with a 'CommitTrans' or 'RollbackTrans' to ensure that your work is saved or discarded as required. If there are any pending transactions when a connection is closed, the user will be prompted to either commit or rollback these outstanding transactions. A DBExecute command 'TransCount' is available which returns the number of pending transactions.

Note: Not all Providers support use of Transactions.

Saving Recordsets as XML

Using the DBExecute() 'Save' command any Recordset may be saved as an XML file, to be imported in to another application. XML resembles and complements HTML. XML describes data, such as city name, temperature and barometric pressure, and HTML defines tags that describe how the data should be displayed, such as with a bulleted list or a table. XML, however, allows developers to define an unlimited set of tags, bringing great flexibility to authors, who can decide which data to use and determine its appropriate standard or custom tags.

Example: XML is used to describe an Employees phone list:

```
<EmployeeList>
      <Entry>
            <Employee>John Jones</Employee>
```

```
            <Phone>555-1213</Phone>
            <Type>Mobile</Type>
        </Entry>
        <Entry>
            <Employee>Sally Mae</Employee>
            <Phone>555-1217</Phone>
            <Type>Business Fax</Type>
        </Entry>
</EmployeeList>
```

You can use an application with a built in XML parser, such as Microsoft® Internet Explorer 5 to view XML documents in the browser just as you would view HTML pages.

Datashaping

The ADO SHAPE command can be used to produce hierarchical recordsets i.e. where a value within the current record is used to access another Recordset. For example, a record showing Customer Details might contain a field for Customer ID. Every time the record position is changed, a child Recordset showing Orders for that Customer ID could be recreated.

Hierarchical recordsets present an alternative to using JOIN syntax when accessing parent-child data. Hierachical recordsets differ from a JOIN in that with a JOIN, both the parent table fields and child table fields are represented in the same recordset. With a hierarchical recordset, the recordset contains only fields from the parent table. In addition, the recordset contains an extra field that represents the related child data, which you can assign to a second recordset variable and traverse.

Hierachical recordsets are made available via the MSDataShape provider, which is implemented by the client cursor engine.

A new clause, SHAPE, is provided to relate SELECT statements in a hierarchical fashion. The syntax is summarized below: (for a full description of the syntax see Appendix D).

```
SHAPE {parent-command} [[AS] name]
APPEND ({child-command} [[AS] name] RELATE parent-field TO child-
field)
[,({child2-command} ...)]
```

Note: By default, the child recordsets in the parent recordset will be called Chapter 1, Chapter 2, etc., unless you use the optional [[AS] name] clause to name the child recordset.

Note: You can nest the SHAPE command. The {parent-command} and/or {child-command} can contain another SHAPE statement.

Note: The {parent-command} and {child-command} do not have to be SQL SELECT statements. They can use whatever syntax is supported by data provider.

Note: A child recordset will be automatically opened/closed whenever its Parent recordset is opened/closed. A child recordset is effectively a field of its parent recordset therefore whenever a new record is selected in the parent a new child recordset will be generated.

Creating a Datashape connection.

- Create DSN file specifying the required database as the Data Source
- Configure a Connection to the DSN file. In the connection string type
  Provider=MSDataShape;
  FILEDSN=<your file name>.dsn
- Configure a Recordset as SQL Text and enter the required shape command as the Source. (See Datashape Source examples).
- After successfully adding a Datashape Recordset it is now possible to add a Child Recordset to the existing Recordset by selecting the right menu option 'Add Recordset' which will now be enabled. If the Connection is 'Live' a list of valid child recordset names will be entered in the Source ComboBox
- Field associations can be added to Child recordsets in the normal manner.

Child recordsets can be accessed via Script command in a similar manner to normal recordsets

```
bResult = DBState( "DataShape.Customers.Orders.Details", "Open" )
```

Note: Child recordsets are not supported in the Database function dialog

Simple Relation Hierarchy example:

```
SHAPE  {select * from customers}
APPEND ({select * from orders} AS rsOrders
     RELATE customerid TO customerid)
```

The parent recordset contains all fields from the Customers table and a field called rsOrders. rsOrders provides a reference to the child recordset, and contains all the fields from the Orders table. The other examples use a similar notation.

Compound Relation Hierarchy example:

This sample illustrates a three-level hierarchy of customers, orders, and order details:

```
SHAPE  {SELECT * from customers}
APPEND ((SHAPE  {select * from orders}
     APPEND ({select * from [order details]} AS rsDetails
         RELATE orderid TO orderid)) AS rsOrders
     RELATE customerid TO customerid)
```

In addition to the Simple Relation Hierarchy example, the Order ID is now used to create a recordset containing the order details for the shown order.

Hierarchy with Aggregate example:

```
SHAPE  (select * from orders}
APPEND ({select od.orderid, od.UnitPrice * od.quantity as
ExtendedPrice
   from [order details] As od}
      RELATE orderid TO orderid) As rsDetails,
      SUM(ExtendedPrice) AS OrderTotal
```

This example creates a Recordset of all the orders and their details, and adds a field called ExtendedPrice to store the total order value for each record, and sums all the ExtendedPrice values which is stored in Order Total.

Group Hierarchy example:

```
SHAPE  {select customers.customerid AS cust_id, orders.*
   from customers inner join orders on customers.customerid =
   orders.customerid} AS rsOrders
COMPUTE rsOrders BY cust_id
```

Group Hierarchy with Aggregate example:

```
SHAPE
   (SHAPE {select customers.*, orders.orderid, orders.orderdate from
      customers inner join orders on customers.customerid =
      orders.customerid}
   APPEND  ({select od.orderid,
    od.unitprice * od.quantity as ExtendedPrice from [order details]
    as od} AS rsDetails
   RELATE orderid TO orderid),
   SUM(rsDetails.ExtendedPrice) AS OrderTotal) AS rsOrders
COMPUTE  rsOrders,
        SUM(rsOrders.OrderTotal) AS CustTotal,
        ANY(rsOrders.contactname) AS Contact
BY  customerid
```

Note: The inner SHAPE clause in this example is identical to the statement used in the Hierarchy with Aggregate example.

Multiple Groupings example:

```
SHAPE
    (SHAPE  {select customers.*,
        od.unitprice * od.quantity as ExtendedPrice from (customers
        inner join orders
    on customers.customerid = orders.customerid) inner join
         [order details] as od on orders.orderid = od.orderid}
              AS rsDetail
        COMPUTE ANY(rsDetail.contactname) AS Contact,
                ANY(rsDetail.region) AS Region,
                SUM(rsDetail.ExtendedPrice) AS CustTotal,
                rsDetail
        BY customerid) AS rsCustSummary
COMPUTE rsCustSummary
BY      Region
```

Grand Total example:

```
SHAPE
  (SHAPE  {select customers.*,
   od.unitprice * od.quantity as ExtendedPrice from (customers inner
   join orders on customers.customerid = orders.customerid) inner
join
         [order details] as od on orders.orderid = od.orderid}
            AS rsDetail
   COMPUTE ANY(rsDetail.contactname) AS Contact,
          SUM(rsDetail.ExtendedPrice) AS CustTotal,
               rsDetail
        BY customerid) AS rsCustSummary
COMPUTE SUM(rsCustSummary.CustTotal) As GrandTotal,
        rsCustSummary
```

Note: The missing BY clause in the outer summary. This defines the Grand Total because the parent rowset contains a single record with the grand total and a pointer to the child recordset.

Grouped Parent Related to Grouped Child example:

```
SHAPE
  (SHAPE  {select * from customers}
     APPEND ((SHAPE {select orders.*, year(orderdate) as OrderYear,
        month(orderdate) as OrderMonth from orders} AS rsOrders
            COMPUTE rsOrders
              BY customerid, OrderYear, OrderMonth)
               RELATE customerid TO customerid) AS rsOrdByMonth )
        AS rsCustomers
COMPUTE rsCustomers
BY  region
```

Chapter 14
Using CX-Supervisor as an OPC Client

This chapter introduces OPC Server to a new user, and explains how to use CX-Supervisor as an OPC Client.

What is OPC?

OPC stands for **O**LE for **P**rocess **C**ontrol, and is a standard published by the OPC Foundation. The basic aim of the OPC standard is to allow hardware vendors to produce software drivers (called OPC Servers) and for software vendors to produce applications (called OPC Clients) which use a standard method for data interchange. This allows software and hardware from different vendors to be used together.

The latest version of the OPC standard is version 2. This replaces the earlier version 1 standard.

CX-Supervisor uses an OPC version 2 interface to connect to an OPC Server which is version 2 compliant. Note that the OPC version 1 interface has been superseded, and is not supported.

Users of CX-Supervisor may need some basic understanding of OPC. For more information on OPC, see the OPC Foundation web site at www.opcfoundation.org.

For instructions on configuring your DCOM settings for connection to remote PCs, see Appendix A.

Using CX-Supervisor with Omrons OPC Server

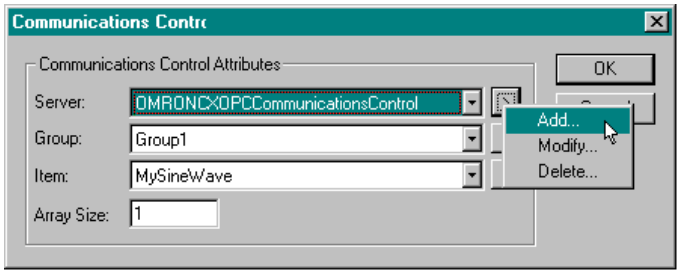
Omron supply a version 2 compliant server as part of the CX-Server OPC product.

Start the Omron OPC Server and configure as described in the CX-Server OPC manual and note that the CX logo is displayed in the system tray.

1, 2, 3…

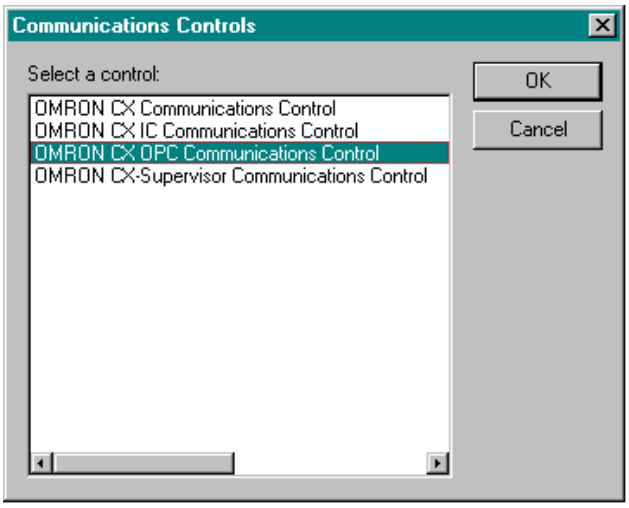
1. Start CX-Supervisor and open your application.
2.  Open the Point Editor by selecting the Point Editor option from the Utilities menu or by clicking the toolbar button.
3.  In the Point Editor dialog click the Add Point button in the toolbar to open the Add Point dialog.
4. In the Add Point dialog move to the **I/O Type:** options and select either the Input, Output or Input / Output option as appropriate. Note that the **I/O Update Rate:** and **I/O Attributes:** options and displayed.
5. In the **I/O Attributes:** options select **OPC/Other** and click the Setup button. This will open the Communications Control Attributes dialog.
6. In the Communications Control Attributes dialog enter the appropriate parameters as follows:

Communications Control Attributes



Server: This shows the name of the communications object to connect to the server i.e.OMRONCXOPCCommunicationsControl. If you wish to use a different object make your selection from the drop down list. To Add, Modify or Delete an object click the Info button.

Selecting the Add option will open the Communications Control dialog. From the list of control objects select the one to be added and click the OK button.



Clicking the OK button in the Communications Control dialog will open the Communications Control Properties dialog from where the server details can be added or updated. To edit these properties later select Modify from the Info menu.

Group: Select the Group containing the required item from the dropdown list. To Add, Modify or Delete a Group click the Info button.

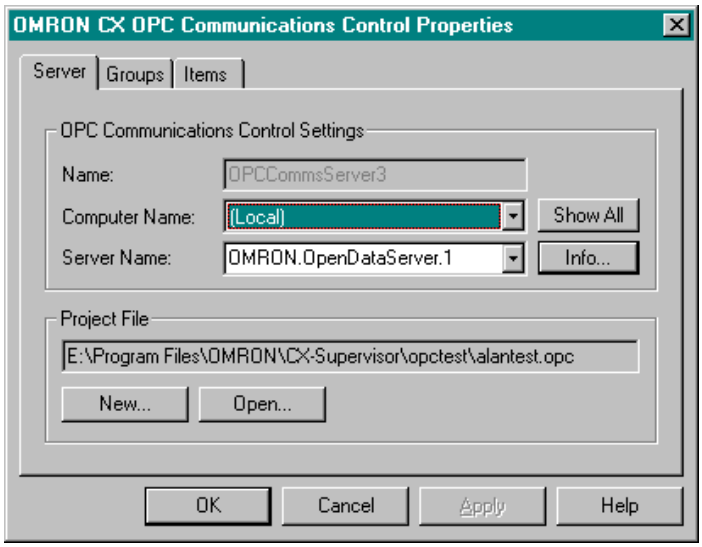
Items: The Items within the selected Group are listed. The Item Attributes dialog can be used to add or edit the items. To Add, Modify or Delete an Item

click the Info button. Selecting the Add or Modify option will open the Items Attributes window from where the item details can be added or updated.

Array Size: Enter the number of array elements in the CX-Supervisor point that this item should have. If not an array, enter 1.

1) OPC COMMUNICATIONS CONTROL PROPERTIES

a) **Server Tab** The options in this window allow you to select the correct name of the computer with the OPC Server and select the appropriate server, i.e. Omron.OpenDataServer.1.



OPC Communication Control Settings

Name: – This is the name of the selected communications control. The default name for the first control is OMRONCXOPCCommunicationsControl. For each additional control added the number increments by one.

Computer Name: – This shows the system name for the computer with the OPC server. If the server is on the same computer as CX-Supervisor, set to '(Local)'. If the OPC server is on a remote computer click the Show All button and select the correct name from the list. If you can not identify the PC in the list contact your system administrator.

Server Name: – This shows the names of the OPC Version 2 compliant servers installed on the specified computer. Make your selection from the drop down list. Clicking the Info button opens the Server Status Information dialog for the selected server, check the information is correct and click the OK button.

Project File

This is the name of the current Project file which stores the setup of the OPC items. If no name is shown or it is incorrect click the New or Open button as appropriate.

Clicking the **Open…** button opens the Open Project dialog from where you can navigate to the project file you wish to open. If you want to create a new file click the New… button to open the Create Project dialog. In the Create Project dialog navigate to the directory in which you want to create your new file and enter your File Name. Select the appropriate file type (Save as type – i.e. File Name.opc) and click the Save button.

Note that a Project File name can not be entered from the keyboard, files names can only be entered by using the New or Open buttons.

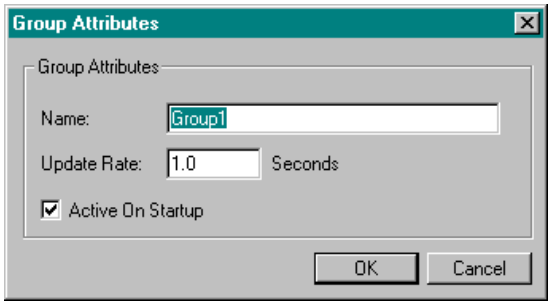
b) **Groups Tab** The groups within the selected project file are listed. A Group is made up of one or more items (data points) that share a common update, rate enabling them to be controlled as a single entity. For example you could create any number of groups each containing Items that have the same update rate.

There is no limit to the number of groups you can have in a Project File and each group can contain any number or type of Items (data points) provided they have the same update rate.

Note that this dialog can not be opened until a valid project file exists in which to create the groups.

Groups: – Use the Add, Edit and Delete buttons to show the Group Attributes dialog and update the list of groups. For identification purposes groups should be given logical names. The defaults are Group1, Group2 etc.

i) GROUP ATTRIBUTES



Name: – This is the name of the selected group. If you are editing an existing group name or creating a new one the current or default name is overwritten. The default name for new groups are Group1, Group2 etc.

Update Rate: – This is the rate at which the Items (data points) in the group will be interrogated and new data entered if it is a readout, or read from if it's a control. Enter the rate as a numerical value and select the units from the drop down list. The minimum value is 100msec, the maximum is 99999Sec i.e. over 27 hours.

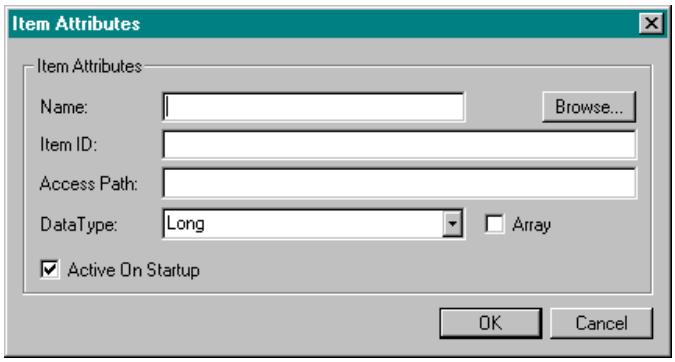
Active On Startup: – Checking this option will make the Group active when the OPC server is started. This means the items contained within will be able to read and write data. The default is checked.

c) **Items Tab** The Items within the selected group are listed. Items are data points of information stored in the OPC Server. The Item Attributes dialog can be used to add or edit the items.

Note that this dialog can not be opened until at least one group is added.

i) **ITEM ATTRIBUTES**

The Item Attributes dialog enables you to define the attributes of each Item (data point) in the selected group.



Name: – This is the client name for an Item i.e. a point of data. If the name is not known click browse button to open the Workspace Browser dialog.

Item ID: – This is the OPC Servers name for the data. Consult the documentation for the server to determine the correct format. For the server included with CX-Server OPC, this should be the name of the point in the CX-Server project (.CDM) file configured in the server.

Access Path: – This is the full path name for the data point.

Consult the documentation for the server to determine the correct format. For the server included with CX-Server OPC this field is not used, and may be left blank.

Data Type: – From the drop down menu select the format used to record the data point information.

Active On Startup: – Checking this option will ensure the Item is active when the OPC server is started. The default is checked.

7. Having checked that all the parameters are correct bring control back to the Point Editor window by closing any attributes window that may be open.

The application can now be run by clicking on the **Run Project** button in the toolbar. Note that the OPC Server logo is displayed momentarily as the server starts. The CX-Supervisor Point will now be connected to the OPC Server and can be used like all other CX-Supervisor points, i.e. to drive animations, in alarm expressed, in recipes, for data logging etc.

Using with Third Party OPC Servers

The exact procedure for connecting CX-Supervisor to Third Party OPC Servers will depend on the server being used. Consult your server documentation for full details. However, the following is a basic overview:

1, 2, 3…

1. Start and configure the OPC Server as appropriate.

2. Start CX-Supervisor and follow steps 2 – 6 above as for connecting to Omrons OPC Server, but select the required OPC Server name or type the name directly into the Server Name field.
   Note: If the server is not shown in the drop down list, the server may not be fully OPC version 2 compliant. Check the server documentation.
3. Create an OPC Group as described in '**1-b-i**' Group Attributes' above.
4. Create an OPC Item as described in '**1-c-i**' Item Attributes' above. If the server supports OPC item browsing facilities, click Browse to browse the OPC Server to list the namespace groups and items to create the OPC Item ID. Otherwise, type the OPC Item ID in the format specified in the server documentation.

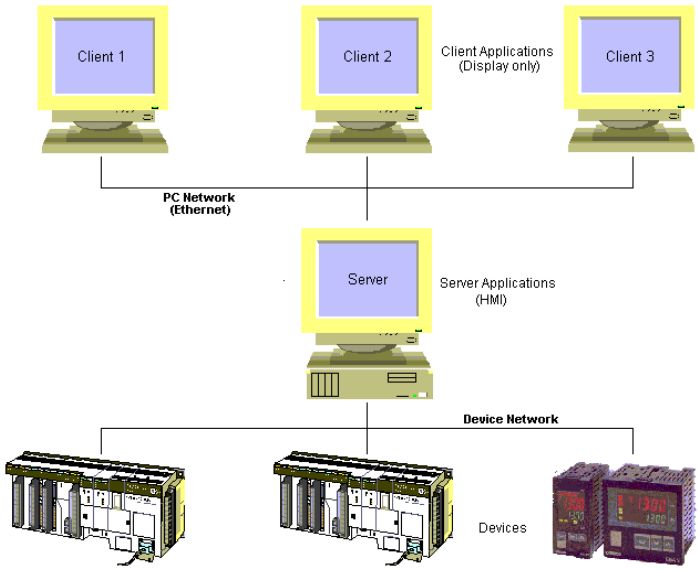
Chapter 15
Connecting to a Remote CX-Supervisor application

This chapter explains how to connect multiple CX-Supervisor applications together to form a distributed solution. Point data from one application can be 'shared' directly with other CX-Supervisor applications across the PC network. Depending on the requirements, there are many reasons and topographies for interconnecting CX-Supervisor applications.

Two Tier, Client - Server or Master - Slave

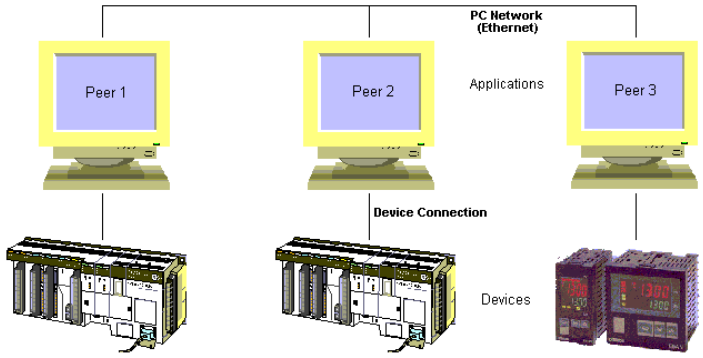
One application is configured as a *Server* application or *Master*. The *Server* is often the main station, and is permanently switched on, and often used locally for HMI for example but could have no graphical element, which is termed a *Blind Server*. It has direct access to the Devices or Device network and is responsible for collecting the data from the devices.

Other applications may connect to the *Server* to read and even control values in the Server. These applications are called *Client* applications or *Slaves*. *Client*s are often used remotely and therefore are often configured 'display-only' applications, transferring the data from the Server using the corporate PC network. The *Clients* do not talk directly to the devices, and often only connect when required.



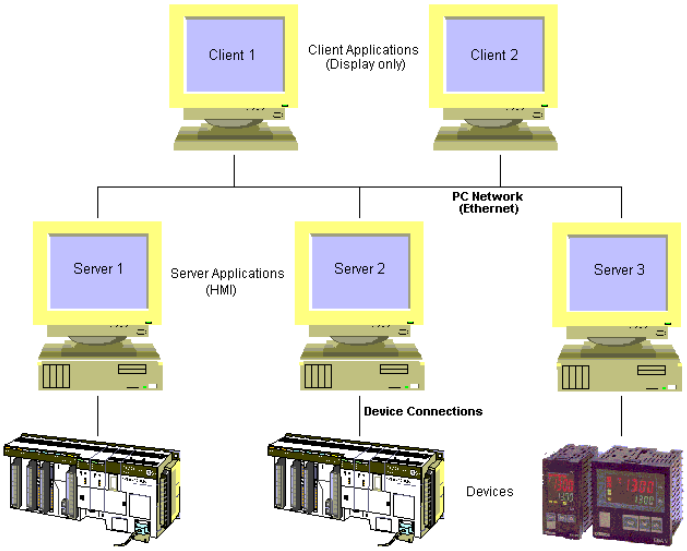
Peer to Peer

Several applications are written to share data with each other. Actually, an application is written as a Server to connect directly to a device, but is also a Client using other Servers to connect to other devices through the corporate network.



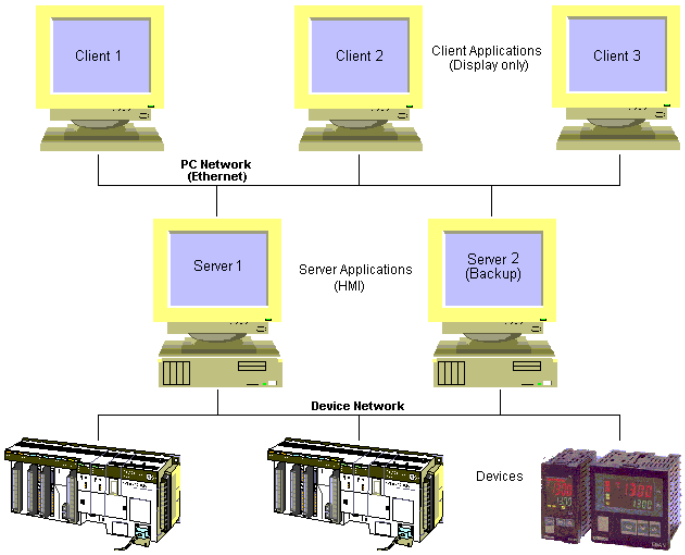
Distributed Server

Several applications are configured as Servers for direct connection, so the data for the system is 'distributed' across several machines. One or more Client applications collect the data from the distributed servers. This can be useful to help performance, by distributing the communication on the device connections, and server processing. It can also provide different security for different clients and offers limited protect against failures, as remaining servers still function.



Redundant Server

Several applications are configured as Servers for direct connection to the same Devices or Device network. The same data is collected by all Servers. One or more clients can collect the data from any single Server, and in the event of a Server failure, can be written to switch to data from an alternative Server.



A distributed solution may be any of the above, or a combination of the ideas. Once your topography is defined, the steps to connect each Client or Server are the same.

Creating a CX-Supervisor Server application

A Server application must collect device data, and allow clients to access it. It may also have other elements like graphics, control or logging. To create your application:

- Create Device points for every data value required by the Server application and any required by any client. See Chapter 4 - Points for more details.
- Configure DCOM on the server machine, to allow access from the client machines. See (Appendix A) for further details.
- Add any other elements required by the Server application e.g. Graphics, Control, Logging, Alarms etc.

Be sure to note the computer name of the server machine.

Note: A quick way to display the computer name is to right-click the 'Network Neighbourhood' icon on the Windows Desktop and select 'Properties'.

Creating a CX-Supervisor Client application

The client must retrieve the data, and process it. To create your application:

- Add any elements required by the Client application e.g. Graphics, Control, Logging, Alarms etc.
- Configure DCOM on the client machine, to allow access from the server machines. See (Appendix A) for further details.
- Create points for every data value required by the Client application following these steps:

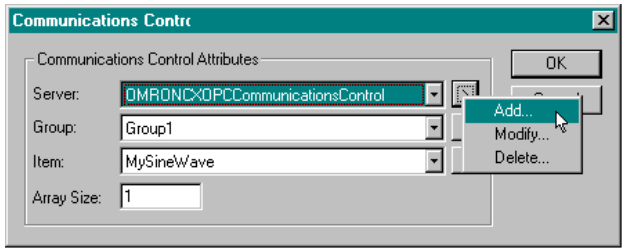
1, 2, 3…

1. Start CX-Supervisor Development and open your application, or start a new application.

2. Open the Point Editor by selecting the Point Editor option from the Utilities menu or by clicking the toolbar button.

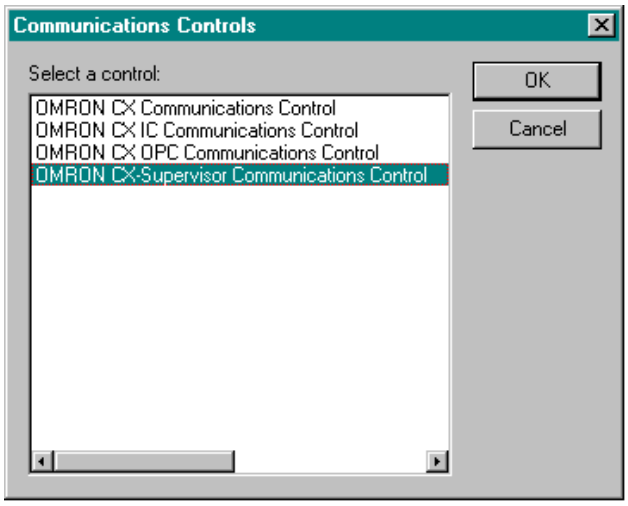
3. In the Point Editor dialog click the Add Point button in the toolbar to open the Add Point dialog.
4. In the Add Point dialog move to the **I/O Type:** options and select the Input, Output or Input / Output option as appropriate. Note that the **I/O Update Rate:** and **I/O Attributes:** options and displayed.
5. In the **I/O Attributes:** options select **OPC/Other** and click the Setup button. This will open the Communications Control Attributes dialog.
6. In the Communications Control Attributes dialog enter the appropriate parameters as follows:

Communications Control Attributes



Server: This shows the name of the communications object to connect to the server i.e.OMRONCXSupervisorCommunicationsControl. If you wish to use a different object make your selection from the drop down list. To Add, Modify or Delete an object click the Info button.

Selecting the Add option will open the Communications Control dialog. From the list of control objects select 'OMRON CX-Supervisor Communications Control' and click the OK button.



Clicking the OK button in the Communications Controls dialog will open the Communications Control Properties dialog from where the server details can be added or updated. Click 'Show All' and select the computer name of the server machine from the list. To edit these properties later select Modify… from the Info menu.

Group: Select the Group containing the required item from the dropdown list. To Add, Modify or Delete a Group click the Info button.

Items: The Items within the selected Group are listed. The Item Attributes dialog can be used to add or edit the items. To Add, Modify or Delete an Item click the Info button. Selecting the Add or Modify option will open the Items Attributes window from where the item details can be added or updated.

Array Size: Enter the number of array elements in the CX-Supervisor point that this item should have. If not an array, enter 1.

7. Having checked that all the parameters are correct return to the Point Editor window by closing any attributes window that may be open.

The application can now be run by clicking on the **Run Project** button in the toolbar. The CX-Supervisor Point will now be connected to Remote CX-Supervisor application and can be used like all other CX-Supervisor points, i.e. to drive animations, in alarm expressed, in recipes, for data logging etc.

CHAPTER 16
Connecting to Omron Industrial Components

This chapter details connecting CX-Supervisor to Omron's Industrial Components, like Temperature Controllers, Digital Panel Meters and Timer/Counters. Any process value or parameter from these devices can be monitored or written. See the device documentation for available parameters and their description.

This is achieved in CX-Supervisor by creating a point and linking it to the required parameter.

Adding a point linked to a parameter

1, 2, 3...

1. Start CX-Supervisor Development and open your project.

2. Open the Point Editor by selecting the Point Editor option from the Utilities menu or by clicking the toolbar button.

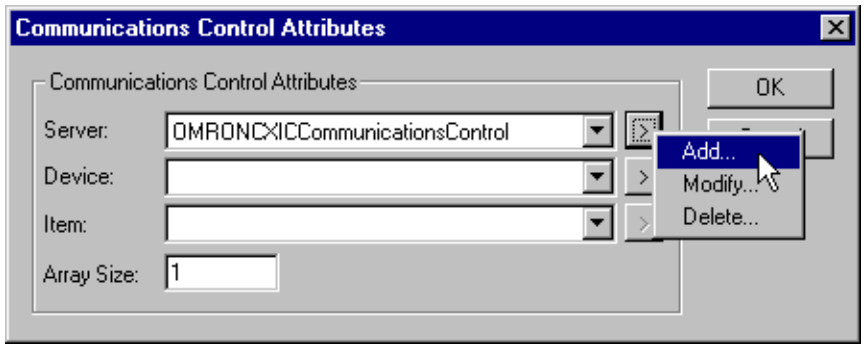
3. In the Point Editor dialog click the Add Point button in the toolbar to open the Add Point dialog.

4. In the Add Point dialog move to the **I/O Type:** options and select either the Input, Output or Input / Output option as appropriate. Note that the **I/O Update Rate:** and **I/O Attributes:** options and displayed.

5. In the **I/O Attributes:** options select **OPC/Other** and click the Setup button. This will open the Communications Control Attributes dialog.

6. In the Communications Control Attributes dialog enter the appropriate parameters as follows:

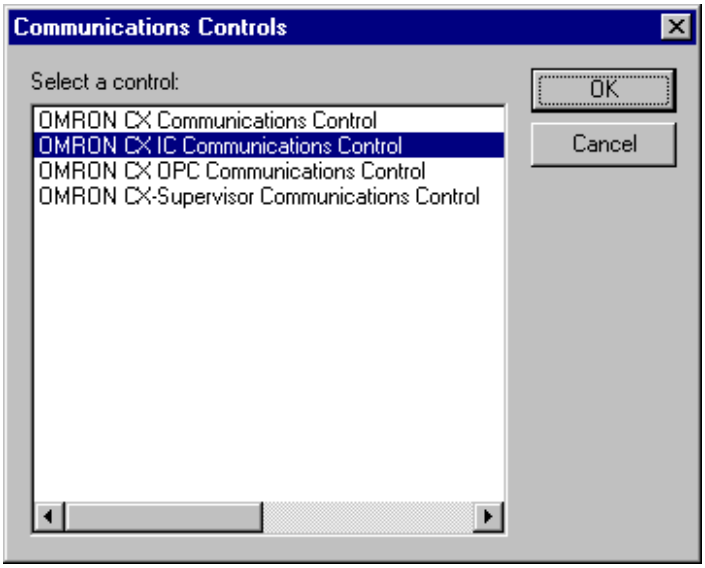
Communications Control Attributes



Server: This shows the name of the communications object to connect to the server i.e.OMRONCXICCommunicationsControl. If you wish to use a different object make your selection from the drop down list. To Add, Modify or Delete an

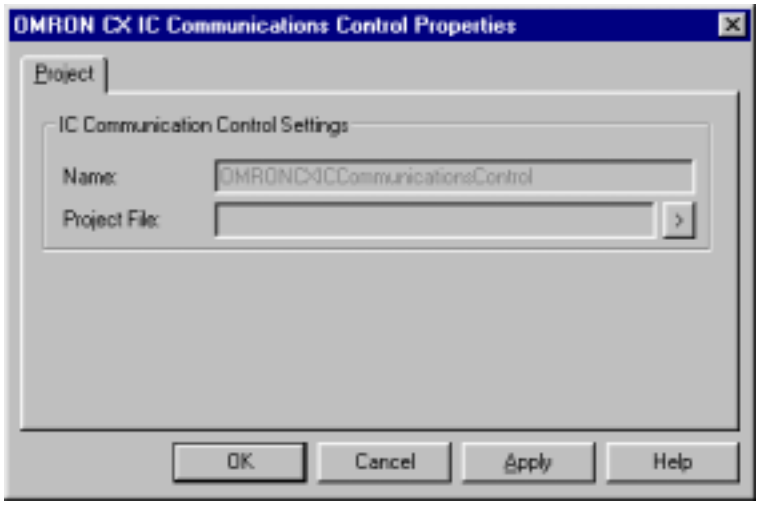
object click the Info button.

Selecting the Add option will open the Communications Control dialog. From the list of control objects select the one to be added and click the OK button.



Clicking the OK button in the Communications Controls dialog will open the Communications Control Properties dialog from where the details can be added or updated. To edit these properties later select Modify from the Info menu.

CX IC COMMUNICATIONS CONTROL PROPERTIES



Name: – This is the name of the selected communications control. The default name for the first control is OMRONCXICCommunicationsControl. For each additional control added the number increments by one.

Project File: - This is the name of the current Project file that stores the setup of the items. If no name is shown or it is incorrect click the Info button and select **Create…** or **Open…** as appropriate.

Clicking the **Open…** button opens the Open Project dialog from where you can navigate to the project file you wish to open. If you want to create a new file click the Create… option to open the Create Project dialog. In the Create Project dialog navigate to the directory in which you want to create your new file and enter your File Name. Select the appropriate file type (Save as type – i.e. File Name.msc) and click the Save button.

Note that a Project File name can not be entered from the keyboard, files names can only be entered by using the Create or Open options.

Device: Select the Device containing the required item from the dropdown list. To Add, Modify or Delete a Device click the Info button.

Items: The Items within the selected Device are listed. The Item Attributes dialog can be used to add or edit the items. To Add, Modify or Delete an Item click the Info button. Selecting the Add or Modify option will open the Items Attributes window from where the item details can be added or updated.

Array Size: Enter the number of array elements in the CX-Supervisor point that this item should have. If not an array, enter 1.

7. Having checked that all the parameters are correct bring return to the Point Editor window by closing any attributes window that may be open.

The CX-Supervisor Point will now be connected to Device parameter and can be used like all other CX-Supervisor points, i.e. to drive animations, in alarm expressions, in recipes, for data logging etc. The application can now be run by clicking on the **Run Project** button in the toolbar.

Appendix A
Configuring a PC for remote connection

The OPC interface and CX-Supervisor Communications Control use a Microsoft technology called DCOM. This allows the Clients and Servers to be seamlessly 'Distributed' over a PC network. The Server should be running on the PC with direct connection to the Device or Device network. However, the Client, or indeed multiple Clients, can be run on different networked PCs and will automatically read and write data over the PC network. To do this, the PC running the Server must be correctly configured. If necessary refer to your OPC server documentation. For full details of DCOM configuration and security issues see your Microsoft documentation. The following is a quick guide:

Note: Although DCOM connections can be achieved using Windows 95, 98 and ME they are more difficult to configure, and offer less functionality. For best results always use Windows NT or Windows 2000.

Configuring a Client PC running Windows NT or 2000

1, 2, 3…

1. Start DCOMCNFG.EXE e.g. by selecting RUN from the start button. The default location is C:\WINDOWS\SYSTEM.
2. View the **Default Properties** tab. Ensure that the **Enable Distributed COM** on this computer is checked.

Configuring a Client PC running Windows 95, 98 or Me

1, 2, 3…

1. Ensure **File and Printer sharing** is enabled by selecting Network from the Control Panel. Add a service and click either "File and print sharing for Microsoft Networks" or "File and print sharing for Netware Networks" as appropriate.

2. Start DCOMCNFG.EXE e.g. by selecting **RUN** from the Start button. The default location is C:\WINDOWS\SYSTEM.
3. View the **Default Properties** tab. Ensure that the **Enable Distributed COM on this computer** is checked.

A CX-Supervisor Client running on Windows 95, 98 or ME also requires the **Microsoft Remote Registry** network service to be installed with the operating system and correctly configured on both the server and client machine. To check: start the Control Panel and view the Network settings. In the list of network components, look for **Microsoft Remote Registry**. If it does not exist, follow these steps to add it.

1, 2, 3…

1. In the Network settings, ensure **User-level access control** is selected on the **Access Control** tab.
2. From the **Configuration** tab, click **Add** to add a Network component. Choose **Service** from the type list and click **Add**.

3. Click **Have Disk…** and browse your Windows CD. Select the path (**\Admin\Nettods\remotReg**) for Win95 or (**\Tools\ResKit\NetAdmin\RemotReg**) for Win98 and select **regsrv.inf**.
4. Follow the screen prompts to complete installation and reboot if necessary.
5. On the server machine, select **Passwords** from the Control Panel.
6. Ensure the **Enable remote administration of this server** option is checked
7. Add all required user ids to the Administrators list by clicking **Add…**

Configuring a Server PC running Windows NT or 2000

1, 2, 3…

1. Start DCOMCNFG.EXE e.g. by selecting **RUN** from the Start button. The default location is C:\WINDOWS\SYSTEM.
2. View the **Default Properties** tab. Ensure that the **Enable Distributed COM on this computer** is checked.
3. From the **Default Properties** tab, configure the **Default Authentication Level** to **Connect** and the **Default Impersonation Level** to **Identify**. Setup the access permissions by either:
   a) On the **Default Security** tab, adding the user to the Access, Launch and Configuration lists by clicking the **Edit Default…** button in each case.
   b) From the **Applications** tab, configure the properties for **OpenDataServer** and **OpcEnum**. On the **Security** tab, add the required users to each of the **Custom Permissions**.

Configuring a Server PC running Windows 95, 98 or Me

1, 2, 3…

1. Ensure **File and Printer sharing** is enabled by selecting Network from the Control Panel. Add a service and click either “File and print sharing for Microsoft Networks” or “File and print sharing for Netware Networks” as appropriate.

2. Start DCOMCNFG.EXE e.g. by selecting **RUN** from the Start button. The default location is C:\WINDOWS\SYSTEM.
3. View the **Default Properties** tab. Ensure that the **Enable Distributed COM on this computer** is checked.
4. View the **Default Security** tab and check the **Enable remote connection** check box.
5. From the **Default Properties** tab, configure the **Default Authentication Level** to **Connect** and the **Default Impersonation Level** to **Identify**. Setup the access permissions by either:
   a) On the **Default Security** tab, adding the user to the Access list by clicking the **Edit Default…** button in each case.
   b) From the **Applications** tab, configure the properties for **OPC Server** and **OPC ServerList Class**. On the **Security** tab, add the required users to each of the **Custom Permissions**.

Third party servers and clients running on Windows 95 or Windows 98, may require the **Microsoft Remote Registry** network service to be installed with the operating system and correctly configured on both the server and client machine. To check: start the Control Panel and view the Network settings. In the list of network components, look for **Microsoft Remote Registry**. If it does not exist, follow these steps to add it.

1, 2, 3…

1. In the Network settings, ensure **User-level access control** is selected on the **Access Control** tab.
2. From the **Configuration** tab, click **Add** to add a Network component. Choose **Service** from the type list and click **Add**.
3. Click **Have Disk…** and browse your Windows CD. Select the path **\Tools\ResKit\NetAdmin\RemotReg** and select **regsvr.inf**.
4. Follow screen prompts to complete installation and reboot if necessary.
5. On the server machine, select **Passwords** from the Control Panel.
6. Ensure the **Enable remote administration of this server** option is checked.
7. Add all required user ids to the Administrators list by clicking **Add…**.

GLOSSARY OF TERMS

ADO
ADO stands for Active Data Objects and is data access technology which uses OLE-DB to access data sources in a uniform way e.g. MS-Access databases, MS-Excel spreadsheets and Comma Separated Variable files.

Application
A software program that accomplishes a specific task. Examples of applications are CX-Supervisor, CX-Server and Microsoft Excel. CX-Supervisor and its development environment allows the creation and testing of new applications through a Graphical User Interface (GUI).

Arguments
Words, phrases, or numbers that can be entered on the same line as a command or statement to expand or modify the command or statement within the CX-Supervisor script language. The command acts on the argument. In essence the command is a *verb*, and the argument is the *object of the verb*. An example of an argument in CX-Supervisor is "`DDETerminate(channel)`" where `DDETerminate` is a command within the script language, and `channel` is the argument upon which the command will act.

Bitmap
The representation of an image stored in a computer's memory. Each picture element (pixel) is represented by bits stored in the memory. In CX-Supervisor a bitmap image can be installed as a single object.

Boolean type
A type of point where the value of the point can be one of two states. Essentially the two states are '0' and '1', but these states can be assigned a meaningful designation. Examples are:

State	Example	Example	Example	Example
0	'OFF'	'FALSE'	'OUT'	'CLOSED'
1	'ON'	'TRUE'	'IN'	'OPEN'

See also: AND, NOT and OR.

COM
COM is a Microsoft technology that allows components used to interact.

Constant
Within CX-Supervisor, a constant is a point within the script language that takes only one specific value.

Control Object
In CX-Supervisor, a control object is applied in the development environment and can be a pushbutton, a toggle button, a slider, a trend graph, a rotational gauge or a linear gauge. Essentially a control object can be a complex graphic object consisting of a number of primitive graphic objects, which provides user interaction.

CX-Server
An advanced communications management system for OMRON PLCs providing facilities for software to maintain PLC device and address information and to communicate with OMRON PLCs and their supported network types. CX-Server supports CS-Series PLCs.

Database connection
A Database connection (or Connection for short) contains the details used to access a data source. This can either be via Data Source Name (DSN), filename or directory.

Database Recordset
A Database recordset (or Recordset for short) is a set of records. This could either be an actual Table in the database, or a table that has been generated as a consequence of running a Query.

Database Schema A Database Schema (or Schema for short) obtains database schema information from a Provider.

Database Server Query A Database Server Query (or Server Query for short) is a query that is stored in the actual Database. They are pre-defined and added by the database designer which means they are 'fixed' for the duration of a project. Server Queries may have pre-defined 'Parameters', which allow criteria to be passed to the query at runtime e.g. values to filter, allowing one query to be used to produce different results. Each pre-defined parameter must have a Parameter Association defined. Because these queries are stored in a compiled and tested form they are more efficient and therefore preferential to running a SQL Query.

Database SQL Query A Database SQL Query (or SQL Query for short) is interpreted dynamically at runtime. The SQL Text can be modified at runtime, enabling different Queries to be run for varying situations however, the SQL Text has to be compiled on the fly every time it is executed and consequently is less efficient than a Server Query.

DCOM DCOM is a distributed version of COM that allows components on different PCs to interact over a network.

DDE Dynamic Data Exchange. A channel through which correctly prepared programs can actively exchange data and controls other applications within Microsoft Windows. CX-Supervisor, through the use of its script language, allows extensive use of DDE functionality.

See also Item, Server, server application and Topic.

Development Environment SCADA applications are created and tested using the development environment within CX-Supervisor. On completion, the finished application can be delivered as a final customer application to be run by the run-time environment.

DLL Dynamic Link Library. A program file that although cannot be run stand-alone as an executable, can be utilised by one or more applications or programs as a common service. DLL files have a *.DLL extension. DLL's comprise a number of stand-alone functions. In CX-Supervisor, a DLL containing icons can be accessed to represent the display part of an OLE object. One such DLL, 'MORICONS.DLL', is provided in the standard Microsoft Windows installation.

Download A recipe is *downloaded* during runtime. This process involves identifying the appropriate recipe and executing the validation code, if any exists. The download is complete when each ingredient has set its point to the target value.

Embedded Object An embedded object is a complex object that can be a bitmap object or an OLE object.

Executable A file that contains programs or commands of an application that can be executed by a user or another application. Executable files have a *.EXE file extension. CX-Supervisor provides two executable files, one for the development environment (**CX-SUPERVISOR**DEV.EXE), and one for the run-time environment (SCS.EXE).

Expressions

In the CX-Supervisor script language, expressions are a construct for computing a value from one or more operands. For instance, in the example "`lift = height + rate`", the expression is "`height + rate`" where the result yielded from the expression is used for the value of "`lift`".

Outside of the script language, expressions consisting of operators and operands can be used to control objects , through actions.

Field association

A field association, enables a link to be made between a CX-Supervisor Point and a particular field (i.e. column) within a recordset.

Graphic Object

In CX-Supervisor, a graphic object is created in the development environment, and can be a line, an arc, a polygon (including a square and rectangle), a round rectangle, an ellipse (including a circle), or a polyline. A complex object can exist as a combination of two or more graphic objects.

GUI

Graphical User Interface. Part of a program that interacts with the user and takes full advantage of the graphics displays of computers. A GUI employs pull-down menus and dialog boxes for ease of use. Like all Microsoft Windows based applications, CX-Supervisor has a GUI.

I/O type

Input/Output type. An attribute of a point that defines the origin and destination of the data for that point. The data for a point can originate (be *input* from) and is destined (is *output* to) to the internal computer memory, PLC, DDE target application.

Icon

Pictorial representations of computer resources and functions. The CX-Supervisor development environment and run-time environment are run from icons. Icons are also used in CX-Supervisor to indicate an OLE object.

Ingredient

Each recipe consists of at least one ingredient. Each ingredient must be related to an existing point.

Integer type

A type of point where the value of the point can only be a whole positive or negative number.

Item

Within the CX-Supervisor script language, Item is used in DDE functions to contain specific information pertaining to an outside application. Using DDE functions, CX-Supervisor allows the manipulation of an outside application with the target application command contained within Item.

JVM

Java Virtual Machine – allows the execution of Java Script and Java Applets.

Microsoft Excel

A spreadsheet application.

Microsoft Windows

A windowing environment for MS-DOS computers, that is noted for its GUI, and for features such as multiple typefaces, desk accessories (such as a clock, calculator, calendar and notepad), and the capability of moving text and graphics from one application to another via a clipboard.

CX-Supervisor will run only under Microsoft Windows. DDE functions communicating with other applications supported by CX-Supervisor use Microsoft Windows as a basis.

Nesting

To incorporate one or more IF THEN ELSE/ELSEIF ENDIF statements inside a structure of the same kind.

Network

1. Part of the PLC configuration, based on the device type. The number of Networks available is dependant on the device type.

	2. A number of computers linked together with a central processing point known as a Server which is accessible to all computers. Networks affect CX-Supervisor in that further Network associated options are available if the computer is Network connected.
Non-Volatile	A point that is designated as 'non-volatile' is a point whose value is saved on disk and automatically reloaded when CX-Supervisor resumes execution.
Object	In CX-Supervisor, an object can be text, graphics, a control, a bitmap, or OLE object as created in the development environment. A complex object can exist as a combination of two or more objects of any of the above types. Specifically, graphical objects can be categorised as a line, an arc, a polygon (including a square and rectangle), a round rectangle, an ellipse (including a circle), or a polyline. A control is essentially a complex graphic object and is specifically either a pushbutton, a toggle button, a slider, a trend graph, a rotational gauge or a linear gauge.
OLE	Object Linking and Embedding. Used to transfer and share information between Microsoft Windows based applications and accessories. When OLE is used in CX-Supervisor, it is possible to view or even edit a file from a target application. See also embedded object.
OLE-DB	OLE-DB is the underlying database technology, on which ADO relies. OLE-BD is designed to be the successor to ODBC.
Operand	The term used for constants or point variables.
Operator	A symbol used as a function, with infix syntax if it has two arguments (e.g. "+") or prefix syntax if it has only one argument (e.g. NOT). The CX-Supervisor script language uses operators for built-in functions such as arithmetic and logic.
Pages	The combination and manipulation of pages containing objects within projects forms the basis of CX-Supervisor. More than one page can exist for each project. The pages in a project provide the visual aspect of CX-Supervisor corresponding to a display with the objects contained in each page providing a graphical representation of the system being monitored.
Parameter Association	A Parameter Association enables values, either constant or stored in a point, to be passed to a Server Query.
Pixel	A single displayable point on the screen from which a displayed image is constructed. The screen resolution of the computer's Visual Display Unit (VDU) is defined by the number of pixels across and the number of pixels down (e.g. 1024 x 768). See also SVGA mode and VGA mode.
PLC	Programmable Logic Controller.
Point variable	A point within the CX-Supervisor script language that stores a value or string assigned to that point.
Point	A point is used to hold a value of a predefined type - Boolean, Integer, Text, etc. The contents of a point may be controlled by an object or I/O mechanism such as DDE. The contents of a point may control the action or appearance of an object, or be used for output via an I/O mechanism.

	See also Boolean type, Integer type, point variable, Real type and Text type.
Project	A CX-Supervisor application will consist of one or a number of pages linked together. The pages may contain passive or active graphics, text or animations, and may be grouped together logically to form a project. A project may consist of many pages, or simply a single page. Projects may be built and tested within the CX-Supervisor development environment, and run stand-alone under the CX-Supervisor run-time environment. Only one project at a time may be open for editing within the CX-Supervisor development environment.
Real type	A type of point where the value of the point can be any number, including those containing a decimal point.
Recipe	A recipe is a set of pre-defined steps used to perform a particular task. A CX-Supervisor project may contain zero or more number of recipes. Recipes are defined in the development environment and executed, or downloaded, in the run-time environment.
Run-Time Environment	SCADA applications are run using the run-time environment of CX-Supervisor, following creation of the application in the CX-Supervisor development environment.
SCADA	Supervisory Control and Data Acquisition.
Server	1. Within the CX-Supervisor script language, Server is used in DDE functions to contain a link to an outside application. Using DDE functions, CX-Supervisor allows the manipulation of an outside application as specified as the Server. See also server application. 2. A Server is the central processing point of a Network which is accessible to all computers. Networks affect CX-Supervisor in that further associated options are available if the computer Network is connected.
Server Application	An application that can be used to view or interact with, whilst currently within CX-Supervisor. See also DDE and OLE.
Statement	Within the CX-Supervisor script language, a statement is a command understood by the run-time environment. Statements are constructed of commands and arguments, which when combined, help to formulate a finished application to be used in the run-time environment.
String	The contents of a Text type point that can only contain literal alphanumeric characters. A string starts following an opening quotation mark, and ends before a closing question mark; in the example “`name = "spot"`”, the point “`name`” holds the string `spot`.
SVGA mode	A mode of video display that provides 800 × 600 **pixel** resolution (or higher) with 16 or more colours and is supported on Super Video Graphics Adapter systems.

SYSMAC-CDM	A communications management system for OMRON PLCs in conjunction with Microsoft Windows, providing facilities for other SYSMAC software to maintain PLC device and address information and to communicate with OMRON PLCs and their supported network types.
CX-Supervisor	A SCADA software application which creates and maintains graphical user interfaces and communicates with PLCs and other I/O mechanisms.
Target Value	An ingredient must specify a target value for its related point. This is the value to which the point will be set in runtime when the recipe is downloaded.
Taskbar	An integral part of Microsoft Windows which allows Microsoft Windows based applications to be started. CX-Supervisor is run from the Taskbar.
Text Object	In CX-Supervisor, a text object is a string on a page. Attributes such as typeface, point size, embolden, italicise, underline, left justify, flush right, and centre can be applied to enhance its presentation.
Text Type	A type of point that holds a string.
Topic	Within the CX-Supervisor script language, Topic is used in DDE functions to specify a file name pertaining to an outside application. Using DDE functions, CX-Supervisor allows the opening of a file, part of the server application.
Validation Code	Recipe validation code is CX-Supervisor script language which is used to check point values before downloading a recipe.
VGA mode	A mode of video display that provides 640 $\times$ 480 pixel resolution with 16 colours and is supported on Video Graphics Adapter systems.
Wizard	Wizards are dialogs used by the CX-Supervisor development environment to take the user through complex operations in a simplified step-by-step process.

INDEX

A

About CX-Supervisor · 260
About the Point Editor · 52
About the Project Editor – *Project Editor* · 134
Access
  Alarm Editor · 133, 142, 144, 152, 153
  Animation Editor · 155
  Graphics Editor · 31
  Graphics Library · 137
  Point Editor · 52
  Project Editor · 133, 134
  Project Workspace · 133
  Recipe Editor · 133, 187
Accessing PLC Connection in Runtime – *Device Configuration* · 68
Activating an Object - *Object Packger* · 111
Activating Graphics Library - *Graphics Library* · 137
Active Data Objects · 255
Adding a Point - *Tutorial*
Adding a point linked to a parameter · 249
Adding Pages to a Project – *Project Editor* · 135
Advanced Point Settings– *Creating Points*: · 62
Advanced Tutorial · 18, 25
  Guage Wizard · 22
  Simulated Instrument Panel · 19
  Slider Wizard · 21
  Test the Instrument Panel · 24
  Trend Graph Wizard · 23
Alarm Editor
  Access · 133, 142, 144, 152, 153
  Delete alarm · 150
  Viewing contents · 144
Alarm Objects - *Control Objects* · 85
Alarm Points - *Point Import*: · 73
Alarm Settings · 142
  Alarm Settings · 142
Alarms · 142
  Copying an Existing Alarm Definition · 150
  Creating a New Alarm · 145
  Current status · 152
  Customise settings · 121
  Deadband · 147
  Deleting an Existing Alarm · 150
  Groups · 144, 146
  History · 152
  Information · 145
  Messages · 148
  Print alarms · *See also* Page, Preview page; Page, Print page; Page, Setup page for printing
  Rate of change · 147
  Simple · 147
  Updating an Existing Alarm · 149
  Viewing the Contents of the Alarm Database · 144
  Workspace · 133
Alias Definitions · 132
Alignment - *Manipulating objects* · 103
Alignment Toolbox - *Manipulating objects* · 103
Amending a Page · 43
Amending a Project · 115
Amending an Existing Point · 62
Animation · 154
  Animation Editor · 154
  Associating Points with Actions and events · 154
  Page · 157
  Printing · 160
  Project · 156
  Runtime Actions · 160
  ViewMode · 156
Animation - *Tutorial*
Animation Editor · 154
  About · 154
  Access · 155
  Alias definitions · 132, 163
  Analogue Colour Change · 159, 175
  Analogue Display Value · 159, 180
  Analogue Edit Point Value · 159, 183
  Analogue User Input · 159, 183
  Blink · 159, 174
  Browse · 160
  Close Page · 159, 173
  Colour Change (Analogue) · 159, 175
  Colour Change (Digital) · 159, 176
  Colour palette · 185
  Create animation · 160
  Delete animation · 156
  Digital Colour Change · 159

Digital Colour Change · 176
Digital Display Value · 159, 179
Digital Edit Point Value · 159, 182
Digital User Input · 159, 182
Disable · 159, 176
Display Page · 159, 172
Display Status Text · 159, 179
Display Text Point · 159, 180
Display Value · 159
Display Value (Analogue) · 159, 180
Display Value (Digital) · 159, 179
Display Value (Text) · 159, 180
Edit Point Value (Analogue) · 159, 183
Edit Point Value (Digital) · 159, 182
Edit Point Value (Text) · 159, 185
Enable · 159, 176
Execute Script · 159. *See also* Script Editor
Expression dialog · 162
Expressions · 257
Height · 169
Height · 169
Height, Resize · 159, 170
Horizontal % Fill · 170
Horizontal % Fill · 170
Horizontal Move · 159, 166
Horizontal Percentage Fill · 159
Invisible · 159, 178
Modify animation · 160, 161
Move, Horizontal · 166
Move, Horizontal · 159
Move, Vertical · 167
Move, Vertical · 159, 168
Object selection dialog · 163
Percentage Fill (Horizontal) · 159
Percentage Fill (Vertical) · 159, 171
Resize Height · 159, 170
Resize Width · 159, 169
Rotate · 159
Runtime · 160
Script, Execute · 159. *See also* Script Editor
Show Page · 159, 172
Text Display Value · 159, 180
Text Edit Point Value · 159, 185
Text User Input · 159, 185
Vertical % Fill · 171
Vertical % Fill · 171
Vertical Move · 159, 167, 168
Vertical Percentage Fill · 159, 171
View · 155
Visible · 159, 178
Width · 168
Width · 168
Width, Resize · 159, 169
AnimationObjects · 158
Animations · 15
Aliases · 132, 163
Object animations · 160
Points · 154
Project animations · 157
Runtime · 160
Script · *See* Script Editor
Application · 255
Applying Tooltips - *Manipulating objects* · 105
Arc - *Creating/Editing Graphic Objects* · 83
Associating Points with Actions and events · 154

B

Bar Chart - *Control Objects* · 87
Bitmap · 255
Opening an existing bitmap · 89
Pixel · 258
Bitmap - *Control Objects* · 89
Block - *Creating/Editing Graphic Objects* · 83
Boolean Point · 96

C

Changing the View Mode – *Project Editor* · 136
Changing the Viewing Mode - *Point Editor* · 54
Closing a Page - *Saving a Page to a Project*: · 50
Colour Palette - *Graphics Editor*: · 32
COM · 255
Communications Control Properties · 240, 251
Communications tutorial · 25
Compiling and Running a Project · 130
Concepts of Projects - *Tutorial*
Configured Users - *Runtime Security* · 126
Configuring a Client PC under Win 95/98/Me
Running Windows 95/98 · 252
Configuring a client PC under Win NT/2000
Running Windows NT/2000 · 252
Configuring a database connection · 217

Configuring a PC for remote connection · 252
Configuring a Server PC under Win 95/98/Me
    Running Windows 95/98 · 253
Configuring a Server PC under Win NT/2000
    Running Windows NT/2000 · 253
Configuring Field associations · 225
Configuring Recordsets · 223
Connecting to a remote CX-Supervisor application · 244
Control Bar
    Horizontal Mirror · 37
    Lower Down One · 36
    Object Identification · 35
    Raise Up One · 35
    Rotate · 36
    Transparency On/Off · 37
    Vertical Mirror · 37
Control Objects
    Alarm Objects · 85
    Bar Chart · 87
    Bitmap · 89
    Linear Gauge · 90
    Pushbutton · 91
    Rotary Gauge · 92
    Scatter Graph · 93
    Slider · 95
    Toggle Button · 96
    Trend Graph · 98
Control Tool Bar · 34
Conversation Attributes – *Creating Points*: · 61
Converting a Object - *Object Packger* · 112
Copy - *Manipulating Objects* · 101
Create Runtime Install Disc · 131
Creating a CX-Supervisor Client application · 247
Creating a CX-Supervisor Server application · 246
Creating a Page · 42
Creating a PLC Connection – *Device Configuration* · 65
Creating a Point · 56
    Advanced Point Setting · 62
    Conversion Attributes · 61
    Data Transfer Actions Update · 61
    General Attributes · 56
    I/O Attributes · 59
    I/O Types · 58
    I/O Update Rate · 59
    Memory Attributes · 58
    PLC Attributes · 60
    Point Types · 56
Creating a project · 114
Creating an Object from file - *Object Packger* · 109
Creating an Object from new - *Object Packger* · 107
Creating and Editing Graphic Objects · 83
Creating Graphics Library - *Graphics Library* · 137
Creating/Editing Control Objects · 85
Creating/Editing Graphic Objects
    Arc · 83
    Block · 83
    Ellipse · 83
    Line · 84
    Polygon · 84
    Polyline · 84
    Rectangle · 84
    Round Rectangles · 84
    Text · 85
Customising · 120
Customising CX-Supervisor · 32, 35
Cut - *Manipulating Objects* · 101
CX-Server · 255
CX-Supervisor customising · 32, 35, 120
CX-Supervisor Pages - *Tutorial*
CX-Supervisor Preferences · 50

D

Data Bases · 216
    Configuring a Connection · 217
    Configuring Recordsets · 223
    Saving Recordsets · 233
    Schemas · 229
Data BasesDatashaping · 234
Data Log Editor · 200
Data Log Expoer · 210
Data Log Viewer · 208
Data Logging · 200, 213
    At Run Time · 204
    Data Log Editor · 200
    Data Logging · 213
    Exporting · 210
    Remote Viewer · 210
    Viewer · 208
Data Logging at Runtime · 204
Data Transfer Actions– *Creating Points*: · 61
Database connection · 255

Database Connection editor · 216
Database Recordset · 255
Database Schema · 256
Database Server Query · 256
Database SQL Query · 256
Databases
  Configuring Field associates · 225
  Parameter associates · 227
Datashaping · 234
Date Points - *Point Import*: · 71
DCOM · 256
DDE · 61, 62, 74, 256
  Examples · 78, 79, 80
  Item · 257
  Points, array · 77
  Points, client · 75
  Points, server · 76
  Script · 78
  Server application · 259
  Topic · 260
Defining Properties of a Page · 44
Delete - *Manipulating objects* · 102
Deleting an Existing Point · 63
Device Configuration · 64
Display Points - *Point Import*: · 72
Distributed Server · 245
DLL · 108, 256
Drop and Drag of Points - *Point Editor* · 55
Dynamic Data Exchange · *See* DDE
Dynamic Link Library · *See* DLL

E

Editing Objects · 82
  Re-shaping · 82
  Re-sizing · 82
  Wozards · 83
Editing Preferences · 51
Ellipse - *Creating/Editing Graphic Objects* · 83
Error Logging Points - *Point Import*: · 73
Event/Error messages · 125
  Column sorting · 124
  Disable updates · 124
  Display · 123
  Enable updates · 124
  Events · 124
  Font · 123
  High priority errors · 124
  Information · 124
  Low priority errors · 124
  Medium priority errors · 124
  Show all events and errors · 124
Exit Level · 130
Extended Style Palettes - *Graphics Editor*: · 33

F

Field association · 257
Fill Pattern Palette - *Graphics Editor*: · 33
Filtering Points in the View via Group - *Point Editor* · 53
Filtering Points in the View via Point Type - *Point Editor* · 53
Find Points · 132
Floating menu
  Runtime environment · 119
Floating Menu - *Manipulating objects* · 105
Font
  Alarms · 87
  Charts · 88
  Default button · 117
  Event/Error messages · 123
  Gauges · 91, 93
  Name · 40
  Pushbutton · 91
  Scatter graph · 94
  Size · 40
  Toggle button · 96
  Trend graph · 99
Font Name – *Text Bar*: · 39
Font Size – *Text Bar*: · 40

G

Gauge
  Wizard · See Wizard
General Attributes – *Creating Points*: · 56
General settings · *See* Customising CX-Supervisor
General Settings
  Runtime Settings · 118
  Settings · 116

General Settings - *Settings* · 116
Glossary of Terms · 255
Graphical User Interface · *See* GUI
Graphics Editor · 13, 39
  About · 31
  Access · 31
  Bold · 40
  Colour Palette · 32
  Control Bar · 35
  Extended Selection · 33
  Fonts · 40
  Grid · 41
  Italics · 40
  Justification · 41
  Library, using the Graphics · 140
  Lower down one · 36
  Mirroring · 37
  Object identity · 35
  Object identity, modify · 35
  Objects · 31, 32, 33, 34, 35, 36, 37, 40
  Overview · 31
  Palette · 31
  Palettes, extending choice from · 33
  Raise up one · 36
  Status Bar · 39
  Text · 41
  Text, bold · 40
  Text, italics · 40
  Text, underline · 41
  Tool Box · 33
  Tools Palette · 34
  Transparency · 38
  Underline · 41
  View · 10
Graphics Library · *See* Library
  Activating the Library · 137
  Creating Library · 137
  Modify a Library · 138
  Opening a Library · 138
Graphics Objects Tool Bar · 34
Graphs · *See* Trend Graph
Grid - *Graphics Editor* · 41
Group - *Manipulating objects* · 103
Group Attributes · 241
Guage Wizad – *Advanced Tutorial*
GUI · 257

H

Help · 30
Horizontal Mirror – *Control Bar*: · 37

I

I/O Attributes – *Creating Points*: · 59
I/O Types – *Creating Points*: · 58
I/O Update Rate – *Creating Points*: · 59
Internal Points - *Point Import*: · 72
Introduction to CX-Supervisor · 9
Item Attributes · 242

J

Java Virtual Machine · 257

L

Library
  About · 137
  Access · 137
  Adding a new object · 139
  Copying an object from a library · 139
  Creating a library · 137
  Creating a new library file · 138
  Default objects · 141
  Editing library attributes · 138
  Graphics Editor, using the · 140
  Icon · 137
  Print Graphics Library · *See also* Page, Preview page; Page, Print page; Page, Setup page for printing
  Sharing · 141
  View · 137
Line - *Creating/Editing Graphic Objects* · 84
Line Style Palette - *Graphics Editor*: · 32
Linear Gauge - *Control Objects* · 90
Linking Pages in a Project – *Project Editor* · 135
Lower Down One – *Control Bar*: · 36

M

Manipulating object
- Alignment · 103
- Alignment Toolbox · 103
- Applying Tooltips · 105
- Delete · 102
- Floating Menu · 105
- Group · 103
- Mirror Image · 102
- Orientation · 102
- Paste · 101
- Raise/Lower · 103
- Transparency · 102
- Undo · 102
- Zoom · 104

Manipulating objects · 100
Manipulating Objects · 139
- Add Object · 139
- Copy · 101
- Cut · 101
- Delete Object · 140
- Library Element · 140
- Move · 101
- Select · 100

Memory Attributes – *Creating Points*: · 58
Menu Option Access Levels - *Runtime Security* · 129
Mirror Image - *Manipulating objects* · 102
Modify Graphics Library - *Graphics Library* · 138
Modifying a PLC Connection – *Device Configuration* · 67
Mouse Points - *Point Import*: · 73
Move - *Manipulating Objects* · 101
Moving On · 29
Multiple Selection – *Project Editor* · 136

N

Navigating Projects with the Workspace · 133

O

Object
- Create new OLE object · 107

Object
- About · 258
- Attributes · 139
- Control object · 255
- Control objects · 31, 100
- Create OLE object from file · 110
- Display OLE object as icon · 109
- Edit definition of an object · 140
- Embedded objects · 31. See also Object Packager
- Grab handles · 85
- Graphic objects · 31, 85, 257
- Manipulating an object · 100
- Re-shaping an object · 82
- Re-sizing an object · 82
- Snapping objects to grid · 103
- Text · 260
- Text object · 31
- Wizards · *See* Wizard

Object Identification – *Control Bar*: · 35
Object Packager · 112
- Access · 106

Object Packger · 106
- Activating an Object · 111
- Converting a Object · 112
- Creating an Object from File · 109
- Creating an Object from New · 107

Objects · 82
OLE · 31, 106, 258. *See also* Object Packager
- Automation helper routines · 81
- Convert package object · 112
- Create from file · 110
- Create new object · 107
- Display as an icon · 109
- Embedded object · 256
- Icons · 109, 257
- Linking to a file object · 110
- Modify icon · 107

OLE Automation · 81
OLE-DB · 258
On-line help · 30
OPC
- Foundation web site · 238

What is it? · 238
Opening a Page via the Project Editor – *Project Editor* · 135
Opening Graphics Library - *Graphics Library* · 138
Optimisation of PLC Communications – *Device Configuration* · 70
Orientation - *Manipulating objects* · 102
Output workspace · 133

P

Page
About · 258
Access · 42
Attributes · 46
Modify page · 43
Preview page · 48
Print page · 49. *See also* Page, Preview page; Page, Setup page for printing; Print
Properties · 46
Save page · 49
Save page as a different identity · 50
Palette
Extended Palettes · 33
Fill Pattern Palette · 33
Line Style Palette · 32
Palette
Colour Palette · 32
Palette - *Graphics Editor*: · 31
Parameter Associates · 227
Parameter Association · 258
Paste - *Manipulating objects* · 101
Peer to Peer · 244
PLC · 59, 60, 61, 64, 67, 68, 258
Accessing connection in runtime · 68
Attributes · 59
Communication · 25, 29
Configuration · 64
Creating a connection · 65
Deleting a connection · 68
Device type · 65, 66
Modifying a connection · 67
Network · 66, 257
Optimising connections · 70
Tutorial · 25
PLC Attributes – *Creating Points*: · 60
PLC Communication Points - *Point Import*: · 73
Point Import · 70
Alarm Points · 73
Date Points · 71
Display Points · 72
Error Logging Points · 73
Internal Points · 72
Mouse Points · 73
PLC Communication Points · 73
Security Points · 74
Time Points · 71
Point Attributes
General Attributes · 57
Point Attributes – *Creating Points*: · 57
Point Editor · 53, 54
About · 52
Access · 52
Changing the Viewing Mode · 54
Create point · 16, 62
Delete point · 63
Dragging from · 55
Drop and Drag · 55
Filtering Points-via Group · 53
Filtering Points-via Point Type · 53
Modify point · 62
Sorting Points in the View · 53
Sorting Points-View by I/O Type · 53
Summary of Point Information · 54
View · 52, 53, 54
Point Types – *Creating Points*: · 56
Points
About · 52, 258
Alias definitions · 132, 163
Animation · 154, 161, 165
Attributes, DDE · 62
Boolean · 53, 56, 57, 71, 175, 178, 179, 181, 255
Constant · 255
DDE array · 77
DDE attributes · 62
DDE client · 75
DDE server · 76
Editor, Point · 53, 54
External sources · 62
Find · 132
Groups · 53, 56, 71
I/O type · 257
Information · 54
Integer · 53, 56, 57, 71, 179, 182, 183, 257
Maintenance · 64

Non-volitile points · 258
Non-volitile rate · 120
Point Editor · 53, 54
Point Editor · 53
Print points · *See also* Page, Preview page; Page, Print page; Page, Setup page for printing
Real · 53, 56, 57, 71, 179, 182, 183, 259
Runtime maintenance · 64
Script Editor · 165
Search · 132
Sort · 53
String · 259
System · 165. *See* System points
Text · 53, 58, 71, 180, 181, 260
Variable · 258
Polygon - *Creating/Editing Graphic Objects* · 84
Polyline - *Creating/Editing Graphic Objects* · 84
Print
Access · 47
Advanced options · 47, 49
Alarm/Message settings · 122
Alarms · 153
Collate copies · 49
Copies, number of · 48
Landscape orientation · 47
Number of copies · 48
Page preview · 48
Page print · 49
Paper size · 47
Paper source · 47
Portrait orientation · 47
Range · 48
Specific printer · 47
Print Preview
Printing a Page · 47
Print Preview - *Printing Points*: · 74
Print Preview – *Printing from Project Editor* · 136
Print Setup
Printing a Page · 46
Print Setup - *Printing Points*: · 74
Print Setup – *Printing from Project Editor* · 136
Printing
Printing a Page · 48
Printing - *Printing Points*: · 74
Printing – *Printing from Project Editor* · 136
Printing from Project Editor
Print Preview · 136
Print Setup · 136
Printing · 136
Printing Points
Print Preview · 74
Print Setup · 74
Printing · 74
Project
About · 114, 259
Adding pages to a project · 135
Advanced settings · 126
Alarm settings · 121
Alarm/Message printer settings · 122
Alias definitions · 163
Alias definitions · 132
Amending a Project · 115
Animations · 156
Colour palette · 116
Compiling a project · 130
Concepts · 11
Create runtime installation · 131
Creating a new project · 10, 114
Creating a project · 114
Deleting pages from a project · 135
Editor, Project · *See* Project Editor
Event/Error messages · 123
Exit privilege · 130
Find points · 132
Font, default button · 117
Information · 115, 131, 136
Language settings · 125
Linking pages in a project · 135
Menu option access levels · 130
Modify a project · 115
Non-volatile rate · 120
Non-volitile point rate settings · 120
Opening a project · 116
Point substitution settings · 125
Project Editor · *See* Project Editor
Running a project · 130
Saving a project · 116
Saving a Project · 116
Saving a runtime project · 130
Screen size · 120
Search for points · 132
Security · 126
Startup conditions · 118
Workspace · 133
Project Editor · 134
About · 134
Access · 133, 134

Adding Pages · 135
Changing View Mode · 136
Linking Pages · 135
Multiple Selection · 136
Opening a Page · 135
Printing from · *See also* Page, Preview page; Page, Print page; Page, Setup page for printing
Removing Pages · 135
Selecting Pages for Display · 135
View · 135
Viewing Project Details · 136
Viewing the Contents · 135
Project Information · 131
Project Workspace
Access · 133
Alarms view · 133
Project view · 133
Recipe view · 133
Pushbutton
Inserting a pushbutton · 91
Wizard · *See* Wizard
Pushbutton - *Control Objects*: · 91

R

Raise Up One – *Control Bar*: · 35
Raise/Lower - *Manipulating objects* · 103
Recipe Editor
About · 186
Access · 133, 187
Configuration attributes · 189
Copying recipe definition · 193
Create a recipe · 188
Create ingredient · 189
Delete ingredient · 192
Delete recipe · 193
Download recipes at runtime · 197
Information · 187
Ingredients · 189
Modify a recipe · 192
Modify ingredient · 192
Print recipes · *See also* Page, Preview page; Page, Print page; Page, Setup page for printing
Runtime · 194
Security levels · 193
Terminology · 186
Validation · 190
View · 187
Recipes · *See also* Recipe Editor
About · 259
Download recipe · 256
Download recipes · 197
Ingredients · 189, 257
Print recipes · *See also* Page, preview page; Page, print page; Page, setup page for printing
Runtime · 194
Security levels · 193
Validation · 190
Workspace · 133
Rectangle - *Creating/Editing Graphic Objects* · 84
Redundant Server · 246
Refining Projects- *Tutorial*
Remote Data Log Viewer · 210
Removing a PLC Connection – *Device Configuration* · 68
Removing Pages from a Project – *Project Editor* · 135
Re-shaping Objects - *Editing Objects* · 82
Re-sizing Objects - *Editing Objects* · 82
Rotary Gauge - *Control Objects* · 92
Rotate – *Control Bar*: · 36
Round Rectangles - *Creating/Editing Graphic Objects* · 84
Rremote connection to a CX-Supervisor application · 244
Rubber Band · 101
Runtime
About · 259
Access PLC connection · 68
Advanced settings · 126
Alarm history · 152
Alarm reporting · 151
Alarm settings · 121
Alarm, acknowledge · 151
Alarm/Message printer settings · 122
Alarms, current · 152
Alarms, print · 153
Animations and scripts · 160
Create installation disc · 131
Event/Error messages · 123
Exit privilege · 130
Floating menu · 119
Language settings · 125

Menu option access levels · 130
Non-volitile point rate settings · 120
Point substitution settings · 125
Points maintenance · 64
Recipes · 194
Saving a project · 130
Screen size · 44, 120
Security · 126
Starting an application · 130
Startup conditions · 118
Testing · 17
User configuration · 127
Viewing recipes · 195
Runtime Point Maintenance · 64
Runtime Security
Access Levels · 129
Configured Users · 126
Runtime settings · *See* Customising CX-Supervisor
Runtime Settings - *Settings* · 118

S

Save Page As - *Saving a Page to a Project*: · 50
Save Runtime As · 130
Saving a Page to a Project · 49
Closing a Page · 50
Save Page As · 50
Saving a Project · 116
Saving Recordsets as XML · 233
SCADA · 256, 259
Scatter Graph - *Control Objects* · 93
Schemas · 229
Screen size · 120
Script Editor · 166
About · 160
Alias definitions · 132, 163
Arguments · 255
Clear · 165, 166
Compilation errors · 166
Completion · 166
Copy · 165
Cut · 165
Executable files, use of · 256
Execution attributes · 163
Expression dialog · 162
Nesting · 257
Object selection dialog · 163
Operator and operand · 258
Paste · 165
Points · 165
Statements · 259
Tabulate · 165
Undo · 165
View · 161
Security · 130
Add a new user · 127
Designer user privilege · 127
Development environment user configuration · 127
Keyboard · 128
Login · 128
Logout · 129
Manager user privilege · 127
Menu option access levels · 130
Modify an existing user · 128
Operator user privilege · 127
Recipe levels · 193
Remove an existing user · 128
Required privilege for exit · 130
Runtime · 126
Runtime environment user configuration · 129
Supervisor user privilege · 127
User configuration, development environment · 127
User configuration, runtime environment · 129
Security Points - *Point Import*: · 74
Select - *Manipulating Objects* · 100
Selecting Pages for Display on Run – *Project Editor* · 135
Settings · 116
Saving a Project · 116
Settings, general and runtime · *See* Customising CX-Supervisor
Simple Tutorial · 18
Simulated Instrument Panel – *Advanced Tutorial*
Slider - *Control Objects* · 95
Slider Wizad – *Advanced Tutorial*
Sorting Points in the View - *Point Editor* · 53
Sorting Points in the View by I/O Type - *Point Editor* · 53
Starting CX-Supervisor · 9
Startup Preferences · 51
Status Bar · 38
Summary of Point Information - *Point Editor* · 54
Super Video Graphics Adapter · *See* SVGA
SVGA · 259

SYSMAC-CDM · 260
System points · 72, 165
  $12Hour · 71
  $ActiveAlarms · 73
  $AlarmCount · 73
  $AMPM · 71
  $AvailableMemory · 72
  $CopyProtected · 72
  $Date · 72
  $DayOfMonth · 72
  $DayOfYear · 72
  $DiskSpace · 72
  $GDIResources · 72
  $HighAlarms · 73
  $HighErrors · 73
  $HighestAlarms · 73
  $Hour · 71
  $LowAlarms · 73
  $LowErrors · 73
  $LowestAlarms · 73
  $MediumAlarms · 73
  $MediumErrors · 73
  $Millisecond · 71
  $Minute · 71
  $Month · 72
  $MonthName · 72
  $MouseX · 73
  $MouseY · 73
  $PLCBusy · 73
  $PLCFailures · 73
  $ScreenSizeX · 72
  $ScreenSizeY · 72
  $Second · 71
  $SecurityLevel · 74
  $SecurityName · 74
  $ShortMonthName · 72
  $ShortWeekDayName · 72
  $ShortYear · 72
  $SystemResources · 72
  $Time · 71
  $UnacknowledgedAlarms · 73
  $UserName · 74
  $UserResources · 72
  $WeekDay · 72
  $WeekDayName · 72
  $WeekOfYear · 72
  $Year · 72
  Description of · 71
System Points · 71

T

Target Value · 260
Testing the Instrument Panel – *Advanced Tutorial*
Testing the Project - *Tutorial*
Text - *Creating/Editing Graphic Objects* · 85
Text - Editing text on a page · 83, 85
Text Bar · 39
  Font Name · 39, 41
  Font Size · 40
  Text Bold On/Off · 40
  Text Centered · 41
  Text Italic On/Off · 40
  Text Justified · 41
  Text Underline On/Off · 41
Text Bold – *Text Bar*: · 40
Text Centered – *Text Bar*: · 41
Text Italics – *Text Bar*: · 40
Text Left Aligned – *Text Bar*: · 41
Text Right Aligned – *Text Bar*: · 41
Text Underline – *Text Bar*: · 41
The First Steps with CX-Supervisor · 9
Time Points - *Point Import*: · 71
Toggle Button
  Wizard · *See* Wizard
Toggle Button - *Control Objects* · 96
Transparency - *Manipulating objects* · 102
Transparency On/Off– *Control Bar*: · 37
Trend Graph
  Inserting a trend graph · 98
  Wizard · *See* Wizard
Trend Graph - *Control Objects* · 98
Trend Graph Wizad – *Advanced Tutorial*
Tutorial · 10
  Adding a Point · 15
  Animation · 14
  Communications · 25
  Concepts of Projects · 10
  CX-Supervisor Pages · 11
  Graphics Editor · 12
  Refining the Project · 17
  Simple · 18
  Testing the Project · 17
Two Tier, Client/Server or Master/Slave · 244

U

Undo - *Manipulating objects* · 102
Using CX-Supervisor · 238
  Communications Control Properties · 240, 251
  Group Attributes · 241
  Item Attributes · 242
  With Omrons OPC Server · 238
Using the Graphics Editor- *Tutorial*

V

Validation Code · 260
Vertical Mirror – *Control Bar*: · 37
VGA · 260
Video Graphics Adapter · 260
Viewing Points · 53
Viewing Project Details – *Project Editor* · 136
Viewing the Contents of a Project – *Project Editor* · 135
Views
  Details view · 43, 50, 54, 116, 136, 144, 156, 187, 197
  Large icon view · 54, 136, 144, 156, 187, 197
  List view · 43, 50, 54, 116, 136, 144, 156, 187, 197
  Small icon view · 54, 136, 144, 156, 187, 197

W

What is a Point · 52
What is OPC? · 238
Windows Taskbar · 260
Wizard · 260
  Gauge Wizard · 22, 91, 92
  Pushbutton Wizard · 91
  Slider Wizard · 22, 95
  Toggle Button Wizard · 96
  Trend Graph · 98
  Trend Graph · 24
Wizards - *Editing Objects* · 83

Z

Zoom - *Manipulating objects* · 104