

USER'S GUIDE

RxSpotlight RxSpotlight Pro

Version 14

Rasterex
2013

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RxSpotlight User Guide

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General Notes

RxSpotlight is a versatile raster-to-vector converter. With RxSpotlight, scanned images such as maps, drawings, sketches and other graphics can be edited, updated and vectorized semi-automatically and automatically.

RxSpotlight is also a powerful hybrid drawing editor. Hybrid drawings consist of a monochrome, greyscale or colour raster image overlaid with vector elements. Multiple raster images can be loaded, and the number of raster images handled during one session is limited only by the computer memory available. RxSpotlight allows the loaded images to be freely arranged in a limitless workspace.

The different natures of vector and raster objects imply the use of different operations to process them. Some of them are intuitively obvious, some are a bit tricky, and some require acquaintance with specific concepts.

The main areas where RxSpotlight is applied are CAD/CAM, GIS, EDM/TDM and Repro.

RxSpotlight is also versatile in handling varied file formats. RxSpotlight allows users to import AutoCAD files (*.dwg, *.dxf, *.dwf), Microstation Design (*.dgn), ESRI Shape (*.shp), HPGL/2 (*.plt, *.hp, *.hpg), raster images from files PDF, and also vector data and document files that were created in previous versions of RxSpotlight or in Vectory. An entire RxSpotlight document or selected objects can be exported to AutoCAD, MapInfo (*.mid) format, ESRI Shape-format, HPGL/2 formats, and objects selected from a current document can be exported to a new RxSpotlight document. Raster images can also be exported to PDF, multipage TIF and multipage CIT files. RxSpotlight supports most raster formats including TIFF (also multipage and geo-referenced), RLC, CIT (also multipage), BMP, JPG, JPEG, PCX, CAL, ECW, C4, TG4, CT4, T4, MrSID (SID), CG4, GP4, MIL, PNG, JP2 and J2K.

RxSpotlight is useful when working with electronic documents with raster images and there is a need to perform unusual or too "intellectual for computer" tasks.

The rough skeleton of RxSpotlight is based on the following techniques:


- Vectorization – conversion of raster lines, arcs, and circles to vector objects. RxSpotlight supports automatic vectorization, selecting and special tracing procedures.
- Rasterization – converting vector objects to raster images.
- Recognition of characters and raster symbols of arbitrary shape and complexity.
- Binarization – picking a raster image, the dots of which are the same colour as, or similar to, a specified colour.
- Calibration – eliminating the distortion of a scanned image due to either initial distortion or scanning errors.
- Correction and filtration to further prepare an image for vectorization.

- Layering – transferring required information from one image layer to another as a result of operations or based on the criteria of pixel colour and object size.
- Creating new vector and raster objects.

RxSpotlight supports all these techniques with multiple additional tools that smooth the workflow and enable the user to solve complex and unusual tasks.

Having learned the power of RxSpotlight, efficiency is considerably increase and goals are reached avoiding time-consuming and boring operations.

Why not simply vectorize it all?

Novice users of RxSpotlight ask the question: “What is this mess of buttons and commands for? Why not simply press this Red Button  and get vectors out of raster immediately?”

OK, if the temptation is irresistible, try it, just to make sure that it works.

If this operation is performed on several different images, then the following rules may soon be derived:

The automatic vectorization result is fine on simple images. It is satisfactory on complex images that are free of distortions caused by scanning, poor storage and the like. It is still good if the complex image is full of standard symbols, texts, hatches, arrows etc. that are found in technical drawings and geographical maps.

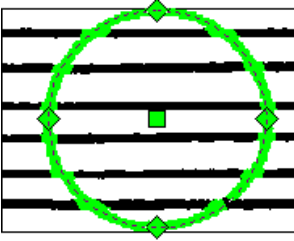
and Red Button pressing results are very unsatisfactory on arbitrary images that are full of speckles, distortions, broken and faded lines, texts, dimension lines, arrows, complex symbols, floodfilled areas, etc.

The last group of images usually contains the most valuable information that can be extracted when the unnecessary noise is filtered out. The automatic vectorization for such extraction must be accompanied by many hours of manual improvement and time-consuming cleaning. Note also that in many cases we do not actually need vectorized images at all; we want our raster image to be cleaned or improved or just to change a part of it.

Now let us introduce one of RxSpotlight features that provide extreme flexibility and precision when working with raster images.

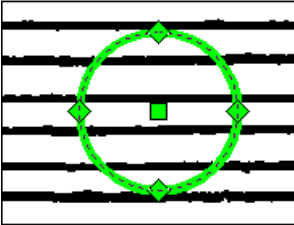


Consider a fragment of raster image, consisting of a circle crossed by lines. We want to make the circle smaller. Though the Red Button is available, we do not need to vectorize or trace this fragment at all in order to obtain the vector analogue of the circle, to change the diameter and then to convert it back to raster because our approach is simpler.

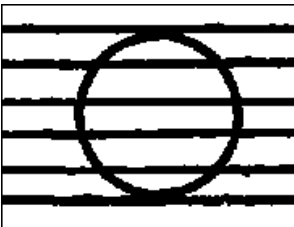


Click on the point on the circle that is not crossed by any line.

The circle is recognized; we can see its centre, and four grips. The grips are used to change circle geometry.



Drag one of the grips towards to centre of the circle. Click on any blank place on this raster fragment to finish the operation...



...Done.....

..... with ONE mouse click and ONE mouse drag. The mechanisms of RxSpotlight have left raster lines intact, even preserving their jagged edges! The circle is drawn with its native line style and colour. All this and other boring intermediate steps are hidden from our eyes.

This Guide describes the variety of techniques and procedures for the transformation of raster objects and images, using operations that are usually applied only to vector objects.

You will also learn now to:

1. Change properties (lengths, colours, geometry, etc) or raster lines, arcs and circles without performing a separate vectorization operation.
2. Treat the raster entities as if they are vector objects and create images from selected objects of a different nature.
3. Recognize hatches, arrows, characters, and symbols.
4. Search raster objects with vector objects of similar shape and vice versa. Replace raster and/or vector objects.
5. Remove noise and speckles from the image or place tiny objects to a separate layer.
6. Manipulate colours on colour images, perform complicated conversions and extract information from colour images directly or using layering procedures.
7. Select objects in more than 40 different ways, including 'intelligent' selection which recognizes the objects nature and type.
8. Correct scanning distortions with a wide range of tools and significantly improve the quality of poor images.
9. Create many copies of selected object(s) with a single command.

10. Create scripts and run them.
... and much more!

Specifications

Supported Raster Formats

Raster formats: TIF, RLC, CIT, BMP, JPG/JPEG, JP2/J2K, PCX, CAL, ECW, C4, TG4, CT4, T4, MrSID (SID), CG4, GP4, MIL, PNG and PDF;
 WORLD and TAF geo-files support;
 Multipage TIFF and multipage CIT support;
 Georeferenced TIFF support.

Import

AutoCAD DWG, DXF files, Adobe Portable Document Format (PDF), Microstation DGN files, HPGL/2 plot files, ESRI Shape files (SHP).

Export

AutoCAD DWG, DWF, DXF files, Adobe Portable Document Format (PDF), Microstation DGN files, HPGL/2 plot files, ESRI Shape files (SHP), MapInfo.

RxSpotlight Document

Unlimited document workspace;
 Modelspace and plot layouts;
 Coordinate System options, UCS creating commands, UCS icon;
 Unlimited number of loaded monochrome, grayscale, and color raster images;
 Storing raster images in a document file as embedded and separate files;
 Rectangular and polygonal clip on raster images;
 Controlling the objects display order;
 Using document templates;
 Auto-saving and recovering, Black-box tool.

User Interface

Multi-document interface (MDI);
 Inspector window that shows and lets users to modify RxSpotlight object properties;
 Templates for saving the settings for all tools for further use;
 Various display modes, previews, named views, Full Screen Mode;
 Customizable menus and toolbars, Individual customization of any command environment;
 Libraries for vector, raster, and hybrid graphics;
 Command Line with interactive keywords and mathematical processor;
 Custom User Profiles to store and switch all Interface settings.

Scanning

TWAIN scanners support, direct support for Context, Graphtec and Colortrac SmartLF scanners.

Printing

Creating layouts with viewports;
Printing with Preview.

Automation

Images Auto Correction – tuning and performing a customizable set of commands;
RxSpotlight Open Architecture: Jscript, VBScript;
COM interface;
RxSpotlight Batch;
RxSpotlight Script language.

Raster Editing

Automatic and manual deskewing;
Image rotating by an arbitrary angle; mirroring; cropping;
Changing an image size and resolution;
Converting to RGB, grayscale, 8-bit indexed;
A wide choice of filters to correct monochrome, grayscale, and color raster images;
Tuning the brightness, contrast, and color balance of an image; automatic and manual correction by histogram; Gamma correction;
Image palette editing; Color reduction;
Drawing and erasing of raster lines with a specified width and color on monochrome, grayscale, and color raster images; flood filling of closed contours;
Pixel drawing and flood filling;
Binarization of color and grayscale images; Various Binarization methods;
Layering of a color image by a specified number of monochrome raster layers.

Calibrating

Calibration of monochrome, greyscale, and colour raster images;
Simultaneously calibration of multiple images;
Calibration by grid and/or by a set of calibration pairs;
10 calibration methods including affine, bilinear, spline, and polynomial with an automatic choice of optimal calibration method;
Calibration accuracy pre-estimation;
Four-point correction to eliminate trapezoid and projective distortions.

Handling Symbols

Tracing and selecting of raster symbols;
Training the program to recognize raster symbols;
Creating the libraries of symbols for recognition;
Searching and replacing of raster and vector symbols.

Hybrid editing

The use of vector techniques for selecting hybrid RxSpotlight objects;
 Selecting hybrid objects and areas within a window and polygon; crossing window and polygon; fence; selecting isolated raster objects; selection by brush and vector contour; various selection modes; wise selection of particular objects;
 The properties and geometry of raster objects;
 The use of vector techniques to edit raster lines, arcs, circles;
 Editing of object geometry using grips;
 Rasterizing vectors to monochrome, greyscale, and colour raster images;
 Merging monochrome, greyscale, and colour raster data;
 Objects moving, copying, duplicating, rotating, scaling, and mirroring;
 Objects aligning;
 Duplicating objects by vector line, arc and circle;
 Exploding complex vector objects;
 Breaking objects at specified points;
 Extending vectors to specified edges;
 Cropping vectors by specified edges;
 Correcting vectors intersection;
 Arranging polyline elevations with 3D view support;
 Polyline edit mode – closing, adding, removing, vertex moving, modifying a curve, joining polylines.

Precise drawing tools

Snapping to the characteristic points of raster and vector objects with display of snap type markers and tool tips;
 Object Snap Tracking mode to snap relative to directions and object nodes;
 Polar snap; orthogonal snap; snapping to grid; fixed moving step.
 Orthogonal drawing.

Selection

27 area and object selection methods;
 WiseObject selection;
 Selection by filter;
 Brush selection;
 Selection by Contour.

Vector Objects

Drawing points, Lines, Circles, Ellipses, Polylines, Splines, Rectangles; Dimensions, Texts and Multiline texts;
 Named blocks with attributes;
 Custom Object attributes
 Custom arrows (markers) and flood fill shapes;
 Custom Line Styles;

Text Styles.

Raster-to-Vector Conversion

Tracing

Tracing on color and monochrome raster images;

Converting raster data to vector objects with automatic recognition of object type and by specified templates;

Tracing arbitrary raster curves by polylines;

Recognizing a raster hatch;

Tracing modes with preserving, erasing, or smoothing of an original raster image;

Auto defining of the most probable polyline tracing direction;

Orthogonalization of polyline segments with specified or auto defined basic direction;

Line orthogonalization when tracing;

Auto defining of a raster entity width with assigning the resulted vectors width;

Distribution of obtained vector objects by layer and colour;

Autoextend option when tracing lines and arcs;

Outline tracing.

Automatic Raster-to-Vector conversion

Recognizing raster lines, arcs, circles, polylines, contour objects, hatches;

Recognizing the type of raster objects, arrows on lines and arc ends;

Auto defining of raster entities width with assigning the widths of resulting vectors;

Recognizing raster polylines on colour images;

Aligning vector segments to the orthogonal direction;

Recognizing raster symbols on bitonal images and converting them to their vector representations;

Distribution of vector objects by layer and color.

Text recognition

Recognizing the text in any orientation;

Training the program to recognize new symbols;

Reviewing and editing recognized texts;

External OCR support.

Vector Correction

Auto correction of vector objects obtained after recognizing, lines conjugation, angle alignment;

Polyline autocorrection;

Joining selected objects to a line, arc, circle, or polyline. Auto defining the type of an object that is the closest to the selected objects;

Collecting polylines.

Rasterization

Rasterization of vector objects to monochrome, grayscale or color images;

Raster Draw mode for creating raster objects.

Installation

For detailed information on installation RxSpotlight refer to “RxSpotlight Installation Guide”.

System Requirements

To work with the program you need the following:

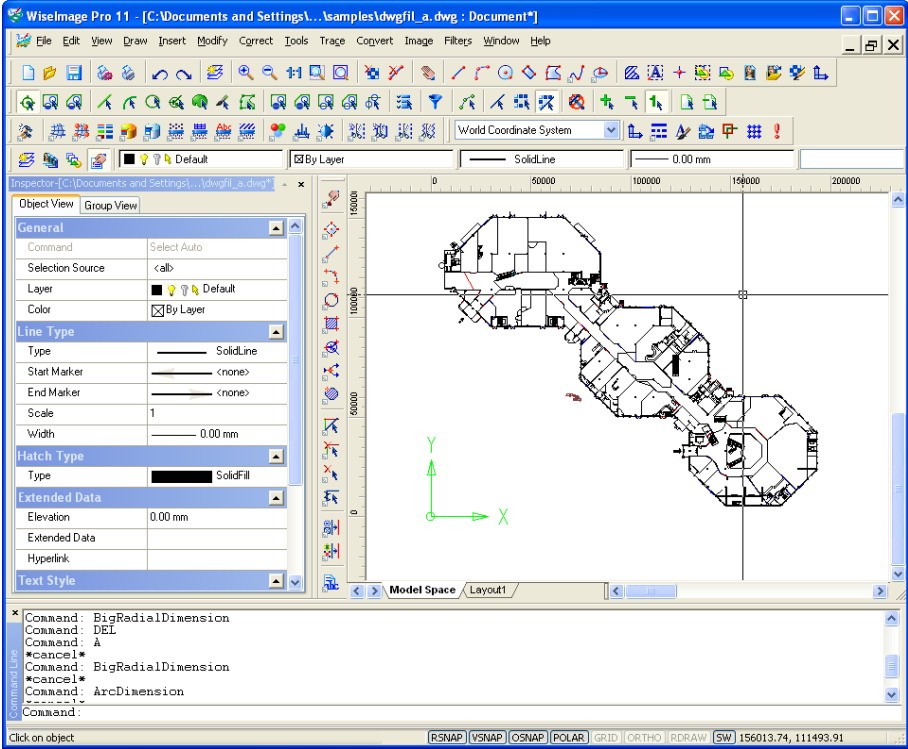
- Computer with Pentium IV based processor and higher.
- 512 Mb RAM and more
- Microsoft Windows XP (SP2) / Vista (32b or 64b) / 7 (32b or 64b) / Microsoft Windows Server 2003.
- Hard disk with 500 MB of free space.

Running RxSpotlight

To start the program choose RxSpotlight icon on the desktop then double click or on the taskbar click the *Start* button>*All Programs>Rasterex>RxSpotlight (Pro) 14>RxSpotlight (Pro) 14*.

RxSpotlight interface

After the RxSpotlight document has been opened you can see menu, toolbars, document window with layout tabs, UCS icon, cursor, status bar, command line and etc.



Document window

Document window shows opened document. If it is necessary, this window can be splitted on several parts. Different modes for image display can be set in each pane, in particular different scales. It may be useful, for example, when working on small details in large documents without losing the whole image.

You can open several documents in RxSpotlight and arrange them in the working area using the cascade, tile vertically and tile horizontally commands.

Layout tabs



These tabs switch document layouts. Every document has at least one tab – Model Space. This is the space where plan creation is performed. A document that was prepared for printing contains other layout tabs.

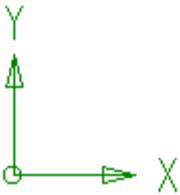
Cursor

Displayed as crosshair with square aperture box. Cursor size and color can be altered in the *Preferences* dialog (see page 389).

Menu Bar

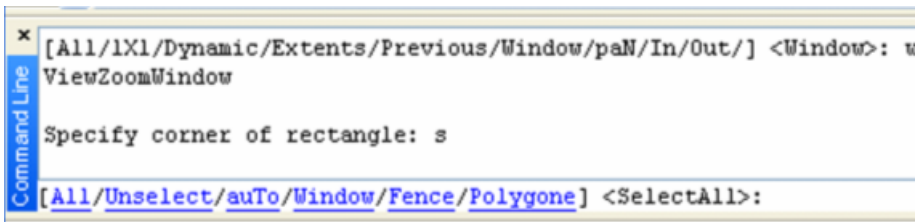
Placed below the caption of an application window and includes drop-down lists of RxSpotlight commands.

User Coordinate System icon (UCS icon)



Displayed at a point 0,0 of current coordinate system. Can be turned OFF by using the Show UCS icon. command.

Command Line



The Command Line is the interactive text window from where RxSpotlight commands can be called and processed. It uses for commands entering and for command prompts displaying. To hide or show Command Line use the Show Command Line command from the View menu.

Status Bar



Status bar is the lowest panel in RxSpotlight application window. It displays command tips (the left part), indicator of program activity, cursor coordinates (the right part), and following buttons:

- Raster (RSNAP), vector (VSNAP), object tracking (OSNAP) and polar (POLAR) snap modes.
- Grid and snap to grid mode (GRID).
- Ortho mode (ORTHO) to draw lines with fixed angles.
- Raster Draw mode (RDRAW) that automatically rasterizes created object on underlying raster image.
- Show width of lines of all objects in the document (SW).
- Show hatches and filling of all objects in the document (SH).

“Life” indicator shows the program activity. It is useful when starting a long operation and to see if it is being performed.

Snap buttons that set snap modes and grid usage are described on page 298.

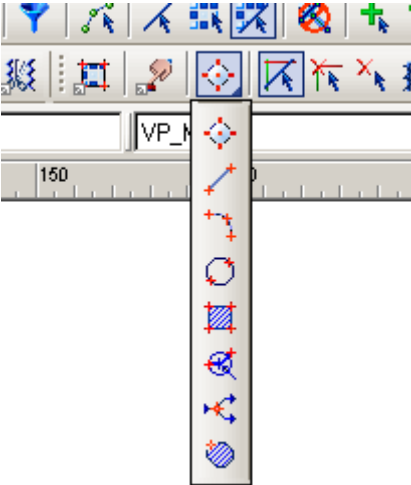
The **ORTHO** and **RDRAW** buttons toggle special drawing modes that are described on page 253 and 297 respectively.

To show/hide the Status Bar use the *Show Status Bar* command.

Toolbars

The toolbars can be moved with the mouse anywhere on the screen with the capability of transparency control.

Every button on the toolbars is intended to start the certain command. If you move cursor to the icon, the name of a command will appear.



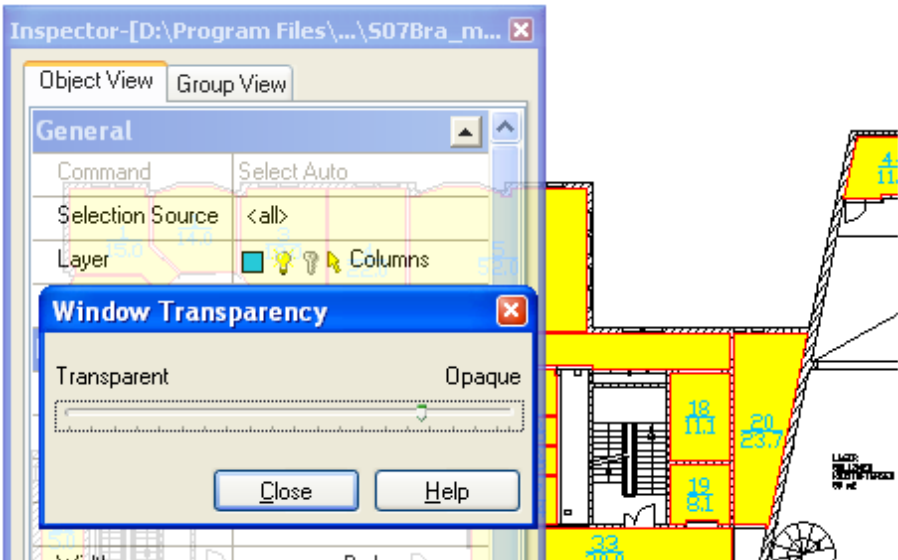
On some toolbars the commands are joined into the groups. You can see only one button from each group. Such buttons have small black arrow in the lower right corner.

To unfold enclosed toolbar it is necessary to click toolbar button and hold the mouse button pressed. Holding the left mouse button, move the cursor to another command of this group and then release the mouse button. As a result the chosen command will be started.

To show / hide toolbars choose the appropriate item from the *View* menu > *Show Toolbar* or right-click on any toolbar, or use keywords, which are shown in the *View > Show Toolbar* menu.

The toolbars are customised in the *Tools > Customise* dialog. Show or hide the toolbars in the list opened by right clicking on tool buttons or by choosing *Show Toolbars* from the *View* menu.

To make a toolbar or dialog transparent, move the cursor onto the desired one and then right-click with the CTRL pressed. When the *Window Transparency* dialog is displayed, use the slider to set this parameter.



The Object Properties toolbar contains buttons and edit boxes. There are four buttons on the left of the toolbar - these open the most important RxSpotlight dialogs: *Layer Manager*, *Image Manager*, *Block Manager* and *Inspector*. *Layer Manager* controls layers and their properties. *Image Manager* controls image visibility and accessibility. The *Block Manager* controls block usage. The *Inspector* window lets the user see and modify the properties of commands and objects.

In the middle of the toolbar there are tools that allow fast modification of selected objects. The list and two buttons on the right are the components of *Named Views*.

-
- ❖ RxSpotlight shows the *Inspector* window and some other dialogs in a docked position. These can be changed to floating if needed by double clicking on the title bar or by dragging window with the Ctrl button pressed.

RxSpotlight document

A RxSpotlight document contains both vector objects and raster images, located on an unlimited workspace. Any number of colour, greyscale, and monochrome raster images can be loaded in a RxSpotlight document; vector objects can be created and documents which contain vectors can be loaded and new images created.

RxSpotlight document can contain several workspaces: a model space and a paper space that is represented by a number of layouts. The most of work is performed in the model space, while the paper space is used for realizing created drawing on the paper.

-
- ☒ For more information on RxSpotlight layouts see page 86.

The RxSpotlight document extension is .CWS; this format can store both raster and vector data.

When working with RxSpotlight a coordinate system is used, this can be specified according to the document requirements.

To create a new RxSpotlight; document choose *New* from the *File* menu. To save a document; use the *Save As* or *Save* command in the *File* menu. When saving a document, all currently loaded RxSpotlight objects will be saved. RxSpotlight also saves all program settings.


Raster images inserted in a RxSpotlight document can be stored in two different ways:

1. as a linked image file. In this case raster images are stored as separate files.
2. as an embedded image inside a RxSpotlight document.

RxSpotlight documents can be opened with the *Open* command of the *File* menu.

RxSpotlight document properties can be set which will be inherited by all newly created objects.


A RxSpotlight document has layers on which RxSpotlight objects are distributed. An object can assume properties “by layer” on which it is drawn or moved to.


 For more information on RxSpotlight layers see “Layers” section on page 45.


RxSpotlight allows the visibility of layers, transparency of raster images. *Birds Eye*, predefined scale or named view can be used for convenient information display.

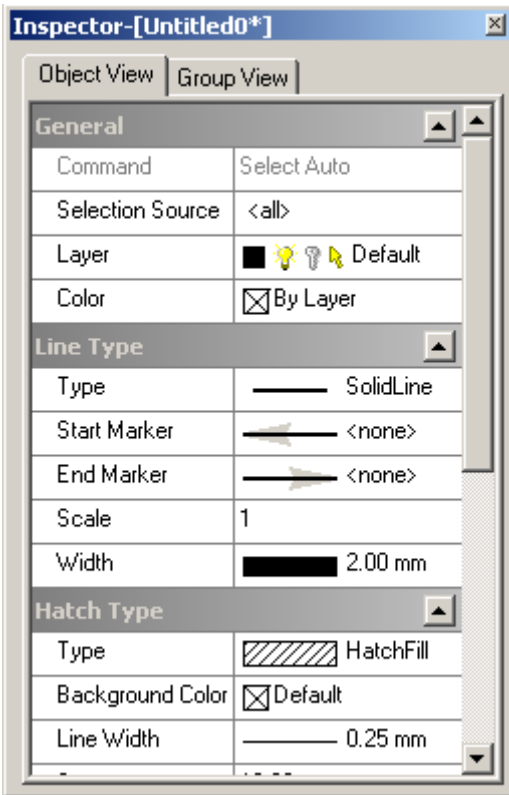
There is also an option to use *file templates*. This allows new documents to be created with raster or vector objects already inserted.

Creating a new Document

1. From the *File* menu, click *New* or press the  button on the *Main* toolbar.

Check the current settings of the RxSpotlight document in the main *Inspector* window by choosing *Inspector* from the *Tools* menu or clicking the  button on the *Image* toolbar. The current settings of RxSpotlight documents can be changed in the *Inspector* window.

To obtain information on the current settings of a RxSpotlight document, be sure that no selection is made or any commands started. Press the *Unselect All* button  on the *Select* toolbar and check the contents of the *Inspector* window.



For more information on *Inspector* window see “Inspector” on page 40.

Predefined raster or vector objects can be inserted in a newly created document. These objects are stored in *file templates* and their usage is controlled by settings in the *Template Usage* section of *Tools > Preferences* dialog (see page 393). For example, if there is a document called BORDERS.CWS which contains a drawing frame and title block, then it is possible to set this as a default template in the *For New documents* section, so that every new document automatically opens with a frame and title block.

Document Template

Document template is a RxSpotlight document with CWT extension, which is used as base for a new documents creating. A document that is created from a template (based on template) inherits template settings (coordinate system, layers, line styles, text styles, snap settings and etc.) and content (raster images, vector and raster objects).

For example, it is convenient to use templates when working with engineering drawings. You create a standard frame with title block, save it in template format and

switch on the usage of this template for new documents. Hereafter all newly created documents will contain these frame and title block.

- ❖ The program supply includes a set of standard (ANSI and JIS) templates for engineering drawings.

To create document template:

1. Prepare document properly: adjust all document settings such as coordinate system, layers, line styles, text styles, snap settings and etc.; delete unwanted objects; create drawing frame and title block; draw any other objects if it is necessary.
2. Save the document in CWT format.

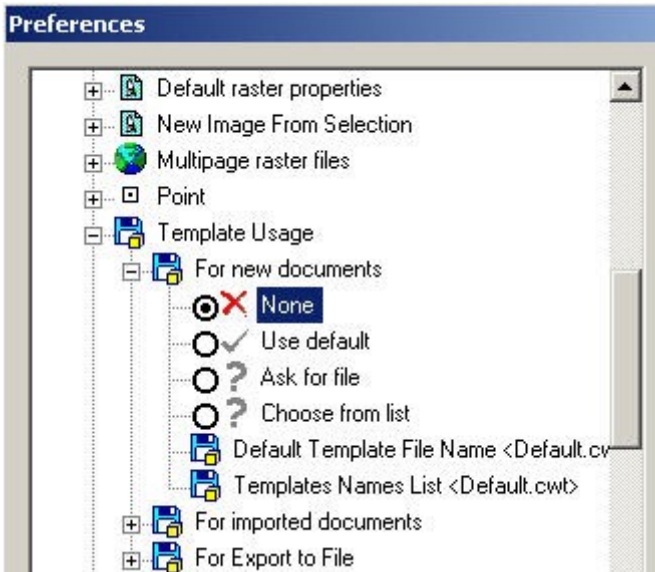
To use templates

Templates can be used for:

- Creating a new document with the *New* command;
- Creating a new document during file *Export* operation;
- Creating a new document during opening a raster image.

The use of template is turned on separately for each of these operations. The template usage is off by default.

There are several ways to work with templates. Adjust settings in the *Template Usage* section of the *Preferences* dialog to specify the way of template usage:



- If the same template is used frequently, then choose the *Use default* option and specify template file name in the *Default Template File Name* text box.

- If you use different templates each time, then choose the *Ask for file* option. Then the file selection dialog will open each time, for a template file specifying.
- To select template file from a predefined list set the *Choose from list* option and specify template files in the *Default Template File Name* text box. Hereafter you can choose appropriate template from a list in the displayed *Choose template* dialog, which includes preview window and description field.
- To switch off usage of templates set the *None* option in the corresponding subsection.

☒ For more information on adjusting settings in the *Template Usage* section *Preferences* dialog see page 393

If the template files are not available or the path to them is specified incorrectly, the message appears: "File not found" and a new document will be created without template.

-
- ❖ Warning: Do not open a template file and a document based on this template at the same time.

Opening a Document

The *File Open* command loads a document from an existing file. If working with another document, then RxSpotlight opens the required document in a new window.

Load a RxSpotlight document through an *Open* command:

- Previous versions of RxSpotlight documents (.cws, .vc4, vc5);
- AutoCAD (*.dwg, *.dxf) files including hybrid ones that contain raster images;
- Raster images of TIF (also multipage and georeferenced), RLC, CIT (also multipage), BMP, JPG, JPEG, JP2, J2K, PCX, CAL, ECW, C4, TG4, CT4, T4, MrSID (SID), CG4, GP4, MIL and PNG formats.

Opening a document loads all its previously saved settings.

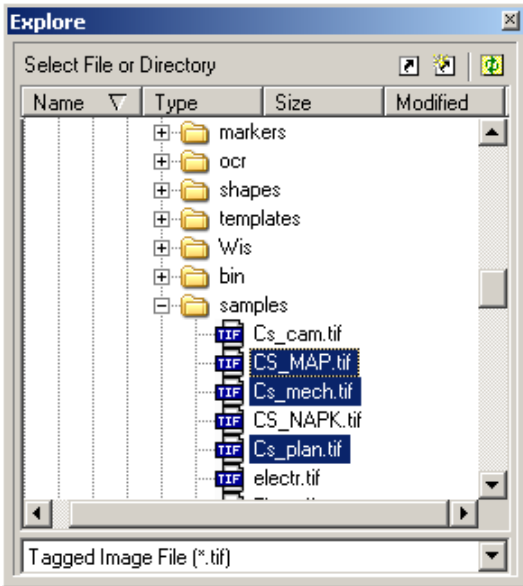
To open an existing document

- 1 From the *File* menu, choose *Open*. The *Open File* dialog appears.
- 2 In the *File Name* box, type or select a file to open. Note that only one file can be opened at a time.
- 3 Click *Open*.

To open multiple documents at once

The *Explore* tool is intended for loading files a RxSpotlight document.

This tool provides all capabilities of working with Windows Explorer files. It allows for opening multiple images at once or inserting several raster images at once, sorting files by type, size, etc.



Choose *Explore* from the *File* menu.

Select a file format from the combo-box at the bottom of the dialog.

In the dialog pane select files (for continuous selection keep the SHIFT key pressed) and move them with the mouse somewhere in the screen. Raster files will be inserted into an open document.

Saving a Document

When starting working with a new unnamed document, RxSpotlight gives it the name *Untitled N*, where *N* is the document ordinal number. RxSpotlight prompts to save this document before closing. It is possible to save an existing document with a different name.

-
- ❖ When saving a document, all RxSpotlight settings are saved.

Before saving a RxSpotlight document, define the way of storing raster images contained within as *linked* or as *embedded*. Note that all created raster images are stored as *embedded*. To store them as *linked*, save them in the *Image Manager* window. Use this window to change the status of *stored as linked* images to *stored as embedded*.


-
- For more information on *Image Manager* see “*Managing Images*” on page 52 of this guide.

The RxSpotlight document can be saved through a *Save* command to:


- Previous versions of RxSpotlight document;
- AutoCAD (*.dwg, *.dxf, *.dwf);
- Raster formats of multipage TIF, multipage geo-referenced TIF and multipage CIT (only raster images).

To save a new document


Define in *Image Manager* the way of storing raster images included in the workspace.

From the *File* menu, choose *Save as* or press the  button on the *Main* toolbar.

In the *Save Document File* dialog box, enter the document name. Click *Save*.

Set additional information on the saved document in the *CWS comments* dialog, which appears by pressing the *Options* button. View this information when opening the document by pressing the *View Menu* button  on the *Open File* dialog or in the viewing object properties mode (comments) with the appropriate Windows tools, including *Explorer*.

To save an existing document

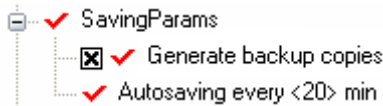
From the *File* menu, choose *Save* or press the  button on the *Main* toolbar.

To save a document with another name:

1. From the *File* menu, choose *Save As*.
2. In the *Save Document File* dialog, type a new name for the current document. Click *Save*.

Autosaving and backup documents

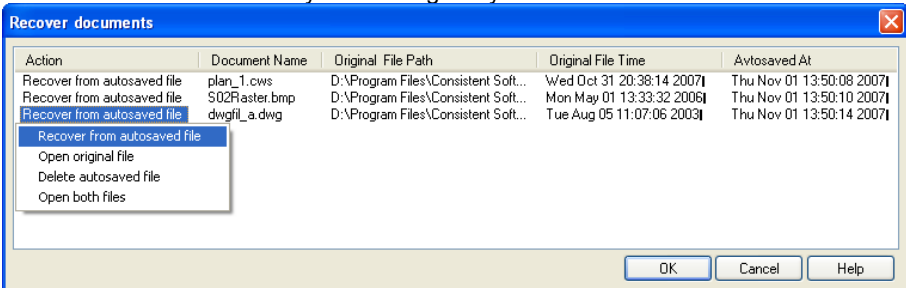
RxSpotlight performs automatically saving for opened documents. Time interval between savings is specified in the *SavingParams > Autosaving every <XX> min* item of the *Preferences* dialog.



To switch OFF the autosaving set 0 for this parameter.

Documents recovering

If RxSpotlight session was unexpectedly terminated, then the *Recover documents* dialog will appear on next application starting. The table in this dialog contains original states of documents, which were opened during program terminating and their backup versions that were created by autosaving utility.



Click left field (the *Action* column) for each table record to specify action for this document:

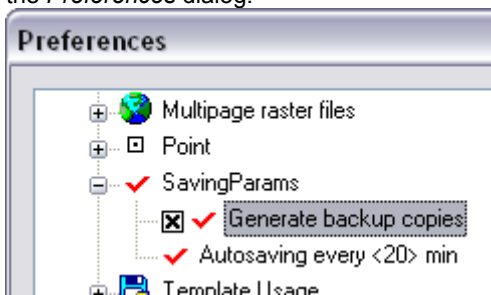
- *Recover from autosaved file* – recover document from automatically saved version.
- *Open original file* – ignore automatically saved version and open original document (if exists).
- *Open both files* – open both documents. Besides, this automatically saved document gets file name postfix "Recovered".
- *Delete autosaved file* – delete automatically saved versions.

Click OK button after performing all actions. All records in the *Recover documents* dialog and temporary files will be deleted.

Backup documents

RxSpotlight generates backup copy of current document right before save to a file. Backup copy is a complete copy of a document with BAK extension. BAK file can be renamed back to CWS an opened at any time.

To switch this feature OFF turn the *SavingParams > Generate backup copies* item in the *Preferences* dialog.



Navigating in RxSpotlight document


Zoom, Pan and Named views









There are many commands that can help navigation in the RxSpotlight screen and indicate the current position relative to the images being processed.

To zoom and pan, use the buttons on the *Main* toolbar. There are more zoom commands in the *View* menu. The most frequently used zoom and pan commands are available in the cursor menu, which opens with a right-click.

Zooming


The *View* menu contains the following zoom commands:

	Zoom All	Displays a whole document.
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	Zoom Previous	Displays a document at a scale set with the previous zoom command. The number of steps for this command is unlimited.
	Zoom Next	Displays a document at a scale that was previously undone by <i>Zoom Previous</i> command. Inactive if <i>Zoom Previous</i> command hasn't been used during current session.
	Zoom Selected	Displays selected objects.
	Zoom Window	Selects an area in the screen.
	Zoom In	Doubles an image size.
	Zoom Out	Decreases an image size by half.
	Zoom 1:1	An image is scaled so that one pixel on the screen corresponds to one image point when DPI is specified.
	Zoom Dynamic	Turns on the mode which can be used to enlarge an object on the screen by moving the mouse up, and decrease it by moving it down.

Some of these commands are available in the cursor menu.

Pan


The *Pan* operation is represented with one command in the *View* menu, with the  button on the *Main* and *View* toolbars, and it is also included in the contents of the cursor menu commands.

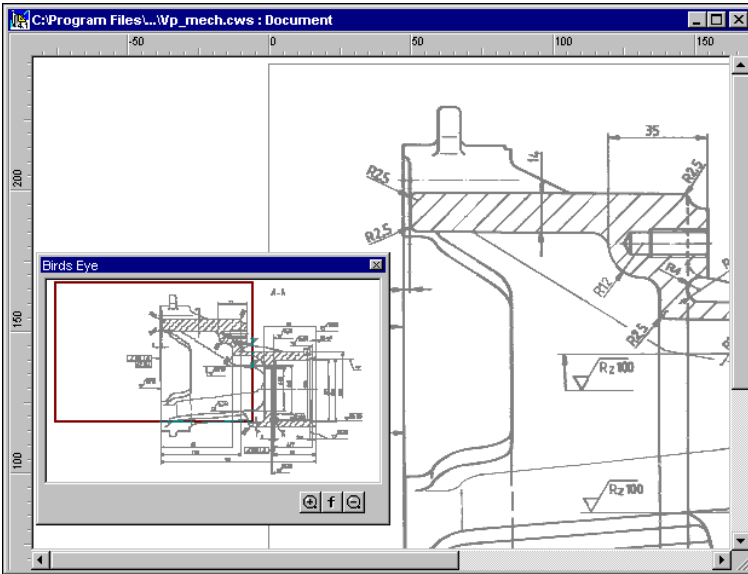
A document workspace can be panned with a hand-shaped cursor. A pan is used often to centre a desired object or feature.

The *Pan* function is also included in many RxSpotlight tools, for example, *Birds eye*, *Preview*, *linefollow tracing*, and others.


Birds eye

Using this tool, any document part can be seen in close-up. It combines the zoom and pan functions, allowing any part of the document to be seen at any magnification.

To launch the *Birds Eye* window, choose *Birds Eye* command from the *View* menu or click the  button on the *View* toolbar.



The *Birds Eye* window contains a view of the document, a red rectangle that represents the part of document shown on the screen, and zoom buttons. Moving the red rectangle pans the document. The selected area fits to the screen boundaries. At the lower right of the window are three buttons. The two zoom buttons allow the details within the red rectangle to be seen without zooming the image. The **f** button pans the image to fit the *Birds Eye* window. The red frame can be resized by clicking and dragging the right mouse button.





The *Zoom Window* command ( button on *Main* toolbar) can be used with the *Birds Eye* window open.

❖ The easiest way to see the entire document is to Click ALT+0.

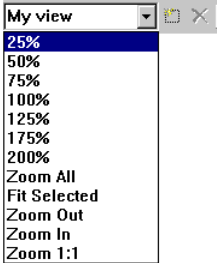
Splitting window


The *View* menu contains the commands to split the window into two or four panes. Different modes for image display can be set in each pane, in particular different scales. It may be useful, for example, when working on small details in large documents without losing the whole image.

There are 4 options to split a document window:


	Split 4	Makes four panes.
	Split Horizontal	Makes two horizontal panes.
	Split Vertical	Makes two vertical panes.
	Single View	Displays a document in one window.

Named views



The mechanism of named views consists of one list box of predefined views and two buttons on the right of the *Object Properties* toolbar. A new view can be created just by typing its name in the edit box or pressing the  button.

The program keeps the documents' window position and scale. Further, choosing the name of the view from the list automatically restores the saved configuration.

To delete a view, select it from the list and press the  button.

Predefined view names can be neither edited nor deleted.

Full Screen mode

This enlarges the workspace to the screen's maximum size at the expense of hiding the RxSpotlight window caption and cropping outermost toolbars and status bar. See the *Customise* dialog > *Options* tab > *Misc* items group > *Full Screen Application Window* checkbox.

-
- ❖ This mode can be turned on for one of the custom profiles and switched momentary. For information about Profiles see page 385.

Grips

Grips are small handles that denote selected objects on the screen. The form and colour of grips show the selection type and editing capabilities. If the grips are green, for example, then the object can be edited. To learn about grips and their options, refer to the *Grip* section in the *Preferences* dialog from the *Tools* menu.

-
- ☒ A description of the information that can be extracted from a grids appearance and the editing procedures using grips can be seen in the appropriate sections of this Guide and in "**Tuning the application**" section on page 389.

Undoing and redoing

The undo and redo functions can be applied once or repeatedly to all operations that modify an image. RxSpotlight distinguishes the limits of operations and their steps. For example, during tracing it is possible to undo or redo tracing steps and segments; then redo the result of the whole tracing session.

The only limitations are the computer's capabilities (most importantly, memory size) and the user's imagination and persistence.

Finishing and cycling commands

By default, after launching a command and getting the results another can be launched by choosing it from a menu or clicking on the toolbar button.

Most commands are cycled; and do not need to be re-launched to repeat an action. For example, when drawing circles, any number of them can be drawn without pressing the corresponding button – it stays “pressed”.

To exit this (and any other command) press ESC or choose another command.

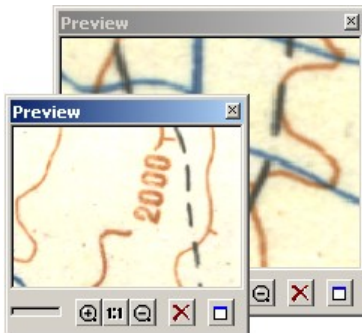
Command cycling is controlled by settings in *Command Setup* dialog, see page 376.

Cursor Menu

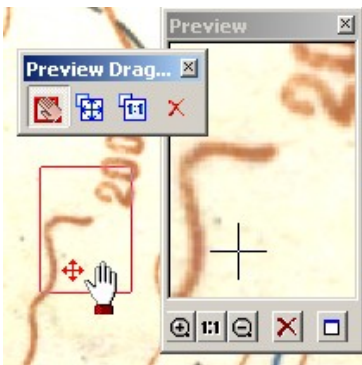
Clicking the right mouse button opens a context-sensitive cursor menu. It contains the commands that may be needed in the current operation mode and also the *Last commands* list.

Preview window

Most RxSpotlight dialogs intended for enhancing and correcting images are equipped with a preview window, where the result of an operation on a selected image part can be observed while tuning its parameters.




The effects of tuning parameters are shown in the *Preview* window. Several preview windows can be opened, which allows the user to observe changes on several image fragments simultaneously.






The image part displayed in the left pane of the dialog is called a preview area. A colour frame on the image indicates the preview area margins. The preview area can be managed using the *Preview Dragger* toolbar, which appears when opening the dialog.

Preview window controls





 – This button turns on/off viewing of the results in the preview window.

 – Zoom in doubles a preview scale in the preview window.

-  – *Zoom 1:1* – displays an image on the screen so that 1 dot in the preview window corresponds to 1 dot on an image.
-  – *Zoom out* halves a preview scale in the preview window.
-  – Opens/closes a detached preview window. Pressing this button repeatedly opens several preview windows for different parts of the image.

Preview area managing buttons

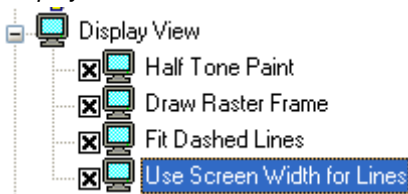
The *Preview Dragger* toolbar

-  – Moves a preview area in the image. The cursor becomes hand-shaped.
-  – Moves an image to place the preview area in the screen centre.
-  – Matches the current scale of a preview area with that of the preview window 1:1.
-  – Turns off the viewing of results in the preview window.

The user can change, if necessary, the position of a preview area in the image without changing its size. To do so, put the cursor in the preview window (the cursor becomes hand-shaped) and drag the cursor to the required part of the image.

Display View details

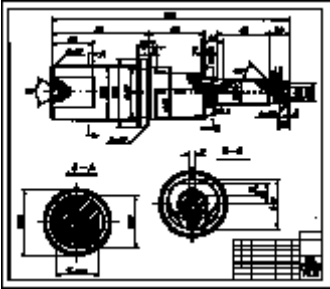
To adjust display options go to the *Preferences* dialog (*Tools* menu) and find the *Display View* item.



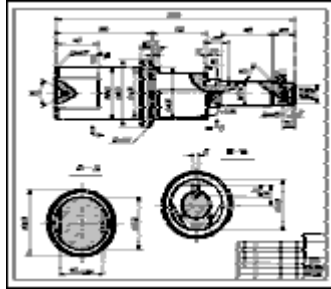
Halftone Raster Painting

When *Halftone Raster Painting* mode is on, RxSpotlight displays the items of a monochrome raster so that the line colour changes according to its width if the scale is decreased.

So if the scale is equal or over 100%, the image is shown with black (or the chosen) colour, and if the scale is decreased, thin lines are shown less crisp and are blurred.



Halftone Raster Painting is OFF, zoomed to 12%. Note that the left lower part of image is a mess.



Halftone Raster Painting is ON, zoomed to 12%. The left lower part of image is easier for the user to understand.

This mode affects colour images in the same way: the images displayed with a small zoom factor are smoothed thus preserving the overall look.

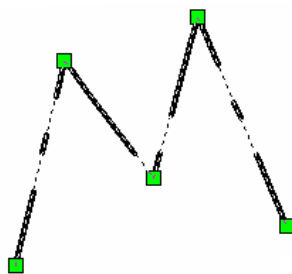
Raster Image Frame Visibility Control

The frame of a raster image is a RxSpotlight vector object that shows the image boundary, which can be controlled. The *Draw Raster Frame* option allows for a frame to be hidden, which is useful when, for example, composing a document from several raster images, or when working with multipage raster images etc.

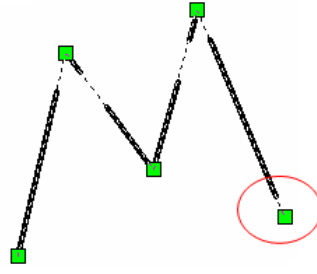
Fit Dashed Lines

When drawing objects with a dashed line style, RxSpotlight tries to display a view of a dashed contour by slightly changing the dashed and spaced size lengths. This method does not affect the objects geometry, but makes the dashed contour view easier to see. For example, in this mode RxSpotlight guarantees that the endpoints of lines, polylines, and arcs will be started and ended with a dash.

This mode can be switched off to view a contour as it is, without changing the length of dashes and spaces. See the *Display View / Fit Dashed Lines* item in the *Preferences* dialog.



Fit Dashed Lines is ON.



Fit Dashed Lines is OFF.

Use Screen Width for Lines

The *Use Screen Width for Lines* checkbox in the *Preferences* dialog shows width of lines in screen pixels. Switch OFF this checkbox to display it in millimeters (RxSpotlight units) to scale line width during zoom operations.

Use Screen Line Types

The *Use Screen Line Types* checkbox in the *Preferences* dialog fixes size of displayed fill shapes, end markers, hatches, line types and etc. without dependence on the document scale. When this mode is switched on, the *Use Screen Width for Lines* becomes active automatically.

Example:

While the *Use Screen Line Types* parameter is ON:

1. Original zoom of a document which contains dashed line:




2. After zooming out of the document:



Thus visual size of Line Type dashes and spaces and End Markers is the same.



Controlling the display of an object's line width

The *Show Width* command from the *View* menu toggles displaying/hiding of objects' line widths. When *Show Width* is off, the objects are shown as "wireframes", thus revealing tiny details and unnecessary garbage. This command  is also placed on the RxSpotlight status bar and its status is shown in the *View* toolbar



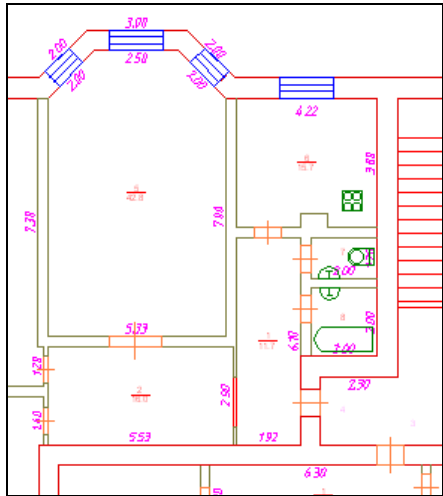
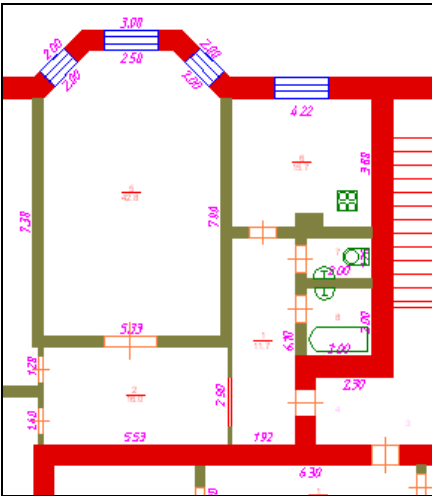
Show/Hide vector and raster objects

These two commands from the *View* menu are especially useful for navigation on the RxSpotlight screen. For example, one click hides the raster data, allowing the user to examine the results of vectorization.

The Show/Hide vector and raster objects commands are represented by the  and  buttons on the Main and the *View* toolbars.

Show/Hide hatches


The *Show Hatches* command shows or hides hatch/fill of all objects in the document.

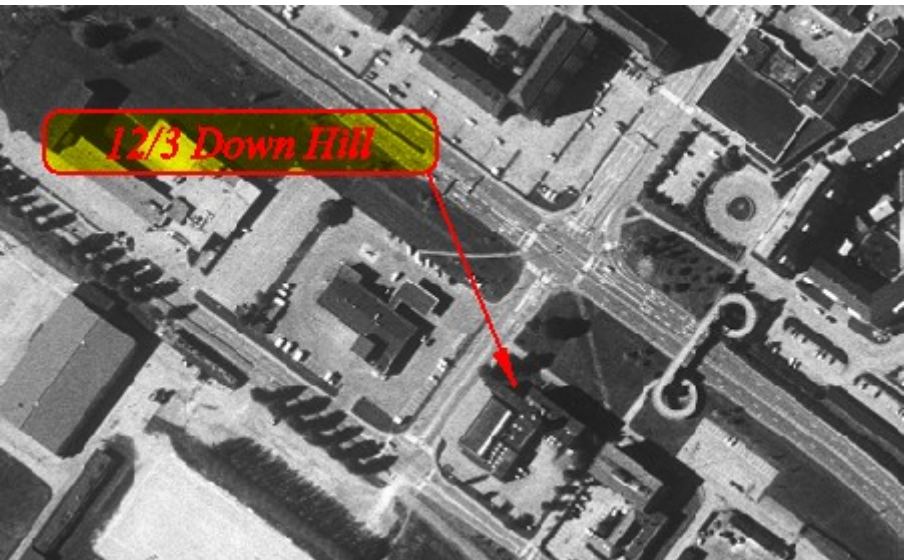


Start the command from the View menu or from the status bar (SH button).



Show/Hide markup

Generally, markup technique uses to redline drawings during reviewing. A vector, raster and hybrid drawings can be marked using the CSView application. RxSpotlight allows you to view markup objects in drawing. To show markup objects click the  Show/Hide Markup button on the Main toolbar.



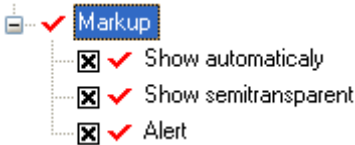
A typical markup object consists of the leader line, contour shape and text. A leader line is a line with an arrowhead at one end and a multiline text and/or contour shape at the other. A text consists of any number of text lines or paragraphs.

Markup Storing

Markup objects are stored in *.CSRL (Rasterex Red Lining) markup files, which should be named equally to the edited drawing file (except for extension) and placed in the folder of the corresponding drawing file. When this drawing is opened with RxSpotlight, then the appropriate markup file is automatically loaded.

Markup Options

Expand the *Markup* section in the *Preferences* dialog to setup markup parameters. To open the *Preferences* dialog, choose the *Preferences* in the *Tools* menu.



- *Show automatically* – shows markup automatically on document open if markup file is exists.
- *Show semitransparent* – shows markup using semitransparent fill.
- *Alert* – shows warning message in case of unknown markup.

Display Order

The order of displaying the objects can be controlled if they obscure each other. Four commands from the *Display Order* submenu of the *View* menu help you rearrange an object “stack”.

	Bring to Front	Brings selected object(s) on top.
	Send to Back	Puts selected object(s) to bottom.
	Bring Forward	Brings selected object(s) one step up.
	Send Backward	Brings selected object(s) one step down.

Cursors

When performing some of the RxSpotlight procedures, the mouse cursor changes to reflect the current operation and its options.

Examples:

	Tracing polyline (linefollowing).
	Create arc by centre, start point and angle.



Select raster in *Remove* mode.

Cursors can be switched off in *Tools > Command Setup* dialog (see page 376)

Dialog templates


RxSpotlight dialog templates are used to save and restore the parameters of different operations. The command dialog that controls such operations contains the *Template* button. A pull-down menu is opened when this button is pressed, containing the *Load* and *Save* commands; the user can save current parameters in the template, as well as to restore the parameters of the current dialog box by loading an existing template.

- ❖ Template files are stored in the corresponding subfolders of the TEMPLATE folder. Settings for *Binarization*, *Colour Separation*, *Colour Reduction* operations and also options set in the *Conversion Options* dialog that influences the tracing, vectorization and selection algorithms are stored in these folders.

Inspector

The *Inspector* window is used to display the information on a current command or selected object(s), as well as for tuning commands and editing objects.

If there is no *Inspector* on the screen, then it can be opened using the *Inspector*

command from the *Tools* menu, pressing the  button on the *Object Properties* toolbar. The keys ALT+ENTER or ALT+F1 can also be used.

The *Inspector* window is usually docked; but it can be made floating by using the standard Windows techniques.

Using *Inspector* to adjust properties of objects

Each RxSpotlight command has properties. By changing these properties in the *Inspector* window the command's performance can be tuned.

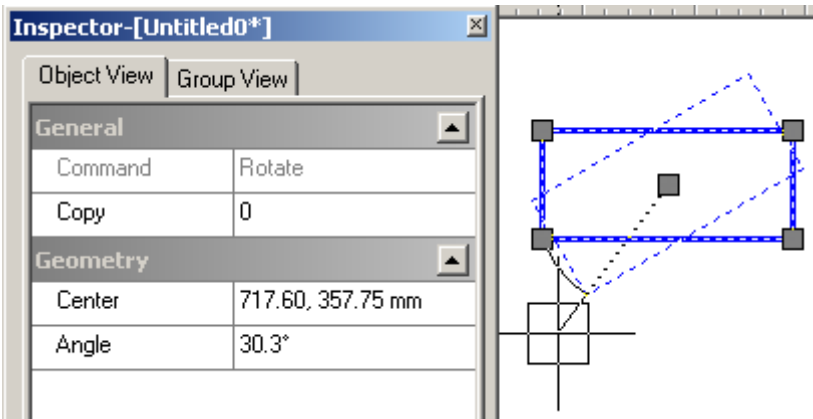
Usually in the Windows environment the commands that require supplementary information are performed in the following order:

1. Start a command;
2. The dialog appears to tune the command;
3. After pressing OK the command runs with specified modes.

The *Inspector* window can be considered as the common dialog for tuning those RxSpotlight commands, which start operations of modifying objects or their condition: moving, changing properties, scaling, rotating, etc. and also creating new objects.

If a command has properties and modes that can be tuned, then the *Inspector* window usually opens automatically.

The *Inspector* window during the *Rotate* command execution is shown below:



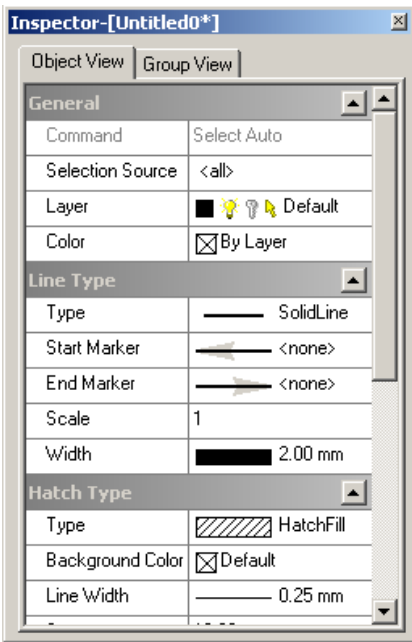
To rotate a vector object, specify its centre, angle, and how many times the command is to be performed (*Copy* property).

The *Inspector* window list begins with the *General* group, which contains current command name and general information on the command or selected object. The remaining part of the list contains the command properties or the properties of any selected objects. The list contents may change depending on the commands' nature.

Default document settings

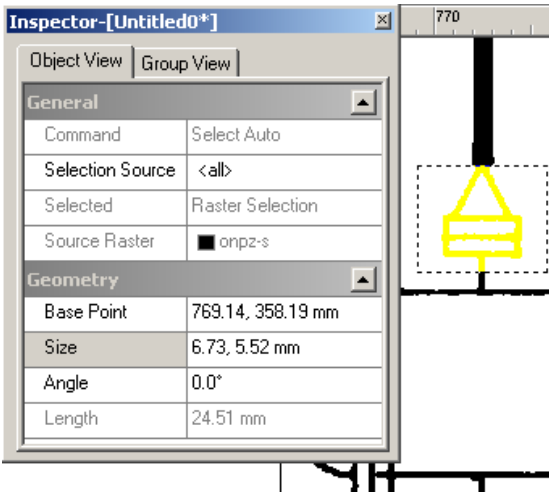
If there is no selection, then the list shows the current (default) document settings to be applied to created objects.

Using Inspector to adjust properties of objects



Since selection is also a command, the commands from the Select family are also presented in the *Inspector* window; after the properties of these commands the properties of selected object(s) are displayed. Thus, the *Inspector* is used as an additional editing tool. Modify an object on the screen with the mouse, or type precise values in the *Inspector* boxes.

If nothing is selected in the document, then the *Inspector* window displays the current document settings, which will define the properties of created objects: for example, if the *Line Width* field contains the value “1mm”, then all new lines, polylines, arcs, circles, ellipses, rectangles and splines will be drawn with this width.



The *Inspector* window is shown when a part of a raster object is selected. The selection can be moved, *Base Point* changed, resized by modifying values in the *Size* box, and rotated by defining them an angle in the *Angle* field.

While reading information in the *Inspector* window, consider the following rules:

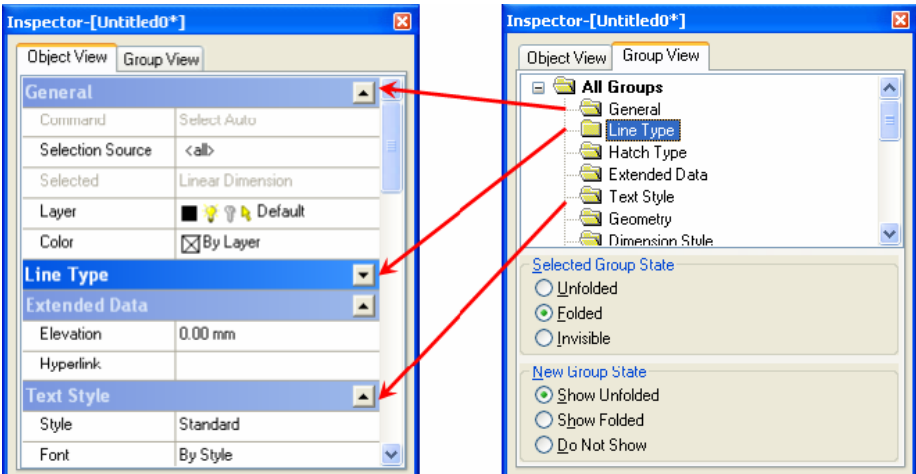
- Black is used to indicate changeable properties. Modify the value of these properties by entering new values to the appropriate field. The *Inspector* does not allow alterations to properties that do not fit the selected property type.

- Grey is used to indicate the properties that cannot be changed in the *Inspector* window, as well as the properties that depend on another properties' value (for example, when selecting a circle in *Length* property contains the circle length, which can only be changed by modifying the circle radius).
- If several objects are selected, then the list includes all properties of all selected objects. These can easily be modified, based on common sense; for example, if a circle and a line are selected, modifying the *Radius* value will only modify the selected circle; and modifying the *Angle* value will only rotate the line.
- If the property value is not specified (the box is empty), then among the selected objects the value of this property is different. By entering a new value in the empty property box, it is possible to define the same value for the properties of all selected objects if applicable.
- Some settings become current after modifying whilst being processed; in this case they are also shown in the relevant lists of properties. For example, if the hatch style for an object is changed, this style remains current and, by examining the *Inspector* window with no selection, the hatch style to be applied to the next created object is shown.
- Some complicated operations can only be performed with the mouse while using the *Inspector* as an information tool. For precision, use both the mouse and the *Inspector* in the correct sequence (see for example *Array* command description on page 253).
- The overall behaviour of the *Inspector* is controlled by settings in the *Inspector* section of the Preferences dialog (see page 389).

Groups



To fold or unfold a group of properties in the *Inspector* window, click the button with small arrow on the right of group name.

To adjust group displaying go to the *Group View* tab. The upper window of this tab shows group names and display status.



Selected Group State

This section tunes visibility of chosen group. Select a group in the upper window and choose an appropriate option in this section:

- *Folded* – To fold selected group. The result is equal to group folding with the  button.
- *Unfolded* – To unfold selected group. The result is equal to group unfolding with the  button.
- *Invisible* – Do not show selected group in the *Object View* tab of the *Inspector* window.

New Group State

The upper window of the *Group View* tab contains only those groups which properties ever been shown in the *Inspector* window. At first, after the program has been installed, this window contains only a few of them, but later, with use of new groups they will be included in this list. For example, the *Viewport* group will be included after creating a first viewport or after it's selecting for the first time.

So the *New Group State* section specifies visibility state of newly included groups.

- *Show Folded* – To show new groups folded.
- *Show Unfolded* – To show new groups unfolded.
- *Do not Show* – Do not show new groups in the *Object View* tab of the *Inspector* window.

Note that you can adjust a visibility of any new group in the *Selected Group State* section at any moment.

Inspector functioning modes

Two variants of *Inspector* functioning can be set: *Document Transparent* (by default) or *Command sensitive*.

When the *Document Transparent* mode is ON, then properties which were changed in the *Inspector* window during any command execution becomes default document properties. For example, if the text size has been changed from 5 mm to 10 mm during text creation, then after the drawing command is completed, the *Text Height* property remains 10 mm.

If the *Command sensitive* mode is ON, then all properties changes during command execution do not affect default document settings.

These modes toggle in the *Properties* mode section of the *Preferences* dialog. (for more information on *Preferences* dialog see page 389)

Custom Properties

To add new custom properties to RxSpotlight objects, right click on the *Inspector* window and choose the *Add Property* item in the appeared context menu. *Text*, *Integer Number*, *Float number*, *Yes/No (Boolean)* data can be added as a value for the new property. Creation of new properties is available from WIOA script.

Custom properties may be useful in WIOA scripts. Additional information can be stored in any object in the document for script purposes.

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- ☒ See *RxSpotlight Open Architecture* chapter on a page 371 for additional information about WIOA script.

There is also an ability to import/export additional properties to other formats where these properties exist. For example in *Mapinfo* and *ESRI shape* formats.

Inspector shows custom property name with point sign at its beginning. For example if custom property name is “ID number”, the Inspector shows “.ID number”.

To delete or rename custom property, right click on it and choose appropriate item in the appeared right-button menu.

Dragging Inspector properties onto toolbars

There is also a possibility to add properties from Inspector to any toolbar using the standard Windows techniques: drag-and-drop with ALT button pressed or direct drag-and-drop when the *Customize* dialog is open. For example, using this method you can create your own toolbar similar to *Properties* toolbar.

Object Properties toolbar

The *Object Properties* toolbar boxes repeat the contents of the corresponding boxes in the *Inspector* window. Add properties from the *Inspector* to this toolbar (or any other) using the standard Windows techniques: drag-and-drop with ALT button pressed or direct drag-and-drop when the *Customise* dialog is open.

The *Object Properties* toolbar also includes the list *Named Views* and the tools for editing it. *Named Views* are described in details on page 33.

Common object properties

Most items in the *Inspector* window are self-explanatory. Below, some of the less-obvious items are explained.

<i>By Block</i>	The block display options are used. Object inherits the colour, line type and other properties of the block containing it.
<i>By Layer</i>	The layer display options are used. The object inherits the colour, line type and other properties associated with its layer.
<i>Elevation</i>	Field for elevation value. Use it when preparing information for GIS systems.
<i>Extended Data</i>	Field for arbitrary information. Use it when preparing information for GIS systems.
<i>Hyperlink</i>	This option allows the user to assign a hyperlink to any object.

Layers

A RxSpotlight document consists of layers on which RxSpotlight objects can be organized. By placing objects on layers, their visibility can be controlled and changes easily made. The properties of every RxSpotlight object include the layer the object belongs to. The objects created can have either the default properties of a RxSpotlight document or assume some of them from the layer they belong to.


Thus, by specifying *By layer* in the corresponding boxes of the RxSpotlight document properties, the properties of created objects can inherit the properties of the layer they belong to. Otherwise, the properties of created objects will inherit the properties of a RxSpotlight document.

Layers can be created, named, and properties assigned to them. Each layer has a set of properties, such as its unique name, display colour, line type, line weight, and more. A layer can be visible or hidden, locked or unlocked, selectable or unselectable. One of the document layers is a current layer on which all drawn objects are placed by default.

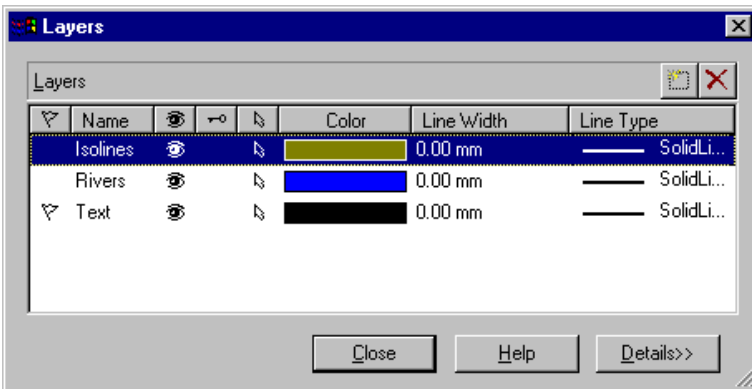
When beginning a new document, it always contains a layer named *Default* with the properties that coincide with those of the RxSpotlight document. An unlimited number of layers can be created. A new layer inherits the properties of the layer that was selected when created. A newly created layer is always visible, unlocked, and selectable. The program assigns the name *New Layer (N)* to it, where N is ordinal number.

Layers can be created and deleted; the information on their properties viewed and changed using the *Layers* dialog.

To open the Layers Manager dialog

Choose *Layers* from the *Tools* menu or click  button on the *Properties* toolbar.

The *Layers* dialog appears:



The *Layers* window can be expanded by pressing the *Details* button to display the full list of the layer properties to be inherited by the objects created on it and inserted in it.

Creating a new Layer


To create a new layer, press the  button on the *Layers* dialog.

A new layer with the name *New Layer (N)* appears in the list. This layer is always visible, unlocked, and selectable.

If the newly created layer is to inherit the properties of another layer present in *Layers*, then select that layer before creating the new layer.

Deleting Layers

A layer which is not current and does not contain any objects can be deleted at any time during the working session. To delete a layer which contains objects delete these objects first.

Select an empty layer to delete from the *Layers* dialog list and press the  button.

Renaming Layers

A layer may be renamed to better define how it is used in the document. A layer can be renamed at any time during the working session.

To rename a layer:

Select a layer to rename from the *Layers* dialog box list, and then:

Click its active name and enter the new name to *Name* or select *Name* in the full *Layers* window and enter the new name.

Making a Layer active

An object is always created on the active (current) layer. This object can assume properties from the layer it belongs to, if *By layer* value is set in the corresponding boxes of RxSpotlight document properties. The active layer should be always visible.

To make a layer current:

Select a layer to make it current in the *Layers* dialog, and then:


Click the *Active* icon  or turn on the *Active* checkbox in the full *Layers* window.


Controlling Layer visibility

RxSpotlight does not display or plot the objects that are placed in an invisible layer. The current layer is always visible. An invisible layer cannot be current.

To turn a layer on or off:

Select a layer to turn it on or off in the *Layers* dialog, and then:

Turn on or off the visibility icon  or turn the *Visible* checkbox on or off in the full *Layers* window.

To toggle visibility off on all the layers, click on the  button on top of the layers list. This toggles the visibility of all layers, except the active one.


Locking or unlocking layers to edit


Locking layers is useful when editing objects associated with particular layers whilst viewing but not editing objects on other layers. Objects on a locked layer cannot be edited. However, the objects are still visible and can be selected and their properties viewed. A locked layer can be made current, and objects can be created and inserted in it.

Commands that do not change the properties of objects located on a locked layer can also be used (for example, select required vectors and convert them to a raster image which is inserted in another unlocked layer). Object snaps can be applied to objects on locked layers. The visibility of locked layers can also be turned off as well as their properties changed.

To lock or unlock layers:

Select a layer to lock or unlock, and then:

Click the *Lock* icon  on or off or turn the *Locked* checkbox on or off in the full *Layers* window.

To toggle locking for all layers click on the  button on top of the layers list.


Controlling object selection


A layer can be made selectable or unselectable.

For example, if there are multiple layers and objects that belong to certain layers need to be selected, the other layers must be made unselectable (and/or invisible).

To make a layer selectable (unselectable):

Select a layer to make it selectable or unselectable:

Turn on or off the *Selectable* icon  or turn on or off the *Selectable* checkbox in the full *Layers* window.


To toggle selectability for all layers click on the  button on top of the layers list.


Controlling Layer printability

RxSpotlight displays but does not plot the objects that are placed in an unplottable layer.

To turn layer printability on or off:

Select a layer in the *Layers* dialog, and then:

Turn on or off the visibility icon  or turn the *Printable* checkbox on or off in the full *Layers* window.

To toggle visibility off on all the layers, click on the  button on top of the layers list.

Specifying Colours

A colour can be assigned to layers so that all objects belonging to these layers are displayed in this colour. The colour of objects is set by choosing a colour from the list in the *Properties* toolbar or in the *Inspector*. If the *By Layer* attribute is set, then the colour of objects is determined by the layer on which the object resides.

The colour of objects that are components of blocks is set on block creation and controlled with the *By Block* attribute.

To change the colour of layer, first select the layer, then choose a colour from the drop-down list or from the *Choose Colour* dialog.

Specifying other layer properties

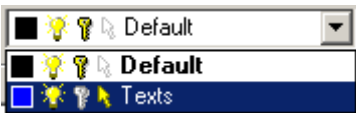
In *Layers* it is possible to specify all properties that can be inherited by the objects created on it. Ensure the *By layer* value is set in the corresponding boxes of the RxSpotlight object properties.

Select a layer to change the properties. Define the required values for this layer. To set the layer properties, except *Line Width* and *Line Type*, expand the *Layers* window by pressing the *Details* button.

-
- For more information on controlling of object properties see “Inspector” on page 40.

Access on the fly

Layers properties can be easily managed in corresponding sections of the *Inspector* window and *Preperties* toolbar.



Images

With RxSpotlight raster images can be opened or inserted and combined with vector objects.

Raster object selection in RxSpotlight makes raster editing as easy as vector editing. Using RxSpotlight, transformation of raster objects into vector objects is simple. Pick a raster object on the image, and then RxSpotlight automatically recognizes its shape and creates the approximating vector. There is an option to delete the original raster. Deleting an original raster object does not leave breaks and gaps in intersecting raster lines.

A raster image inserted into a drawing is either externally referenced (linked images) or embedded to RxSpotlight document. When inserting an image from an existing file, the RxSpotlight object *raster image insertion* is created which contains a path to the image file, scale, rotation angle, insertion point, and other properties. The reference or link to the raster image can be modified or deleted at any time. Raster images can also be stored inside a RxSpotlight document as *embedded* (note that it increases the size of the RxSpotlight document file).

Raster images, as other RxSpotlight objects, can be rotated, scaled, copied, moved, and cropped.

RxSpotlight supports almost every standard image file formats used in computer graphics, document management, mapping and geographic information systems (GIS). Images can be bitonal (monochrome), 8-bit greyscale, 8-bit colour, or 24-bit colour. In the case of bitonal images, the background pixels are treated as transparent.

Each image inserted in a RxSpotlight document has a border. Select an image by specifying a point on its border; if a point inside an image is specified, the image will not be selected. Images can also be selected using the *Select Image* dialog.

A raster image properties can be changed, including:

- image layer, boundary colour;
- image visibility on the screen, border visibility on the screen;
- image transparency in percentage;
- switching on/off background transparency of bitonal images;
- image clipping;
- read-only status;
- scale, rotation angle, insertion point.

Multiple raster images can be inserted in the document.

Any existing image may be loaded and placed in the workspace at the selected location. Images can be edited, saved, and closed. New raster images can also be created in RxSpotlight.

To open a raster image

To open an image, choose *Open* from *File* menu and select an image from the list. RxSpotlight will open a new document that will contain only one object – an image.

The loaded image will be inserted at point 0,0 with scale 1 and rotation angle 0.

The image can be changed and saved. RxSpotlight saves images in their native format by default. If, during working, some other objects are added in the document, then it may not be possible to save all document contents in the image file. In this case, either save an image losing some data, or save the document in .CWS file.

Predefined raster or vector objects can be inserted into newly opened images. These objects are stored in *file templates* and their usage is controlled by settings in the *Template Usage* section of the *Tools > Preferences* dialog (see page 393). For example, if there is a document called BORDERS.CWS with a drawing frame and title block, this can be set as a template in the *For New documents* section, so that every new image automatically opens with a frame and title block.

To insert an image into a current RxSpotlight document

Choose *From file* from the *Insert* menu. After selecting an image in the dialog, it needs to be placed in the document workspace. When moving a dashed rectangle representing the image border to the appropriate position, click to finish the insertion.

When inserting, specify an insertion point and/or scale or rotation angle in the *Inspector* window.

An insertion point can be specified when initially inserting an object (the left bottom corner of the image). In this case the image is inserted with a zero rotation angle and at a scale of 1:1. For example, choosing A4 format with *Portrait* orientation, and millimetres as measurement units, an image of 297 mm in height and 210 mm in width will be inserted.

To change an image scale, specify a scale factor in the *Inspector* window.

The *Angle* field in the *Inspector* window allows the rotation angle of the inserted image to be entered.

To load very wide monochrome raster images

RxSpotlight can open bitonal raster images not higher than 16 million pixels and not more widely than 64500 pixels.

There is, however, an ability to open very wide bitonal images. Those images will be inserted visually as is but with the *Angle* property equal to 90 degrees.

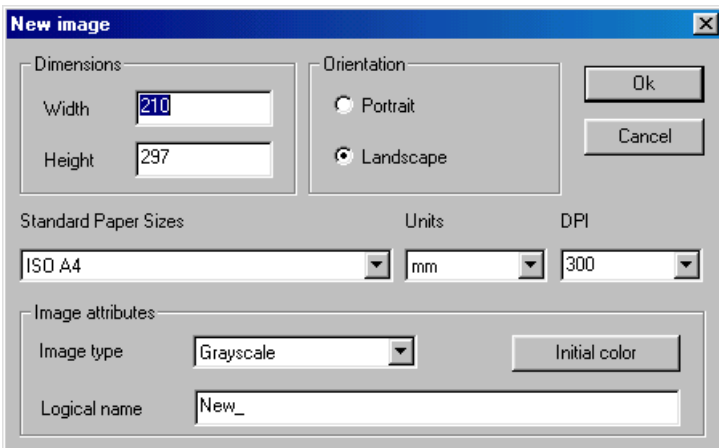
- ❖ A wide bitonal image will be saved to a raster file rotated by 90 degrees.

Options for this feature can be set with the *Large format images control* item of the *Preferences* dialog.



To create a new raster image

1. Choose *New Image* from the *Insert* menu.



2. Enter the image size in *Width* and *Height* or from the *Standard Paper Sizes* list, select the image size.

- ☒ This list only contains the sheet formats included in the *Paper Formats* list of the RxSpotlight *Options* dialog box. This list can either be added to or reduced. See “**Tuning the application**” on page 389.

3. Select an orientation required for the specified sheet format in the *Orientation* box.
4. Select the required image resolution in *DPI*, and the measurement units that will be used when image scaling in *Units*.
5. Click *OK*.

Specify an insertion point, and/or scale or rotation angle in the *Inspector*.

An insertion point can be specified when initially inserting an object (the lower-left corner of the image). In this case the image is inserted with a zero rotation angle and at a scale of 1:1. For example, choosing A4 format with *Portrait* orientation, and millimetres as measurement units, an image of 297 mm in height and 210 mm in width will be inserted.

To change an image scale, switch to the *Inspector* and specify a scale factor.

The *Angle* box in the *Inspector* allows the rotation angle of the inserted image to be entered.

- An image that only contains selected objects can be created. The procedure is described on page 292. The newly created object will have *embedded* status. See the description of embedded images below in this section. A new image can also be inserted directly from a scanner (see page on page 86).


To change image properties

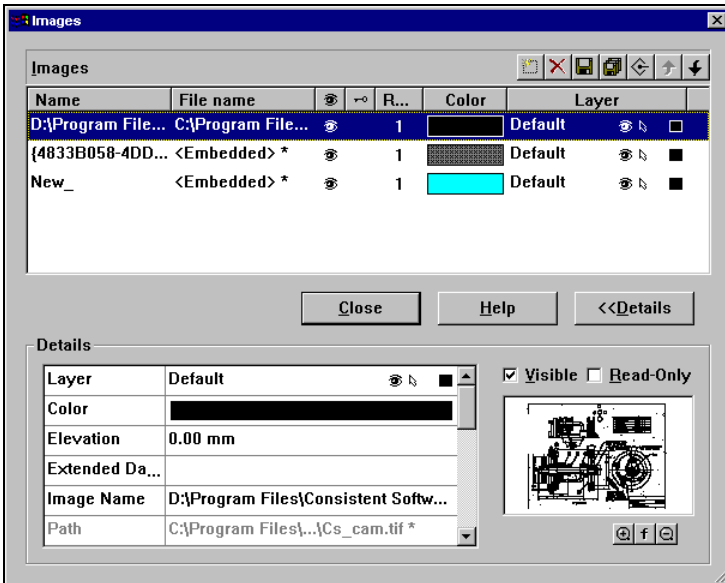
Image properties can be changed with the *Inspector* window and in the *Images* dialog.

Managing Images

The *Images* dialog lists the names of all raster images loaded into the RxSpotlight document.

To open the *Images* dialog

Choose *Images* from the *Tools* menu or click  button on the *Properties* toolbar.



To change the properties of an image, select it from the list.



Name

In this box type in the logical name of the image.

File Name

Displays the selected image's filename.


Read-Only and Visible attributes

These attributes control the ability to change the images. They are represented by *Visible* and *Locked* ( and  icons) and two checkboxes in the *Details* section of the dialog. TRUE and FALSE values can also be set for these attributes in the *Details* list or in the *Inspector* window.

-
- Visibility of images can also be toggled on/off with the *Show/Hide Rasters* command, see page 37. This operation does not change the visibility attribute of images.

References

Images are created or opened once but can be inserted (and displayed) many times. *Reference* shows the number of times the image has been inserted in the document. For example, if an image is selected, copied, and pasted, then the *Reference* field will contain 2.

If the image is not inserted anywhere in the document, then *Reference* will contain 0. It means that image data still exists in the document and is ready to be shown again; to purge it, you must press the *Delete* button .

Colour

Displays the colour of an image (for monochrome images). A colour can be chosen to distinguish between images in the *Inspector* window or *Properties* toolbar. The *By layer* option assigns the layer colour to images that belong to this particular layer; and *By block* assigns the colour of the block to an image that is part of the block.

Layer

the layer to which an image belongs can be seen and the image moved from one layer to another (actually the image does not “move”; but the *Layer* attribute of the image changes).

Details

This button opens the full list of image properties. For example, rotate an image by specifying a non-zero value in *Angle* or make it opaque by setting FALSE in *Transparent Color* (for monochrome images). the same properties list can be seen in the *Inspector* window for a selected image.







Preview

This is the standard RxSpotlight Preview window. It can display the entire image or zoom to an area. Buttons and options are described on page 34.

Buttons


New

Creates a new image.

	Delete	Purges an image from the document.
	Save	Saves an image.
	Save As	Saves an image to a new file.
	Embed	Embeds the selected image. The image is not linked to the file and exists only in the document. See the description of embedded images below.
	Up	Moves the selected image or page of multipage TIFF up. For multipage TIFF this is a way to rearrange pages before saving.
	Down	Moves the selected image or page of multipage TIFF down. Moves selected image or page of multipage TIFF up. For multipage TIFF this is a way to rearrange pages before saving.


Embedded vs. Linked images

There is a possibility to insert an image in document from a file, process and save it. During its work, RxSpotlight keeps image file name and allows to save raster image at any time with the the *Save* button from the *Images* dialog.

RxSpotlight can also process images, which are actually located in the document. Any linked image can be embedded in RxSpotlight document. To embed a linked image, select this one in the *Images* dialog and press *Embed* button . The <Embedded> word appears in *File Name*.

Embedded images can be created by applying the RxSpotlight commands *New Image* (see description on page 50), *New Image from Selection* (see description on page 292), *New Image from Scanner*. They are also generated by RxSpotlight procedures that create images such as binarization and colour separation.

To change embedded image to linked

1. Select an embedded image and press  button.
2. Select a filename and an image format in *Save As* dialog.
3. Press *OK*.

Setting Raster Formats for Saving

RxSpotlight allows you to manage raster formats, which used in:

- *Save As* command of *Images* dialog,
- *Open* command,
- *Insert Image* command.

To set format parameters

1. Press the *Options* button in the dialog of the *Save As* command of the *Images Manager*.

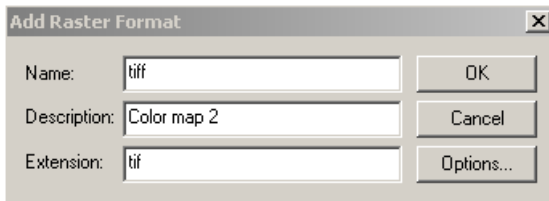
2. Set the necessary parameters of the selected format.

To compose a format list to be applied in the **Save as** command

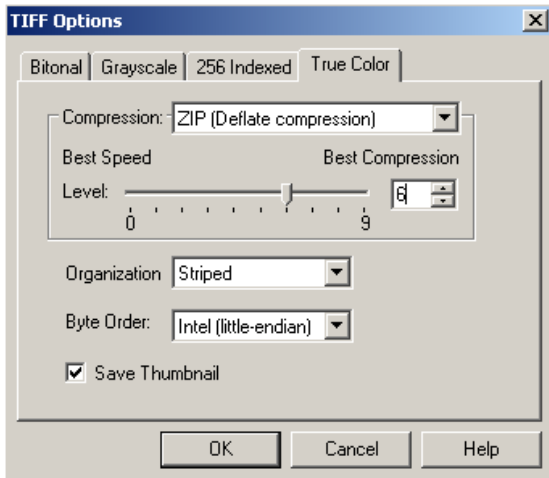
1. Choose *Preferences* from the *Tools* menu.
2. In the *Preferences* dialog pane open the list of *Raster file formats*.
3. Select checkboxes for the desired formats.

To create a custom format based on an existing one

1. Select a base format in the *Preferences* dialog, the *Raster file formats* section.



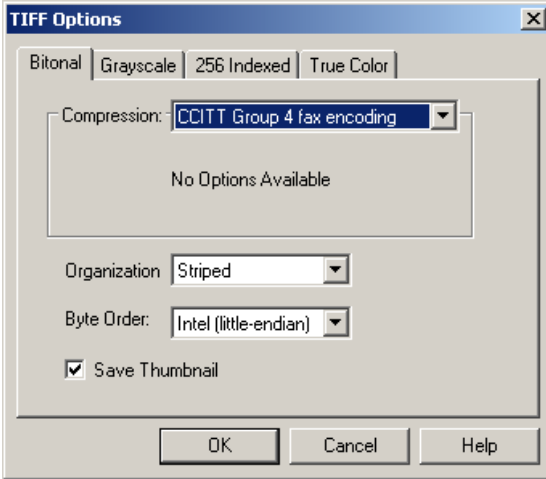
2. Press the *Add* button. Set the name and description for a new format. Press the *Options* button.



3. Set the necessary options in the displayed dialog. The dialog is different depending on the base format selected.
4. Press *OK*.

The format created will appear in the *Files of type* list of the *Save* and *Open* commands.

TIFF Format Options



Compression

Sets compression and compression options:

- No Compression (*All*)
- CCITT modified Huffman RLE (*Bitonal*)
- CCITT Group 3 fax encoding (*Bitonal*)
- CCITT Group 4 fax encoding (*Bitonal*)
- Macintosh RLE (*All*)
- ZIP (*All*)
- JPEG DCT (*Greyscale and True Colour*)

Organization

Raw - No organization

Striped - Sets striped organization

Tiled - Sets tiled organization

Byte Order

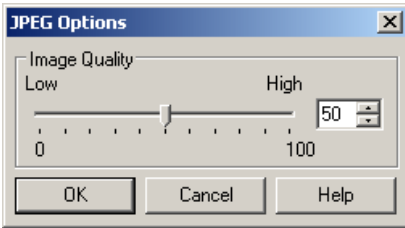
Sets byte order: Intel (little-endian) or Motorola (big-endian)

Save Thumbnail

Saves the thumbnail of the image to preview

JPEG Format Options

JPEG format allows specifying the image compression level; but this operation can result in irreversible information loss. To decrease the visual effect of the information loss, apply a compression level not lower than 80%. Saving an image in this format allows for a considerably reduced file size,. Note that when saving in JPEG format the image is resaved with the new information; this, however, means that the image quality is lowered with each saving. . If the image quality is critical, then it is preferable to use a TIFF format. This format also allows compressing an image with no information loss.



Low - Low quality, high compression level.

High - High quality, low compression level.

Clipping

Clipping is an operation that defines the subregion on the image for displaying, plotting or processing. If an image is saved with a clipped area in CWS file and later reopened, then only the clipped part will be loaded thus reducing load time and saving computer memory. Operations such as filtering and tracing can only be applied inside the clipping boundary that protects the rest of the image from unwanted changes. The clipped area can also be used for cropping (see next section).

The *Image Clip* submenu contains the following commands:



Reset

Resets the clipping boundary



Rectangular

Sets the rectangular clipping boundary



Polygonal

Sets the polygonal clipping boundary

Clipping is the image property that can be viewed and changed in the *Inspector* window.


More on images

Image border

When an image is selected or inserted into a document, a dashed border and three grips can be seen. These interface elements help to move, rotate and scale the image on the screen. They are described in the section “**Entire Image selection**” on page 104.

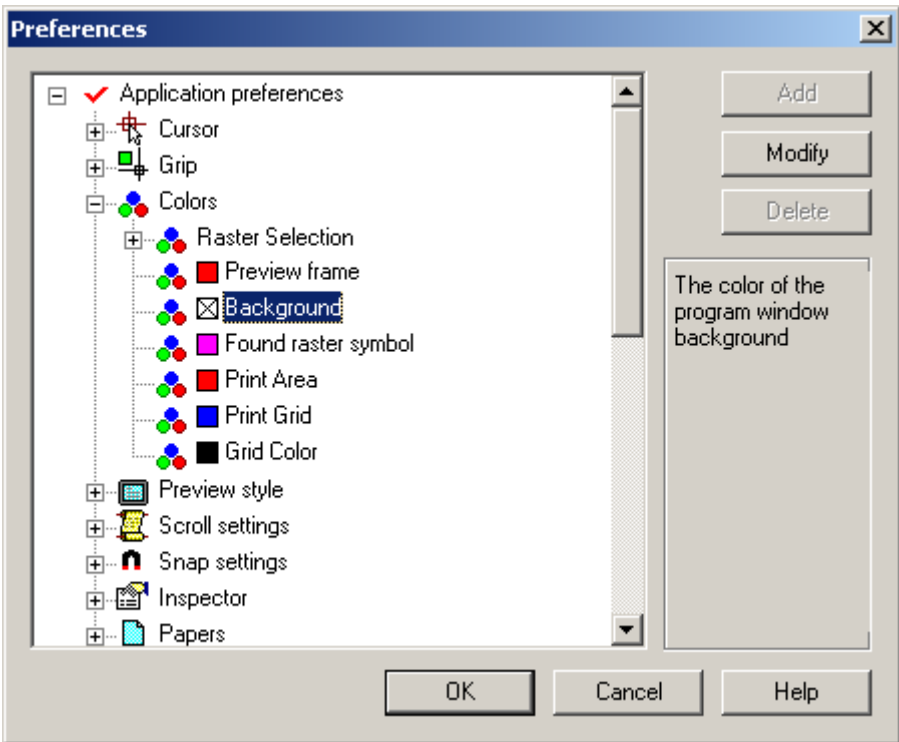
Image selector dialog

Several images can be selected and apply many RxSpotlight operations to them.

Pressing a  button opens the *Image Selection* dialog and images can be selected by clicking them on screen. See the section “**To select several raster images**” on page 105 for more information.

Background of a document and image

To setup the background colour for the RxSpotlight document, open the *Tools > Preferences* dialog and click on *Colours*.




The checkmark next to *Background* means that the default colour is being used. To change the colour choose the *Background* option, press the *Modify* button and choose a colour from the open *Category Name and Colour* dialog and turn off the *Use default colour* checkbox. Press *OK* twice. All RxSpotlight documents will be displayed on the background of the chosen colour.

A background colour can be deleted by setting the *Use default colour* checkbox in the *Category Name and Colour* dialog. In this case the default Windows colour is used.

The background colour of an image can be changed in the *Inspector* window since it is a property of all monochrome images.

To change the image background colour

1. Select an image in *Vector selection* mode ( button pressed) by clicking on its border.
2. Open *Inspector* window.
3. Set *Transparent Color* to FALSE (for monochrome images).

4. Select new background colour in *Background* list.

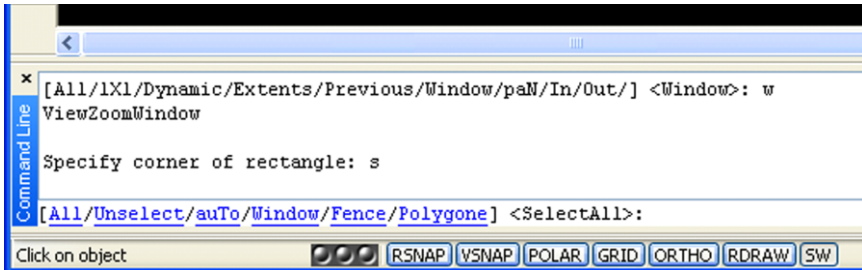
The new background colour shows immediately on monochrome images.

On colour images the background colour shows when raster information erased from the raster image.

Command Line

The *Command Line* is the interactive text window from where RxSpotlight commands can be called and processed.

To show the *Command Line* window choose the *View > Show Command Line* in menu.



The standard way of interaction with RxSpotlight is performed by using dialog windows, *Inspector*, toolbars, and right-button menus. The *Command Line* can be used jointly with all set forth ways of interaction to speed the user's interaction with the program. The new interface is especially convenient for those users who know the AutoCAD interface well.

RxSpotlight *Command Line* is not case sensitive so both uppercase or lowercase can be used.

Commands, aliases and shortcuts

To enter a command from the keyboard, type the full command name in the command line and press ENTER or SPACEBAR to execute it.

A *Command Line* alias is an abbreviation that entered on the *Command Line* instead of typing the entire command name. For example you can enter `HATCH` alias instead of `HatchCmd` command name to run drawing hatch command. A number of aliases could launch the same command. RxSpotlight uses AutoCAD compatible aliases.

Command Line shortcuts are similar to aliases but launch a group of commands grouped by certain criterion, for example the `S` shortcut initiated launching group of selection commands:

```
[All/Unselect/auTo/Window/Polygone/Fence] <SelectAll>:
```

The complete list of registered command names, aliases and shortcuts can be viewed in *Command Line* window by entering the ` (apostrophe) sign followed by the space or Enter key.

Command Line prompt

By default the RxSpotlight *Command Line* prompt looks like

Command:

but it varies depending on the current command or program state.

The command prompt can include descriptive messages that are displayed on the status line when command is running:

`Specify center point for circle:`

Also it can include interactive keywords in square brackets separated by one or more slashes when a choice should be made:

`[Auto/aRc/Circle/Hatch/Line/Outline/Shape/line Following] <TraceAuto>:`

The user can type any keyword or just click on it.

The keyword specified in angle brackets is the keyword "by default". To choose it press the ENTER key.

In addition to choose a keyword, enter the letters capitalized in one of the keywords in the brackets (in uppercase or lowercase). For example, to choose the `aRc` keyword, just enter the `R` or the `r` letter.

Some prompts demand various data as arguments: text, numbers, coordinates, etc. The format of input of such data is similar to a format of data entered in *Inspector* window.

To use coordinate values to specify a point, enter an X value and a Y value separated by a comma `<X, Y>`. The X value is the positive or negative distance, in units, along the horizontal axis. The Y value is the positive or negative distance, in units, along the vertical axis.

For example, to enter coordinates of the point during drawing line command, type the x-coordinate and y-coordinate divided with comma:

`23.45,-6.98`

or just click a point on the screen using the mouse.

Absolute coordinate values are based on the origin `<0, 0>`, where the X and Y axes intersect. Use absolute coordinates when you know the precise X and Y values of the point. For example, the `3, 4` specifies point 3 units along the X axis and 4 units along the Y axis from the origin.

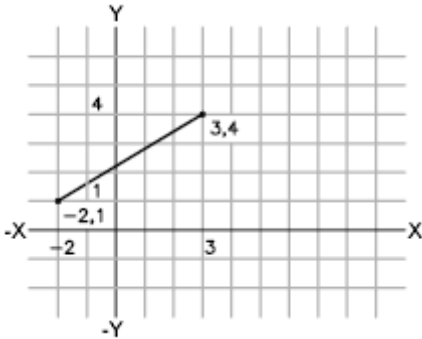
For example, to draw a line beginning at an X value of `-2`, a Y value of `1`, and an endpoint at `3,4`, make the following entries on the command line:

Command: `line`

Specify start point for line or [Continue/]: `-2,1`

Specify end point for line or [Continue/]: `3,4`

RxSpotlight locates the line as follows:



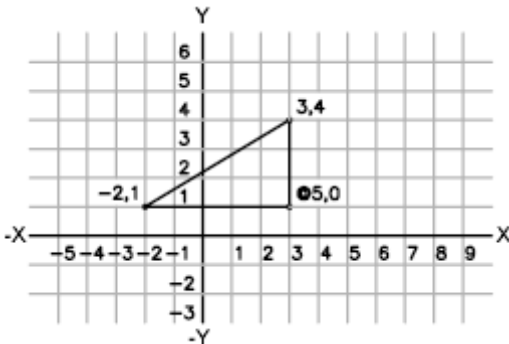
Relative coordinates are based on the last point entered. Use relative coordinates when you know the location of a point in relation to the previous point. To specify relative coordinates, precede the coordinate values with an @ sign. For example, @3, 4 specifies a point 3 units along the X axis and 4 units along the Y axis from the last point specified.

The following example draws a line whose endpoint is 5 units in the X direction and 0 units in the Y direction from the start point at the absolute coordinate location -2,1.

Command: `line`

Specify start point for line or [Continue/]: `-2,1`

Specify end point for line or [Continue/]: `@5,0`



To enter polar coordinates, enter a distance and an angle separated by an angle bracket <. For example, to specify a point that is at a distance of 1 unit from the previous point and at an angle of 45 degrees, enter:

`@1<45`

By default, angles increase in the counterclockwise direction and decrease in the clockwise direction. To move clockwise, enter a negative value for the angle. For example, entering `1<315` is the same as entering `1<-45`.

Polar coordinates are either absolute (measured from the origin) or relative to the previous point. To specify relative coordinates, precede the coordinate with an @ sign.

The following example shows a line drawn with polar coordinates.

Command: line

Specify start point for line or [Continue/]: 0,0

Specify end point for line or [Continue/]: 4<120

The following example shows a line drawn with relative polar coordinates.

Command: line

Specify start point for line or [Continue/]: 0,0

Specify end point for line or [Continue/]: @3<45

Transparent commands execution

Many commands can be used transparently: that is, they can be entered on the command line while you use another command. Transparent commands frequently change drawing settings or display options, for example, ZOOM, or GRIDSETUP.

To use a command transparently, click its toolbar button or enter an apostrophe (') before entering the command at any prompt. After you complete the transparent command, the original command resumes. In the following example, you perform on zoom window command while you draw a line, and then you continue drawing the line.

Command: line

Specify start point for line or [Continue/]: -45.87,643.12

Specify end point for line or [Continue/]: 'zoom

[All/Dynamic/LX1/Window/In/Out/Pan/previous/] <Window>: w

Specify corner of rectangle: -120.22,714.92

Specify opposite corner of rectangle: 154.89,-150.55

Specify end-point for line or [Continue/]: 72.11,-59.62

Commands that do not select objects, create new objects, or end the drawing session usually can be used transparently. Changes made in dialog boxes that you have opened transparently cannot take effect until the interrupted command has been executed.

Navigating

To navigate and edit text and to correct or repeat commands use the standard keys:

- UP, DOWN, LEFT ARROW, and RIGHT ARROW
- INS, DEL
- PAGE UP, PAGE DOWN
- HOME, END
- BACKSPACE

Repeat any command used in the current session by cycling through the commands with UP ARROW and DOWN ARROW and pressing ENTER. By default, pressing CTRL+C copies highlighted text to the Clipboard. Pressing CTRL+V pastes text from the Clipboard.

For most commands, the *Command Line* with five or six lines of previous prompts, called the command history, is sufficient for viewing and editing. To see more lines of command history, you can scroll through the history or resize the command window by dragging its border.

Mathematical Processor

The command line allows input of not only commands, numbers and points, but also of mathematical expressions. This is convenient, when the coordinate or number is not known beforehand but should be calculated proceeding from some conditions.

For example, instead of calculating beforehand coordinate of a point, and only then to type it in a command line, like there:

```
Command: Line
Specify start point for line or [Continue/]: -12.45,17.17
```

you can use math expression:

```
Command: Line
Specify start point for line or [Continue/]: -12.45,$QRT(349.56-275.90)*2
```

The complete list of registered operations, functions and constants can be viewed in *Command Line* window by entering the ? sign followed by the space or Enter key.

The Mathematical Processor supports the following arithmetical operations:

()	Groups expressions
+ -	Adds, subtracts
* /	Multiplies, divides
%	Remainder
**	Power

constants:

E	The constant e, the base of natural logarithms.
PI	The constant pi. It represents the ratio of the circumference of a circle to its diameter.

functions:

COS	Returns the cosine of a number.
SIN	Returns the sine of a number.
TAN	Returns the tangent of a number.
ACOS	Returns the arccosine of a number.
ASIN	Returns the arcsine of a number.
ATAN	Returns the arctangent of a number.
ABS	Returns the absolute value of a number.

EXP	Returns e (the base of natural logarithms) raised to a power.
LN	Returns the natural logarithm of a number.
LOG	Returns the base-10 logarithm of a number.
SQRT	Returns the square root of a non-negative number.
FLOOR	Returns the largest integer less than or equal to the given numeric expression
CEIL	Returns the smallest integer greater than or equal to the given numeric expression.
FRAC	Returns a locale-specific count of the number of digits to display to the right of any decimal point.
TRUNC	Returns the integral digits of the specified number. Any fractional digits are discarded.
ROUND (<i>x,precision</i>)	Returns a number rounded to a specified number of decimal places (<i>precision</i>). The <i>precision</i> variable value indicates how many places to the right of the decimal are included in the rounding.
NEG	Returns the negative value of a number.
SGN	Returns an integer that indicates the sign of a number: 1 - Greater than zero; 0 - Equal to zero; -1 - Less than zero.

The user defined variables can be used in calculation expressions. The variable is created using the following syntax:

?<variable>=<value>

For example:

?base=10

Specify a point: base+10.1,base+20.2


Coordinate System of a RxSpotlight Document

By default a new RxSpotlight document opens in the *World coordinate system* (parameters: origin 0.0, 0.0/angle 0/scale1:1, direction - counter clockwise). Measurement units specified by default depend on the geographical region which is established in the options of the operational system.

It is possible to work in the *World Coordinate System* or set a user defined one.

- ❖ You can set and modify coordinate system for the model space only, because the paper space coordinate system is the World Coordinate System.


To set the Coordinate System

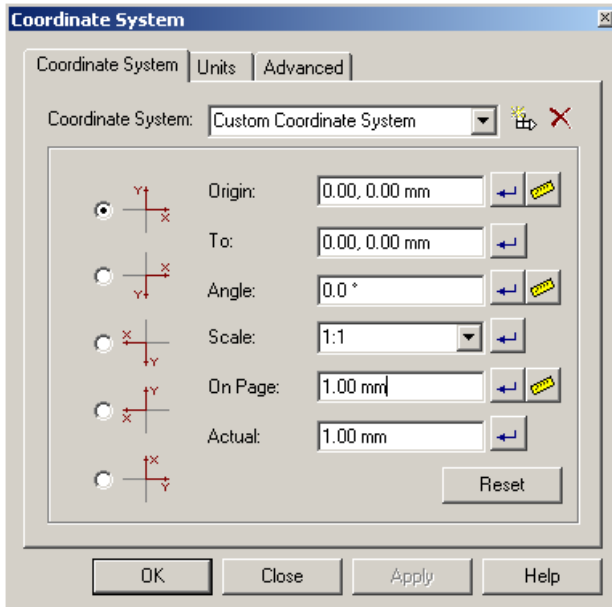
From the *Tools* menu choose *Coordinate System*; or press the button  located on the *Settings* toolbar.



Set a coordinate system in the *Coordinate System* tab of the *Coordinate System* dialog.

If the *World Coordinate System* is selected, then the parameters *Origin*, *On Page*, *Angle*, *Scale*, *Actual* and *To* are disabled.

Creating and modifying a Coordinate System


Press the button  *New Coordinate System*, located next to the *World Coordinate System* field, set a name for the desired coordinate system, and then ENTER.



1. Choose the mutual axis orientation of the coordinate system in the *Base* box
2. Change the origin by either specifying it in the input box or by measuring it on the screen, having pressed the button with the ruler .
3. Change the X-axis angle by either specifying it in input box or by measuring it on the screen, having pressed the button with the ruler .
4. It is possible change the scale in two ways:
by specifying it in the *Scale* box,

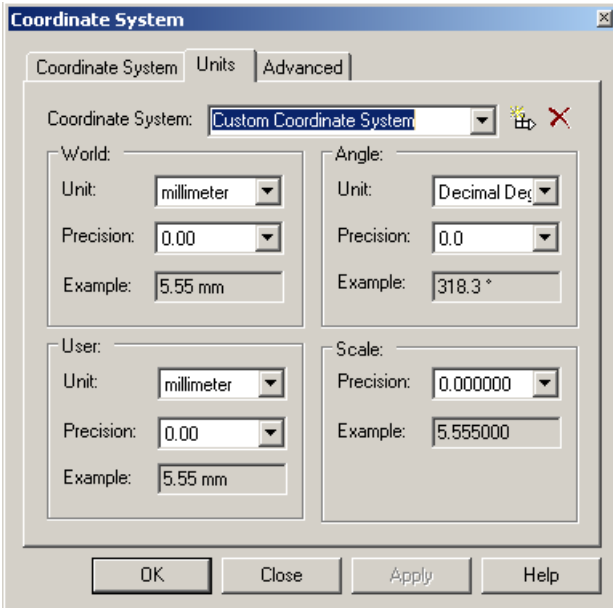
- or -

by measuring the distance *On Page* (either by specifying it in input box or by measuring it on the screen) and entering the matching value in *Actual*. The *Custom* value will appear in *Scale*.

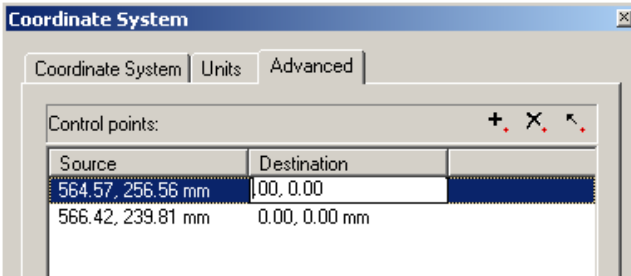
Buttons with arrows  near the boxes reset the default values for corresponding boxes. The *Reset* dialog button resets all parameters of the *Coordinate System* tab to their *World coordinate system* values.




The *Apply* button applies the current settings of the coordinate system to the document and the dialog on the screen stays open. (Pressing *OK* does the same, but the dialog is closed.)

Select the values and precision for both linear and angle units for the coordinate system from the appropriate boxes of the *Units* tab. The *Example* boxes show a way to display the set values with the current settings (units and precision).



The *Advanced* tab helps set a coordinate system on the basis of a few (two at least) control points with known coordinates. This method snaps the image to the coordinate system needed for a current work session.



- Press the *Add Point* button , pick a point in the image, the coordinates of this point will appear in the *Source* field.
- Enter the real (known) coordinates of this point in the *Destination* box.
- To change a control point, select it in the table and press  *Move Point*; then specify a new location in the image.
- To delete a point press the button  *Delete Point*.

UCS defining commands

RxSpotlight has three commands for change coordinate system origin and orientation on the fly.

Set UCS by Point

This command allows you to shift UCS origin.

1. From the *Tools* menu choose *Coordinate System* and then *Set UCS by Point* command;
2. Specify location of new UCS origin.

Set UCS by Point and Angle

This command allows you to change UCS origin and UCS orientation.

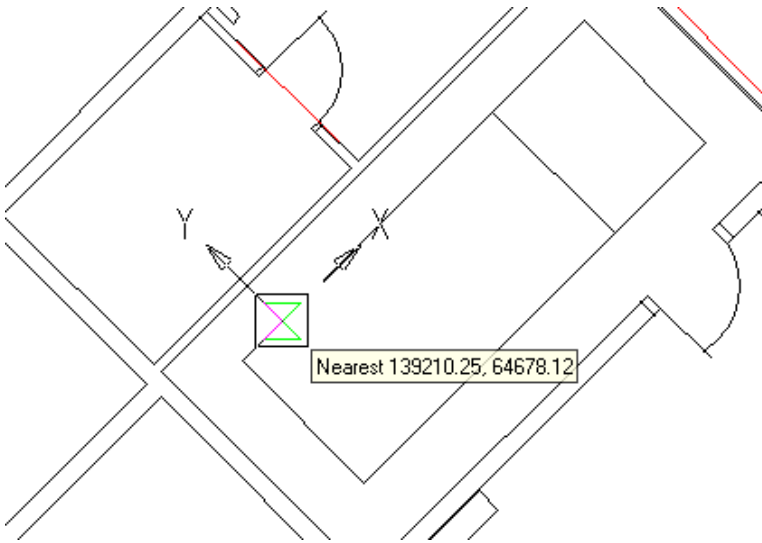
1. From the *Tools* menu choose *Coordinate System* and then *Set UCS by Point and Angle* command.
2. Specify location of new UCS origin.
3. Specify UCS rotation angle.

Set UCS by Object

Sets UCS origin and UCS orientation based on a selected object.

While the cursor has been moved to an object, UCS origin is placed close to object contour. Generally, UCS X axis is placed along straight edge or tangentially to curved edge of object. Y axis is placed dependently of an object type and of X axis orientation.

-
- ❖ To place UCS origin exactly on contour of an object, switch on appropriated snap mode.



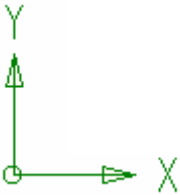
The following table shows dependence between UCS axes orientation and type of an object.

Object type	Axes orientation
<i>Line</i>	X axis – passes along the line in a direction of its longest part. Y axis – changes direction to keep UCS counter clockwise.
<i>Rectangle</i>	Equal to line for each rectangle side.
<i>Arc</i>	Y axis – draws in a counter direction to the arc centre point. X axis – passes tangentially to arc edge in such a manner to keep UCS counter clockwise.
<i>Polyline</i>	Equal to line for each linear segment. Equal to arc for each curved segment.
<i>Circle</i>	Equal to arc.
<i>Ellipse</i>	X axis – passes tangentially to ellipse edge in this or that direction. Y axis – draws in such a manner to keep UCS counter clockwise.
<i>Spline</i>	Equal to ellipse.
<i>Point</i>	X and Y axes keep their previous orientation.
<i>Dimension</i>	Depends on dimension type and part.
<i>Hatch</i>	Snaps to hatch contour. X and Y axes orientation depends on hatch container object.

<i>Block</i>	Snaps to objects in block. X and Y axes orientation depends on type of object.
<i>Ray and Xline</i>	X and Y axes orientation equal to World Coordinate System.
<i>Text</i>	Snaps to text base point. X and Y axes keep their previous orientation.
<i>Multiline text</i>	Snaps to multiline text nodes and text. In addition, UCS origin can be placed inside multiline text field. X and Y axes keep their previous orientation.
<i>Raster image object</i>	Equal to rectangle and line objects.

- ❖ After the *Set UCS by Point*, *Set UCS by Point and Angle* or *Set UCS by Object* command has been performed, the new User Coordinate System is created and became current. It is named as *Current Coordinate System*. It is based on previous UCS and newly specified settings. If the *Current Coordinate System* already exists, then only update of UCS settings is performed.

UCS icon



The Coordinate System icon is displayed at a point 0,0 of current coordinate system and shows UCS origin and axes orientation. This sign can be turned OFF or ON by using the *Show UCS icon* command from the *View* menu.


To change UCS icon color refer to *Colors* section of the *Preferences* dialog.

Measure window

The *Measure* command from the *Tools* menu opens a window with a rich set of tools for measuring lengths, angles, perimeters and areas on the screen.

Use the measure tools to measure objects on the image, edit the results as text and then save to a separate file.

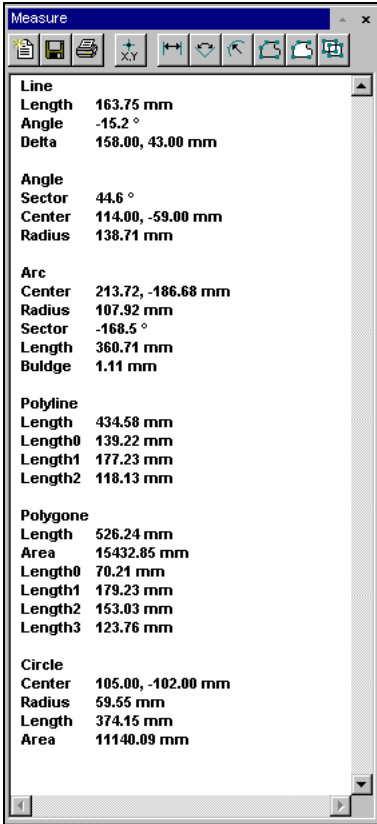
To measure on the screen:

1. Open the *Measure* dialog and choose the appropriate measuring mode (one of the six right buttons; using the  button adds the coordinates of points to the measurement results).

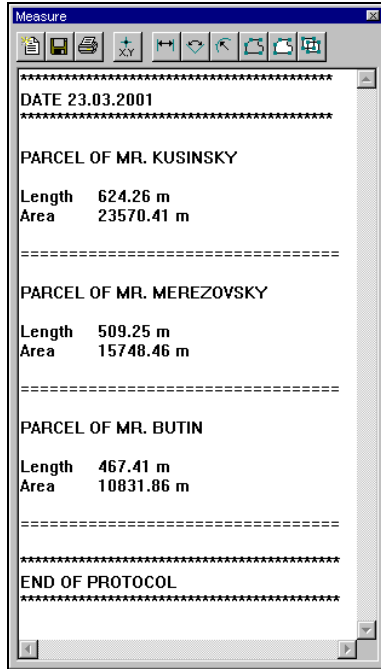
- Move to the document window and by pointing with the mouse; draw a measuring contour over a measured object. It is drawn with «rubber line». When creating a measuring contour use the standard RxSpotlight operations used for creating entities (e.g., a polyline can contain arc segments; they are drawn as arcs with SHIFT pressed).

After creation the measuring contour disappears and the results of measuring are viewed in the protocol window.

- It is possible to edit the text of the protocol and add text. By pressing the buttons on the left of the button bar, the text of the protocol can be deleted, saved and printed.



Automatically recorded protocol



Edited protocol text

Buttons in Measure window



Measure Distance



Measure Angle



Measure Arc



Measure Polyline
Measures the length of a polyline, consisting of line or arc segments.



Measure Polygon
Measures the area and perimeter of the figure enclosed by the polyline.



Measure Selected objects
Pressing this button with one or more objects selected gives the string *Multiple selections*, the number of objects in the selection and their overall area and perimeter in the protocol.
If only one object is selected, then this button also determines the type of object.



Add point coordinates
If this button is pressed, then the coordinates of points are added to the measurement protocol.



New Log
Clears the window of the measurement protocol (previous content is removed).



Save Log
Saves the protocol in a file with the extension .TXT.



Print Log
Prints the protocol.

Measure protocol window
Contains the results of measuring. These results can be scrolled and edited.
The picture shows the edited log.

Clipbooks

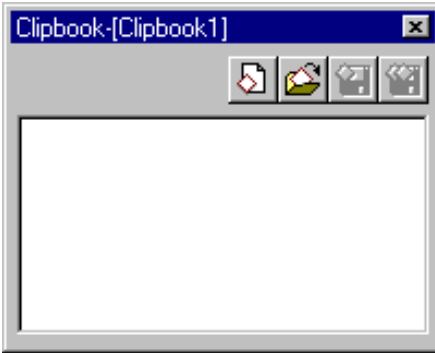
The RxSpotlight Clipbook is a container for raster, vector or hybrid graphics.

Any number of selections can be stored in the RxSpotlight Clipbook. It is also possible to name and save the contents of any RxSpotlight Clipbook window in a file with CLB extension. Therefore, Clipbook files can be used as libraries of raster, vector or hybrid graphics.

To create a new RxSpotlight Clipbook window

From the Tools menu, choose *Clipbook*.

The following window appears.



RxSpotlight Clipbook window

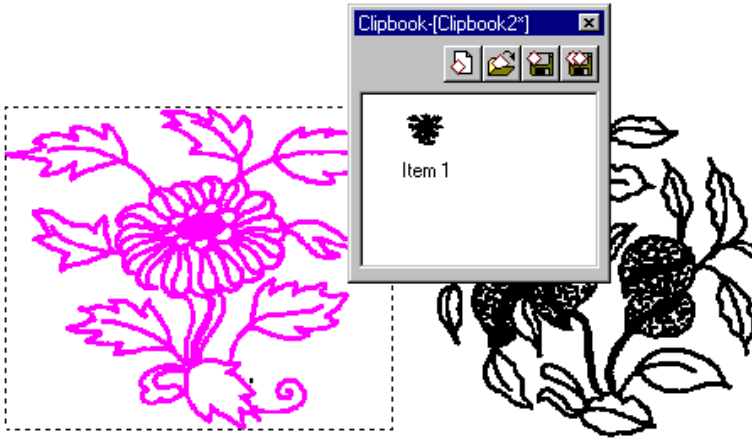
Moving Graphics into the Clipbook

To move graphics from the RxSpotlight document to the Clipbook, cut or copy a selection with the *Cut* or *Copy* command, and then paste the data to the Clipbook. The user can also drag-and-drop selected items into the open Clipbook window.

To move graphics into a Clipbook

1. Select graphics to move.
2. From the *Edit* or right-click and from cursor menu choose *Cut* or *Copy*.
Cut erases the selection and places the erased data in the data storage. *Copy* places graphics in the data storage but does not remove the selection.
3. Activate the *Clipbook* window.
Right-click anywhere in the *Clipbook* window. From the cursor menu, choose *Paste*.

The previously copied or cut selection appears in the *Clipbook* Window. It appears as "Item N" where N is integer.




Previously copied or cut selection appears in the Clipbook window


Managing Clipbook Contents

Using the *Clipbook* toolbar or cursor menu the contents of a Clipbook can be saved in a disk file, and then restored from file.

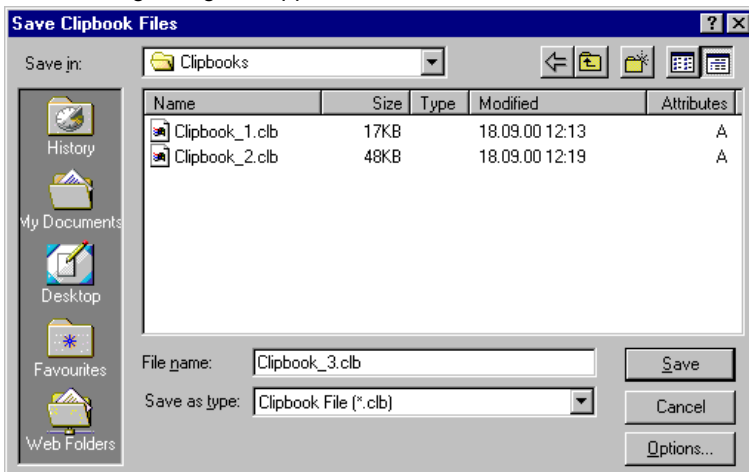
To save the Clipbook

1. Activate the *Clipbook* window to be saved.
2. From the *Clipbook* toolbar click the  button.
 - or -
 - Right-click anywhere in the *Clipbook* window. Choose *Save* from the cursor menu.

To save the Clipbook as

1. Activate the *Clipbook* box to be saved.
 - From the *Clipbook* toolbar, click the  *Save As* button.
 - or -
 - Right-click anywhere in the *Clipbook* box. Choose *Save As* from the cursor menu.


The following dialog box appears.



Save Clipbook dialog box

2. Choose the folder to save the Clipbook.
3. If necessary, then press the *Option* button and write the comments for this Clipbook in the displayed *Comments* window.
4. Type a new name in the *File Name* box or select an existing file to replace.
5. Click *Save*.

To load previously saved contents of the Clipbook

1. Activate the *Clipbook* window where you want to load previously saved Clipbook contents.
2. From the Clipbook toolbar click the  button.
- or -
Right-click anywhere in the *Clipbook* window. Choose *Open* from the cursor menu
The *Open Clipbook* dialog box appears.
3. Select the name of a file to open and click *Open*.





Managing Clipbook Items

Use the cursor menu to rename, delete, cut, copy, and paste any Clipbook item. The user can drag items from the Clipbook and drop them on a RxSpotlight document or on another Clipbook.

To operate with a Clipbook item

Select an item with the left mouse button, then from the right button cursor menu.

Choose:

	<i>Cut</i>	To erase the selected item and place it in the RxSpotlight data storage.
	<i>Copy</i>	To place the selected item in the RxSpotlight data storage but not to remove the item from the Clipbook
	<i>Rename</i>	To change the name of the selected item.
	<i>Delete</i>	To remove the selected item from the Clipbook.

Pasting Graphics from the Clipbook

A Clipbook item can be pasted to a RxSpotlight document or to another opened Clipbook window.

Any item can be moved, scaled and rotated in a RxSpotlight document.

To paste a Clipbook item

1. In the *Clipbook* window, select an item to paste.
2. Cut or copy the selected item to the RxSpotlight document using the *Cut* or *Copy* command from the right mouse cursor menu.
3. From the RxSpotlight *Edit* menu, choose *Paste*.

- or -

Place cursor on the RxSpotlight document or on another *Clipbook* window and choose *Paste* from the cursor menu.

- or -

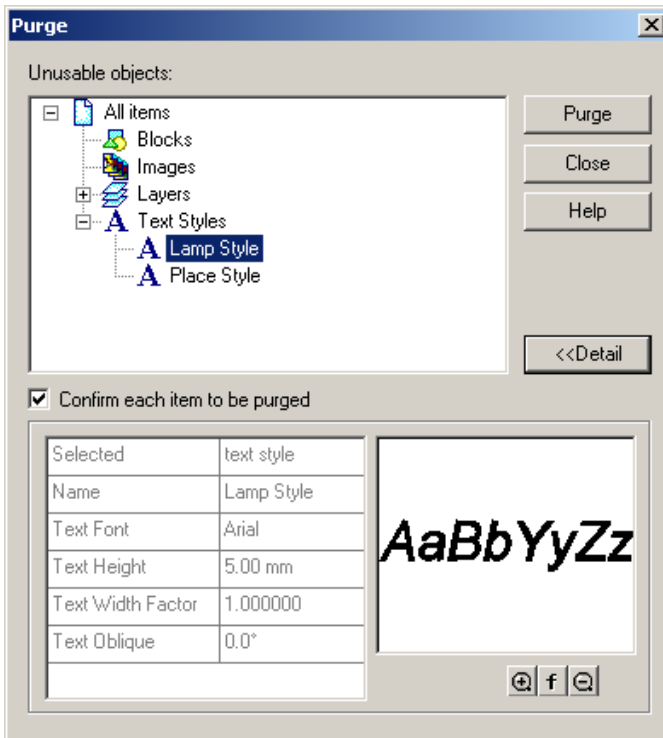
Drag the item from the Clipbook to the RxSpotlight document or to another *Clipbook* window.

The item appears in the RxSpotlight document or in another *Clipbook* window.

- ❖ Clipbook items preserve layer structure. If multilayered items are pasted into the document, then the number of layers may increase, if the layer names of the Clipbook item are different from those of the document.

Purging

Frequently modified documents often contain many unused named objects such as block definitions without block insertions, image definitions without image insertions, layers which do not contain objects, not used text styles. To easily detect and remove all unused objects, use the *Purge* dialog. To start dialog choose *Purge* from the *Tools* menu



This dialog shows only those objects which can be safely removed from the document. For example, a block definition cannot be purged if it is nested inside another block.

Use the *Confirm each item to be purged* checkbox to prevent casual removals.

Turn it on to receive an *object removing confirm* message after every Purge button click. To remove all the objects of a certain category select this category and purge it.

The following objects will not be visible in this dialog:

A block definition cannot be purged if

- It is nested inside another block definition.
- It is inserted in the drawing.

An image definition cannot be purged if

- It is nested inside the block definition.
- It is inserted in the drawing.

A layer cannot be purged if

- It is the current layer.
- It contains objects.

A text style cannot be purged if

- It is the current text style.


- It is used by a text in the drawing.

Exporting and Importing

Exporting

It is possible to export an entire RxSpotlight document or selected objects to AutoCAD, MapInfo format, HPGL/2 formats, ESRI Shape-format as well as to select desired objects from a current document and export them to a new RxSpotlight document, and also export raster images to PDF, multipage TIF and multipage CIT files.

To export a RxSpotlight document or selected objects

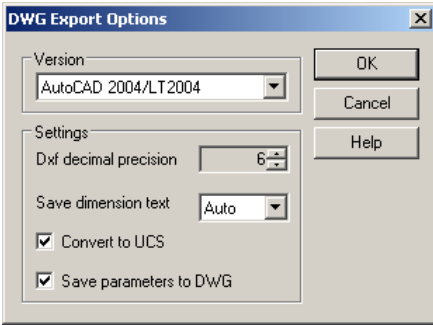
1. Select desired RxSpotlight objects if you need to export particular objects.
2. From the *File* menu, choose *Export* or click the  button on the *Miscellaneous* toolbar. The *Save/Export document File* dialog appears.
3. Select a folder to save the file in and file format from the list of *Save as type* box.
4. The *Options* button offers the optional settings for the selected file format.
5. Type a new name in the *File Name* box or select it from the list.
6. Switch on the *Selection Only* checkbox to export selected objects only.
7. Click *Save*.

Export formats	Exported objects
RxSpotlight (5.x – 7.x) (*.cws) AutoCAD (*.dwg, *.dxf, *.dwf) of version R14 (AutoCAD LT 97) and higher	Vector objects and/or raster images
Adobe (*.pdf) Multipage *.tif Multipage *.cit	Raster images
AutoCAD (*.dwg, *.dxf,) of version R13 (AutoCAD LT95) and lower MapInfo (*.mid) HPGL/2 (*.plt, *hp, *hpg) ESRI (*.shp)	Vector objects

Export to AutoCAD DWG/DXF format

Start the *Export* or *Save As* command, choose the AutoCAD DWG (*.dwg) or AutoCAD DXF (*.dxf) from the format list and click *Options* button.

Use the displayed dialog to select the desired properties.



When exporting to DXF format specify the *Dxf decimal precision* parameter. It defines the maximal decimal precision for the exported document so it can be decreased to the appropriate value.

The *Convert to UCS* parameter is used when saving and exporting. If it is set to on when saving objects in DWG format, then the coordinates and sizes of objects specified with user's measurement units (for example, centimetres) will be recalculated to the corresponding ones in the DWG file. This result is achieved through scaling objects and recalculating coordinates.

The method of dimension text conversion can be chosen in the *Save dimension text* combo-box. Unfortunately, there is no foolproof method to convert RxSpotlight dimension text to AutoCAD dimension text and vice versa, because the dimension text of one application has its specific properties and document concatenations, which is missing in another application.

Text – This method allows conversion of a RxSpotlight dimension text field (the text with its numeric part (%N)) to a plain (word-for-word) AutoCAD text, i.e. a text without a numeric part. Such text will not be changed by a dimensional transformation, but visually it will be identical to the source. This method may useful if DWG format uses as archive format for finished drawings.

Auto – This method allows conversion of a text in dimension text. But if there is no reasonable way to do this, then a text will be converted in the same way as in the first method (a plain word-for-word text).

For example, AutoCAD has no such UCS property as *scale*. So if a RxSpotlight document has UCS scale unequal to 1 and *Convert to UCS* checkbox is OFF, then there is no ability to convert dimension text as it is – the dimensions values of in the RxSpotlight document and in the AutoCAD document would be different.

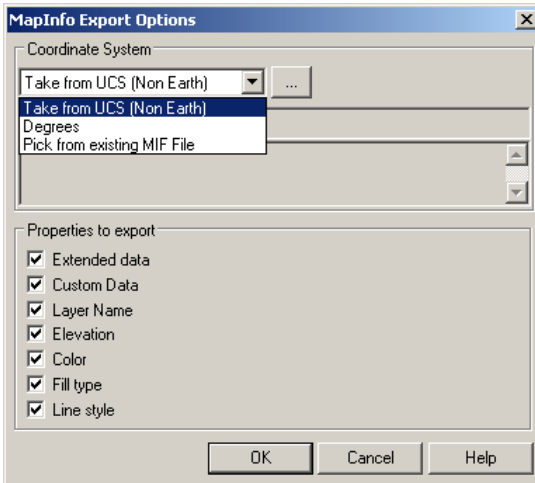
Click OK.

Enter the file name in the *Export* dialog and click *OK* to execute exporting.

The UCS scale can be applied, or not, to geometrical object properties, such as text height and line width while exporting or saving to DWG/DXF. Use the *Apply UCS scale to geometrical object properties* checkbox in the *DWG Export* section of the Preferences dialog.

Export to MapInfo format

1. Start the *Export* command, choose the Mapinfo file (MID) from the format list and click *Options* button.
2. Use the displayed dialog to select desired coordinate system and properties. Click *OK*.



3. Enter the file name in the *Export* dialog and click *OK* to execute exporting. Two files with MID and MIF extensions are created. When exported, some objects are broken to their constituent parts (see the table below). When exported raster images contained in a RxSpotlight document are ignored.

RxSpotlight objects	Mapinfo objects
Line	Line
Point	Point
Arc	Arc
Circle	Circle
Polyline	Polyline
Rectangle	Frame/Region
Text	Text
Multiline text	Text
Raster image	Ignored

To export object properties which are not native to RxSpotlight but are specific for *Mapinfo* do the following steps:

1. Add custom properties to the objects that are identical to Mapinfo object properties
2. Turn on the *Custom data* checkbox in the *Mapinfo Export Options* dialog

Export to ESRI Shape-format

1. Start the *Export* command, choose the *ESRI Shape file* from the format list and click *Options* button.

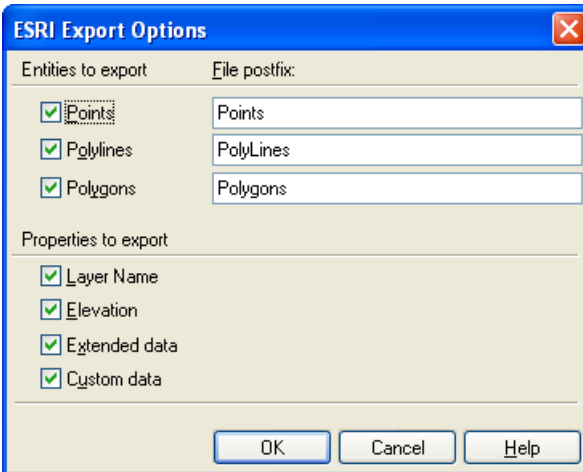
2. Select the appropriate checkboxes (*Layer, Height, Attributes*) to export all attributes you need. The export settings should be saved between work sessions.

To export object properties which are not native for RxSpotlight, but are specific for *ESRI Shape format* do the following steps:

1. Add custom properties to the objects, which are identical to *ESRI Shape format* object properties
2. Turn on the *Custom data* checkbox in *Export Options* dialog

RxSpotlight objects	ESRI Shape format objects
Point	Points
Line	Polylines
Rectangle	Polylines and Polygons
Arc	Polylines
Circle	Polygons
Ellipse	Polygons
Polyline	Polylines (and Polygons if closed)
Spline	Polylines
Text	Ignored
Multi-string text	Ignored
Hatch	Ignored

When being exported, complex objects such as dimensions and blocks are exploded into simple objects; hatches and texts are ignored.



Importing

RxSpotlight allows importing of AutoCAD, Microstation Design, ESRI Shape, HPGL/2 Plot files, raster images from PDF files as well as vector data and Workspace files that were created with the previous version of RxSpotlight (3.X-7.X) or Vectory.

It is possible to add more import file filters by adding the path in the *External format filters location* entry (*Tools > Preferences* dialog box, *Standard directories* section). Import filters can be obtained from your RxSpotlight dealer.

To import a file

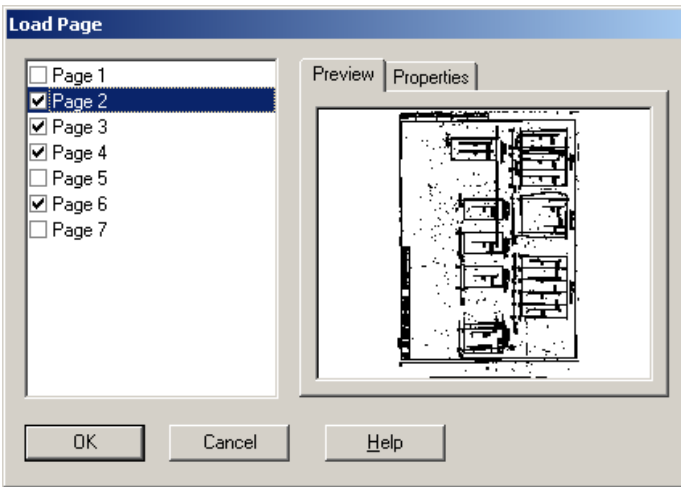
1. From the *File* menu, choose *Import*. The *Open Vector File* dialog appears.
2. Select a file format from the list of *Files of Type*.
3. Enter a file name in *File Name* or select it from the list of files.
4. Click *Open*.

Import formats	Imported objects
Microstation (*.dgn) AutoCAD (*.dwf) HPGL/2 (*.plt, *.hp, *.hpg) ESRI (*.shp)	Vector objects
Adobe (*.pdf)	Raster images

Multipage TIFF and CIT support

Multipage TIFF and CIT are image storage formats that make it possible to keep several images (pages) in one TIFF or CIT-file. It is possible to save a set of raster images as a multipage-TIFF/CIT raster file, and also load multipage files, created with RxSpotlight and other applications. Raster images of any type can be united in multipage-TIFF files. Multipage CIT file supports only bitonal raster images.

Multipage file can be opened using the RxSpotlight *Insert > Image* dialog. The *Load Page* dialog will appear.



To select the pages to be opened, check the boxes next to the appropriate pages (a preview of each page contents is shown in the *Preview* tab and information in the *Properties* tab).

Multipage file can also be opened with the *File > Open* command. In this case the *Load File* dialog is skipped. Rearrange pages in the *Images* dialog window (see page 52).

To rearrange pages


1. Open a multipage TIFF file.
2. Open the *Images* dialog and rearrange pages with *Up* and *Down* buttons (see page 52).
3. Close *Images* dialog.
4. Save raster file using the *Save* or *Save As* commands.

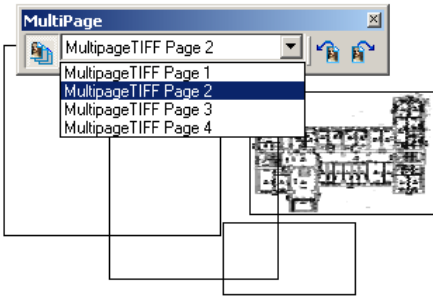
Multipage document mode

The *Multipage* document mode allows to switch between pages in multipage file and view only one page at a time. All newly created and inserted raster images regarded as pages of single multipage file.

To automatically switch to this mode; turn on the *Multipage Raster Files > Enter Multipage Mode Automatically* option in the *Preferences* dialog when opening Multipage file by the *File > Open* command.

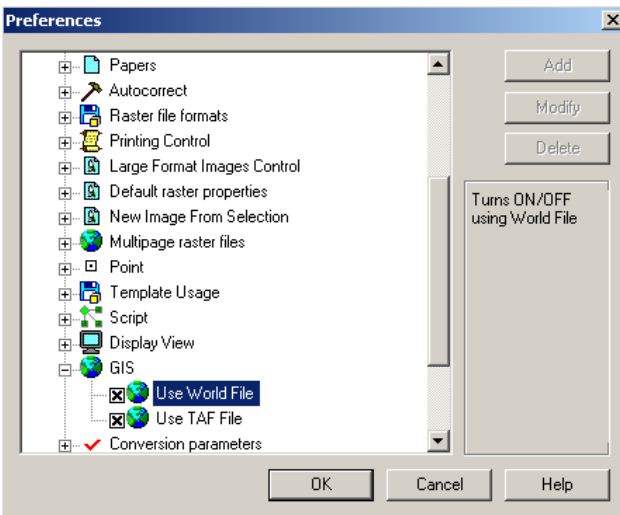
☒ For addition information about *Preferences* dialog see page 389

To turn on Multipage document mode manually, use the  button on the Multipage toolbar. Use the *Next/Previous* buttons on this toolbar to switch between pages.



World file and TAF file support

World file support and TAF file support can be enabled in the *Preferences* dialog.



When saving a raster file an additional file with world coordinates is created. The World File contains the world coordinates of the lower left corner of the raster image, its angle and scale. The additional file name is the same as the source file and the extension is made of first letter of the source file extension, last letter and the letter "W", e.g. saving BMP file creates BMP and BWF files, saving TIF creates TIF and TFW files, etc. If the file extension consists of 4 or more letters, then the letter "W" is simply added, e.g. saving JPEG file creates JPEG and JPEGW files. The TAF additional file name is the same as the source file and the extension is *.taf*.

Raster files can be automatic placed an image in RxSpotlight environment and other applications that support World File feature (mostly mapping programs). When opening files with an accompanying World file, the image is placed using coordinates and other information obtained from the World file. If the raster position, then the scale or angle is changed the World file will be rewritten with new data when saved.

The World and TAF files are the ASCII files, which can be viewed using any text editor.

Scanning

Scanning creates a new image and inserts it into the RxSpotlight document. RxSpotlight uses the WiseScan LE tool. WiseScan, an advanced module designed to work with large-format monochrome and colour scanners. With the practical scan control dialog that presents compactly all WiseScan LE settings the user can quickly and easily define settings and start scanning.

Working with Directly Supported Scanners

In the Direct Support Mode WiseScan LE performs scanning with the use of the built-in scanner functionality (dynamic threshold, background suppression, half-tone transfer, etc.), and are executed in real-time. WiseScan LE controls the scanner on the hardware level – this method is the most efficient when producing high quality images. Gamma curves editing and manipulation helps to scan images of poor quality with colour reproduction defects or change colour profile of these images. The user selects modes and parameters, and the scanner processor executes processing runtime and transfers the results to a workstation.

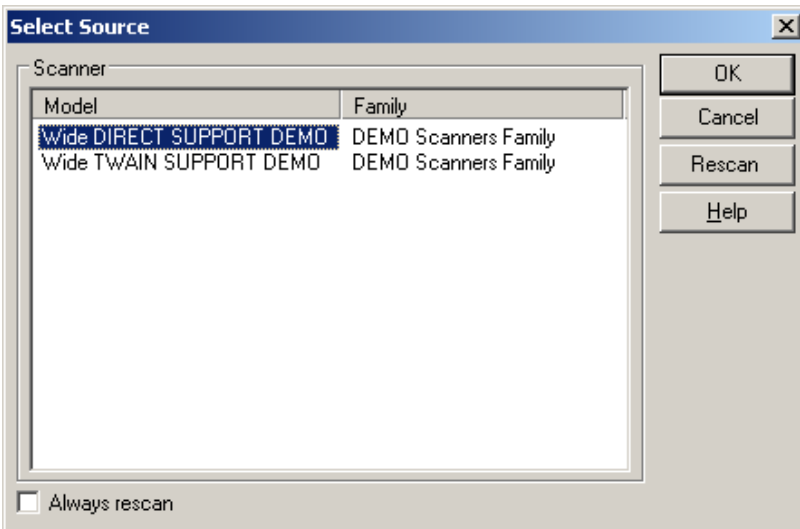
Direct support helps to improve the quality of scanning images and speeds up the scanning process. It is highly suitable for difficult sepias and blueprints and other kinds of similar drawings with background defects. Support for a linear and adapting palette and palette classification speeds up the process of scanning and preparing GIS maps and plans.

Working with TWAIN Scanners

WiseScan LE scan supports TWAIN API for working with TWAIN compatible scanners. In this mode WiseScan LE simply carries out fast image output and post processing; it has none of the advanced features as in the direct support mode.

Begin scanning with WiseScan LE

Select the *Acquire* in the *File* menu. If WiseScan LE is launched for the first time, then the *Select Source* dialog will appear.



The user can choose a source of scanning in the *Select Source* dialog. The dialog opens with the *Select Source* command of the *File* menu.

Process scanning

WiseScan LE works in *Scan to View* mode. In this mode a scanned image is automatically loaded into the main program. It allows processing of an image right after it is scanned using the batch instruments of the main program.

This mode provides additional image processing.



If the *Save To* checkbox is selected then the location where the acquired image will be saved after processing must be given. The file mask must also be specified.

The *Output folder* list shows the current naming scheme for folders with the use of macros. The button opens the standard Windows *Browser for folder* dialog in which the folder name can be combined with macros. This is available only when the *Save To* checkbox is switched on. Optionally an FTP address can be the destination folder.

In the *Mask* list the list of characters to be appended to the filename is specified. This is available only when the *Output* checkbox is switched on.

-
- Refer to *Ws_[Scanner Vendor]* manual for information on scanning modes and WiseScan controls.

To exit from WiseScan LE

1. Press the *Stop* button to stop scanning.
2. Select the *File > Acquire* command or press the button in the host application's *File* toolbar (when WiseScan LE is active the *Acquire* command in the *File* menu is checked and the button is pressed).

Inserting a scanned image into an existing document

Scanned images can be inserted directly into a working document, using *New Image from Scanner* from the *Insert* menu. This command operates in the same way as *Acquire*.

Printing

Document workspaces

To prepare drawing for printing use the paper space. RxSpotlight document consists of two spaces: the model space and the paper space. While the drafting, vectorization and model creation is performed in the model space, the paper space is used for realizing created models on the paper. The paper space consists of a number of layouts.

To prepare drawing for printing

1. Create a new layout or switch to an existing one using drop-down list on the *Layout* and the *Properties* toolbars;
2. Create and adjust viewports;
3. Create other paper space objects (for example drawing frame and title block);
4. Tune layers printability using the *Printable* parameter;
5. Adjust print options;
6. Start the *Print* dialog to print drawing.

To print directly from the model space begin from the step 4. This can be suitable for simple and draft printing.

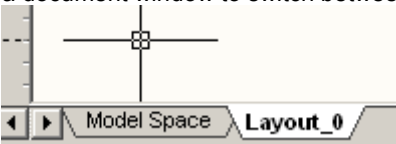
Layouts

Paper space

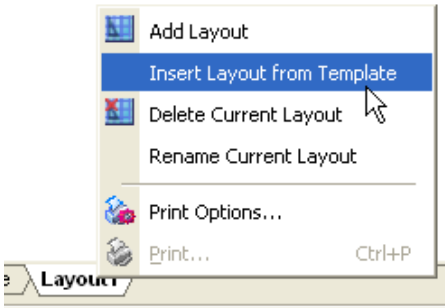
Working in paper space, you create objects just on certain layout. These objects are printed on paper but not displayed in the model space. You should create such an object as layout viewport, to see predefined part of model space in paper space layout. Viewport is a "window to model space" actually. It is convenient to place those objects in paper space, which are used only for print output (drawing border and title block).


Layouts


Each document can contain a number of layouts. Use layout tabs in the bottom part of a document window to switch between the model space and layouts.



All layout commands are accessible from the *Insert* menu, the *Layouts* toolbar and context menu (right click on any layout tab):



To create new layout use the *New Layout* command from the *Insert* menu or click the  button on the *Layouts* toolbar.

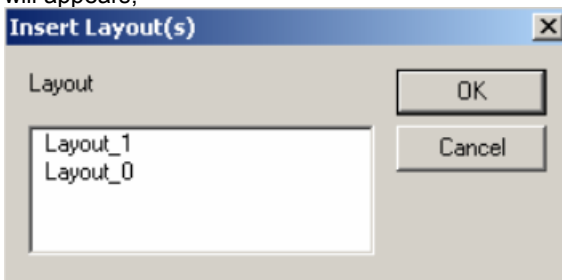
To delete current layout run the *Delete Current Layout* command from the *Insert* menu or click the  button on the *Layouts* toolbar.

To rename current layout run the *Rename Current Layout* command from the *Insert* menu or from the context menu after right click on the appropriated layout tab.

Inserting layout from a template file

To insert layout from external RxSpotlight document (CWS), from document template (CWT) or from AutoCAD drawing (DWG) use the *Insert Layout from Template* command.

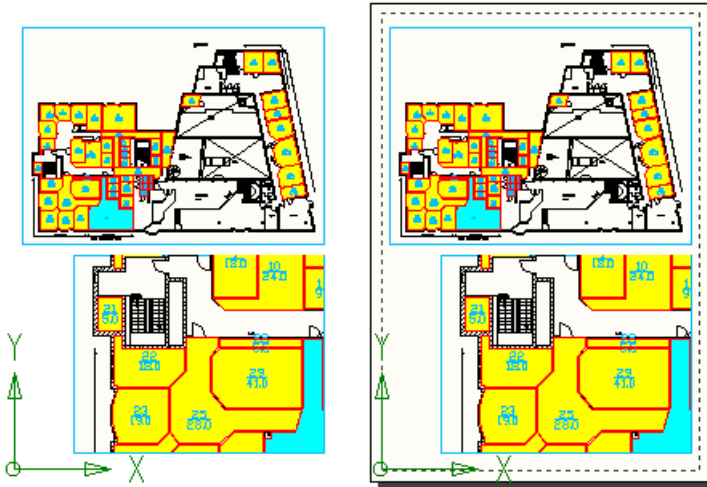
1. Choose *Insert Layout from Template* from the *Insert* menu;
2. In the *Open Document Template File* dialog that appears, select document (template) and click *Open*. If chosen file contains layouts the *Insert Layout* dialog will appear;



3. Select layouts to export in current document. Use SHIFT and CTRL during selection to chose more than on layout. Click OK button.

Layout displaying

Each layout can be displayed as unlimited space (like model space displaying) or as paper sheet.



In the second case, paper format is got from settings of that printer, which is specified in the *Print Options* dialog. Such paper representation is useful when drawing should be printed on the single paper sheet.

- ❖ A dashed frame on a paper sheet defines actual paper size. Paper fields outside dashed frame shows only for better visualization.

It is convenient to switch OFF paper sheet displaying if drawing should be printed on several pages (see *Print Options*).

Use the *Show Current Paper* command from the *View* menu to show or hide layout paper sheet.

Layout color can be changed by *Layout Paper* parameter of *Color* section in the *Preferences* dialog.

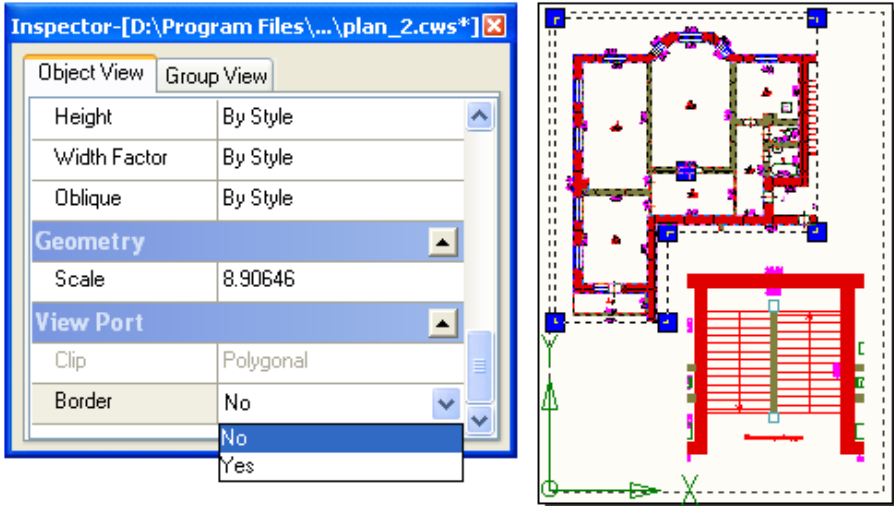
Viewports

Viewports are "windows" to model space. They are used for showing specified parts of the model space in certain place of paper space layout.

There are rectangular and polygonal viewports in RxSpotlight.

Since viewports are document objects, they can be edited with their grips like other objects. The central grip defines viewport position in layout, while other grips define

viewport border size and form.



Viewport (like any other RxSpotlight object) has its own specific properties, which can be viewed and modified in the *Inspector* window. For example, a *Border* property allows you toggle ON or OFF visibility of viewport border.


Application has three commands to create viewports:

- Rectangular Viewport
- Polygonal Viewport
- Current Viewport

Creating rectangular viewport

This command is available if at least one layout exists in a document.


To create rectangular viewport:

1. Start *Rectangular Viewport* command from the *Insert* menu or click the  button on the *Layout* toolbar.
2. In opened model space, specify an area that should be visible in created viewport, using rectangular frame.
3. In paper space layout that opens, choose appropriate layout name from list. The selected one will open.
4. Set a point that will be a central point of created viewport. Specify viewport scale in the *Command Line* or by moving a mouse.

Creating polygonal viewport

This command is available if at least one layout exists in a document.

To create rectangular viewport:


1. Start *Polygonal Viewport* command from the *Insert* menu or click the  button on the *Viewport* toolbar.
2. In opened model space, specify vertices of polygonal area that should be visible in created viewport.
3. In paper space layout that opens, choose appropriate layout name from list. The selected one will open.
4. Set a point that will be a central point of created viewport. Specify viewport scale in the Command Line or by moving a mouse.

Current viewport

The *Current Viewport* command creates rectangular viewport, which shows current model space view.


This command is available from model space only and if at least one layout exists in a document.

To create rectangular viewport:

1. Make sure that the document has at least one layout.
2. Switch to model space using drop-down list on the *Layout* and the *Properties* toolbars.
3. Zoom, pan and stretch workspace window to contain all data that should be showed in a new viewport.
4. Start *Current Viewport* command from the *Insert* menu or click the  button on the *Viewport* toolbar.
5. If document has more then one layout, then choose an appropriated one from list. The selected one will open.
6. Set a point that will be a central point of created viewport. Specify viewport scale by moving a mouse or type scale value in the Command Line.


Printing

An entire document, its visible part, or a specified rectangular area can be printed. A scaled image can be printed or fit it to current paper size. The layout of a printed area on the paper sheet can also be set by setting page margins. During print preparation the screen displays the current printing area and its layout on the page. In case of multiple pages, the screen displays the distribution of the printed image on pages.

Before printing a RxSpotlight document, decide which existing layers to plot. If some of them are not wanted, then turn off their printability  in the *Layers* dialog. Also note that RxSpotlight objects are printed in the same colour and in the same order as they are displayed in the screen. The order of object display can be changed, using commands from the *Display Order* submenu of the *Draw* menu.

-
- For more information about *Display Order* toolbar and submenu see the “Display Order” section on page 39.

Setting Printing Parameters

From the *File* menu, click *Print Options* or press the  button on the *Main* toolbar. The *Printer Setup* dialog appears.

When this dialog is shown the blue and red frames are displayed in the document window.



- The red frame – document printing area, which size can be adjusted in this dialog.
- The dashed blue frame – paper printable area (depends on specified printer),
- The solid blue frame – extents of specified paper format.

Frame colors can be changed in sections *Colors > Print Area and Colors > Print Grid* of the *Preferences* dialog.

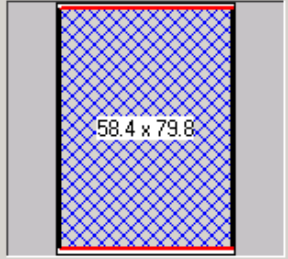
 For more information on *Preferences* dialog see page 389.

Dialog options

List of available printers	If several printers are installed on the system, then choose one from this list.
<i>Setup</i> button	Shows setup dialog of chosen printer. In this dialog, set the printer parameters, such as page size, a mode of page supply, etc.

<i>Area</i> section	<p>Specifies a printing area.</p> <ul style="list-style-type: none"> • <i>Extents</i> – prints all objects in the current space (model space or certain layout). • <i>View</i> – prints an area visible on screen. Use zoom and pan commands to get desired view in document window. Change window size if it is necessary. • <i>Window</i> – prints an area, which should be specified by using following buttons: <ul style="list-style-type: none">  <i>By rectangle</i> – click this button and specify two corner points that defines printing area.  <i>By paper</i> – click this button and specify printing area location. The size of this area will be equal to the current paper size. <hr/> <p>❖ Paper size should be defined in the setup dialog of chosen printer.</p>
---------------------	--

Scale section	<p>Sets a printing scale.</p> <ul style="list-style-type: none"> • <i>Fit to paper</i> – automatically scales a printing area to fit current paper format. • <i>Scaled</i> – allows you to set the precise scale factor and enter the image increase/decrease factor in percent. <p>To set one of predefined scales use the left combo box <input type="text" value="10:1"/>. The 1:1 value prints document in true size i.e. one unit of displayed document corresponds to one unit of a printed image. 2:1 – double increasing of printing area relative to paper sheet. 1:2 – half size.</p> <p>Use right combo box <input type="text" value="4.95"/> to specify custom scale by entering value with decimal precision.</p>
----------------------	--

Standard Paper Size section	<p>Sets a page format and orientation.</p> <p>All changes in this section takes effect on preview window and color frames in the drawing.</p> 
------------------------------------	---

Position, Margins and Units section	<p>Sets location of printing area on paper sheet.</p> <p>To set paper margins, enter their sizes in the input boxes. The margin value allowed is 0 or greater. Choose measurement units in the <i>Units</i> list box.</p>
Specify	<p>If it is not convenient to specify custom margins from extents of</p>

Margins by Paper Size checkbox

a paper printable area (dashed blue frame), then switch this checkbox ON to set margins direct from the paper sheet extents (solid blue frame). This parameter adds paper nonprintable margins (which depends on specified printer) to values of user defined margins in input boxes.

Position, Margins and Unis

0.0

1.0 0.0

0.0

Units: centimeter

Specify Margins by Paper Size

Position, Margins and Unis

0.6

1.6 0.6

0.6

Units: centimeter

Specify Margins by Paper Size

If the printing area fits to one page of the current format, then the alignment can be set. To set type of alignment, press one of nine *Alignment* buttons with white arrows.

The following example demonstrates printing area, which is larger than specified paper format because of 1:2 scale factor. Printing area is aligned to the central left paper side. Left margin is set to 1cm.

Area

Extents

View

Window

Scale

Fit to Paper

Scaled

1:2 0.5

Close

Cancel

Help

Template

Position, Margins and Unis

0.0

1.0 0.0

0.0

Units: centimeter

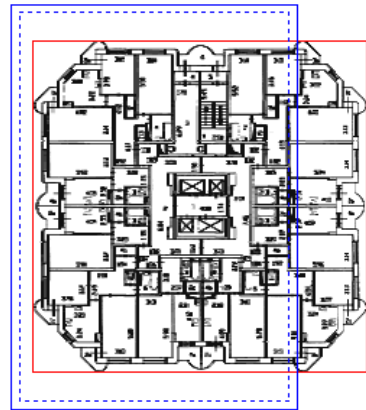
Specify Margins by Paper Size

B/W printing

Scale Widths

Copies: 1 Pages:

19.7 x 28.4

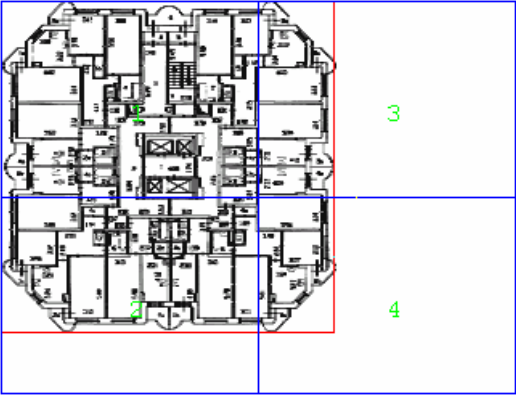


To resolve this problem it is necessary to decrease printing scale or to *switch Pages* checkbox for multipage printing.

B/W printing checkbox

To print document in monochrome (bitonal) mode.

Scale Width checkbox	Scales line width according to specified scale (in the <i>Scale</i> section of this dialog) while printing from the paper space.
----------------------	--

Multipage print	<p>If a printing area does not fit to one page of the current format, it is possible to divide it into parts according to the size of the current format and specified margins.</p>  <p>❖ If the multipage print is ON, then blue frames shows only pages printable areas, i.e. areas without user defined margins and nonprintable paper margins.</p>
<i>Pages</i> checkbox	<p>Initiates multiply pages print.</p> <p>Leave this textbox empty to print all pages. To print certain pages enter it's numbers separated by commas. To specify range of pages enter the first page number, then a dash character, then the final page number. For example: 1,3,5-9</p>
<i>Copies</i> field	<p>Sets the desired number of copies.</p>

Plot style table

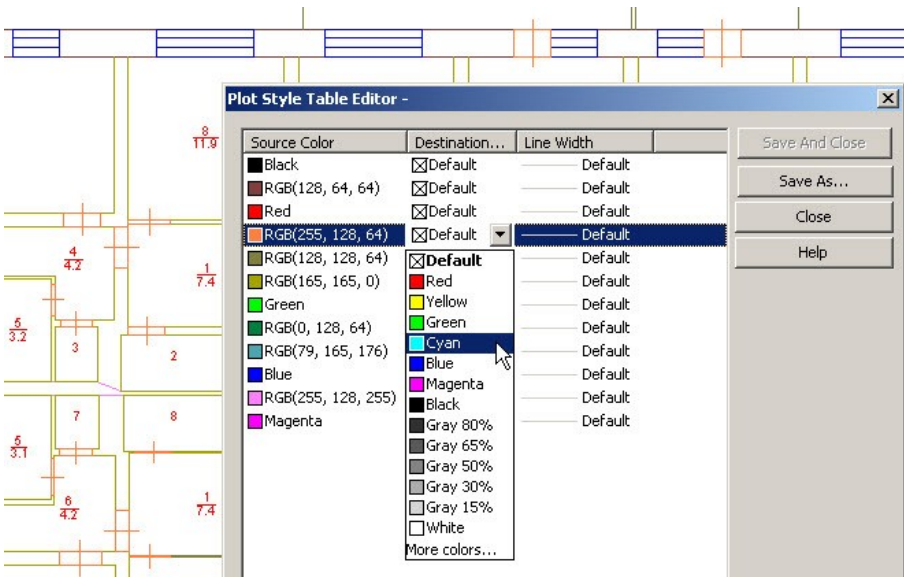
Sets width and color for printed objects.

Use the *Plot style table (pen assignments)* dropdown list to set, edit and create plot styles.



- To create a style table choose *New Default Palette* from the dropdown list.
- To create a style table for a current document choose *New Document Palette*. The created table will contain colors of the objects which are present in the document.
- To edit the current palette choose *Edit*.

In *Plot Style Table Editor* window that opens, set a width and a color for each object color in the document.




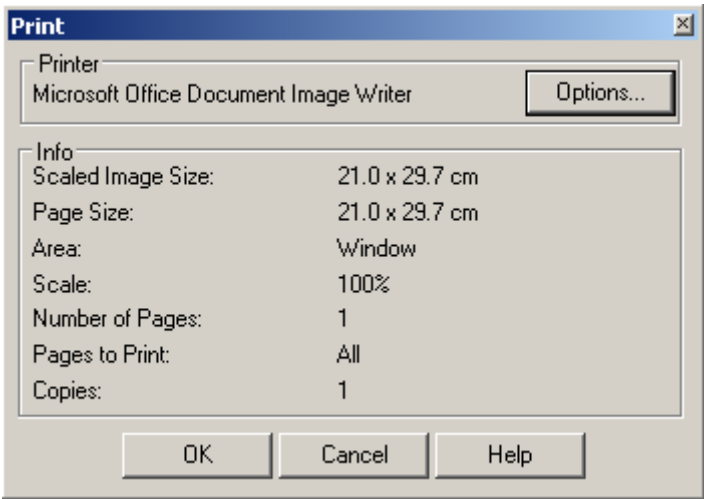
To finish the command press the *Save and Close* or *Save as* buttons and specify a style name.

- *Save as* – to save the settings in a file with *.CMT extension.
- *Save and close* – to save with previous name and to close the *Plot Style Table Editor* dialog.
- *Close* – to close the editor dialog. You can save or not the results of the settings.

<i>Template</i> button	Uses for saving parameters of this dialog in a template file for future loading.
<i>Close</i> button	Saves settings and closes dialog.
<i>Cancel</i> button	Discards all changes and closes dialog.
<i>Print</i> button	Saves settings, closes dialog and launches printing.

Print dialog

From the *File* menu choose *Print* or press the  button on the *Main* toolbar. The *Print* dialog will appear.

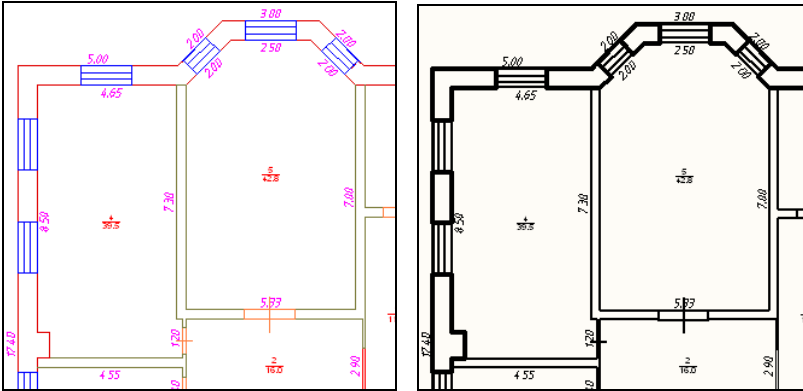


If you are satisfied with the current printing options displayed in the *Print* dialog, then press OK.

To change the current values press the *Options* button. Then the *Print Setup* dialog will be displayed, so you can make necessary alterations.

Show Print Preview

Use the *Show print preview* command from the *View* menu to display the print preview of the document. The document will be shown depending on the settings in the *Print Options* dialog (for example, *B/W printing* mode, the applied print style, etc. will be considered).



Selection

Selection set

In RxSpotlight the user can select raster objects and areas, vectors, and entire images. Selected Items are called a selection set.

Since items have different natures and may belong to different layers, a procedure of *selection set composition* needs to be performed to collect both raster and vector data together before applying a wide range of RxSpotlight commands to it. Keep in mind that there are no limits on the contents of the selection set. The flexible and powerful *selection set composing procedure*, using the intellectual recognition techniques in more than 30 selection methods, allows a selection set of unlimited complexity to be created. The graphics selected are placed in the *selection set* and highlighted on the screen. Selected vector and raster objects, and entire images are highlighted with grips; the fragments of raster images are highlighted with a different colour and dashed border.

❖ The terms *selection* and *selection set* are similar in this Guide.

This chapter describes the methods of selecting on monochrome images. Most of them are applicable to colour and greyscale images. Selection on these kinds of images is also affected by settings in the *Colour Accuracy* toolbar (see page 311).

Selection buttons and methods

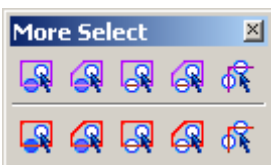
There are two toolbars that can be used to define selection method – *Select*, *More Select* and the additional toolbar - *WiseObject selection*. To choose a selection method, press these buttons in appropriate combination.



First row: 3 Selection style buttons, 5 Forced selection buttons and two special raster area selection buttons;

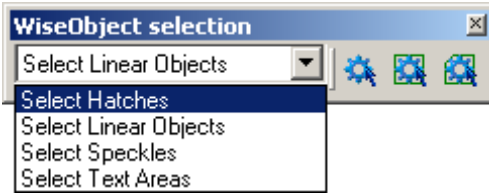
Second row: 5 Selection by Object Type Recognition buttons, Image Selector, *Select with Filter*, and *Node Selection* buttons.

Third row: 3 Selection target buttons, *Disable Hybrid Objects* toggle, 3 selection mode buttons and *Select/Unselect All* buttons.



First row: Selection by *Linefollowing* buttons;

Second row: Selection by *Floodfilling* buttons.

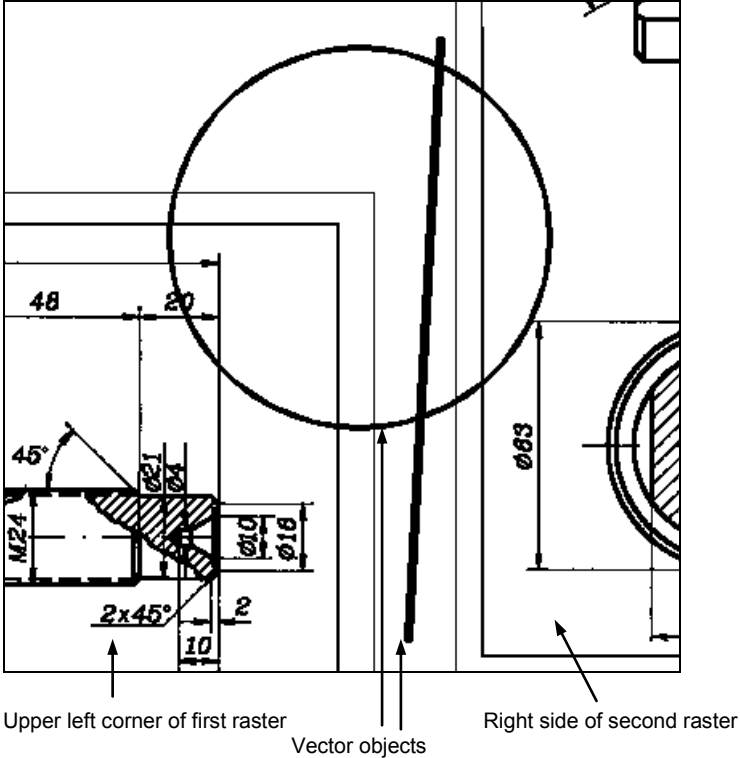


There are no strict rules that govern which selection set to use for a particular procedure. The same result can be obtained by applying different selection methods. This section provides information on the major selection techniques, so the most appropriate combinations can be selected.

-
- ❖ The *Polyline edit tool* is described on page 227.
The *Disable Hybrid Selection* button is described on page 295.

Example of selection

To get to selections techniques in RxSpotlight, consider the example shown below of a document containing two raster images (one occupying left bottom left corner and the other the right-hand side of the picture below) and two vector objects: a circle and line.



Click the following buttons to set a selection method:



Auto button – sets the selection *style* that is most versatile.

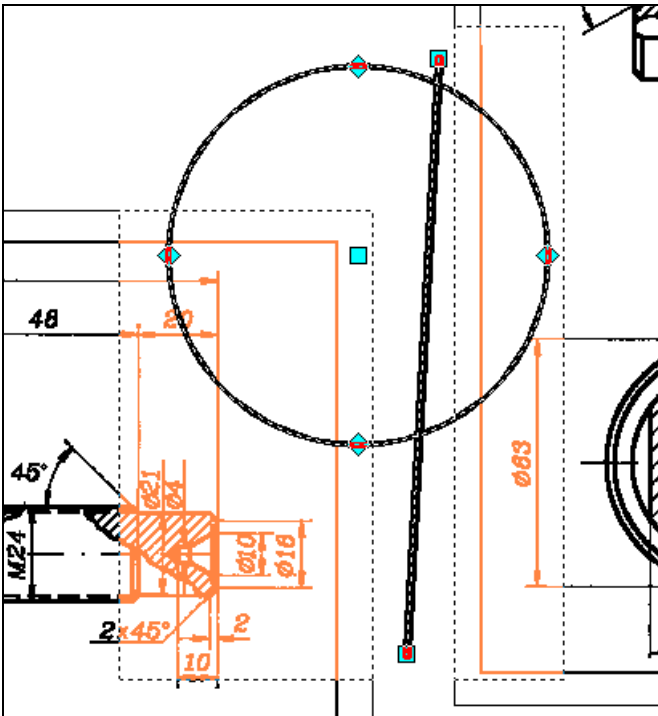


Hybrid selection – sets the *selection target*, the kind of objects that are supposed to be selected.



Single button – sets composition mode. The selection composition procedure ends when the first selection is made. New selection cancels previous selection.

A selection can now be made. Draw a rectangle that encompasses both vector objects and captures areas on both rasters. The following figure shows the result.






The selection set contains vector data that is highlighted with grips, and raster fragments from both raster images – they are highlighted in colour and bordered with dashed line.

Now apply RxSpotlight commands to the selection.

Comments:

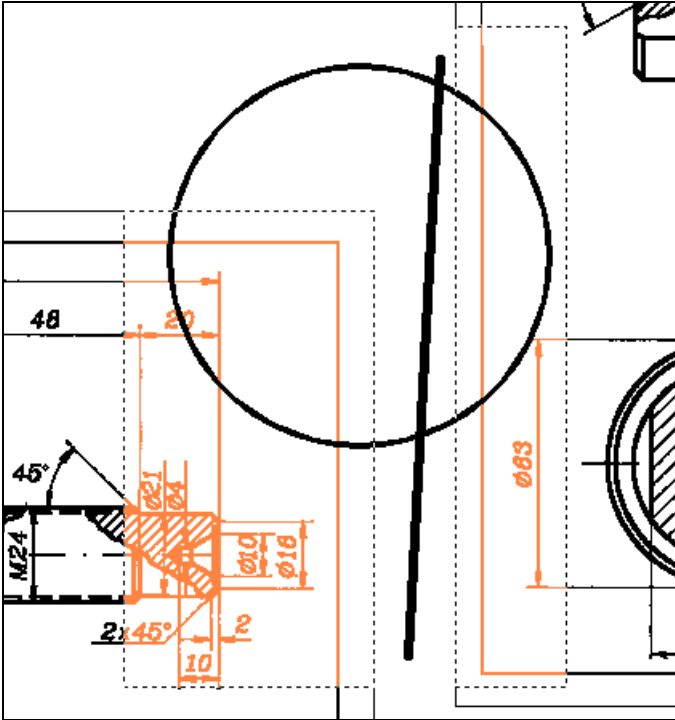
1. The selection procedure used in the example above is applied to all visible and selectable layers.

If data is to be preserved on a different layer from the selection, then turn off the visibility or selectability attributes of that layer.

2. Three buttons, , , and  define a *selection composition method*. This is not only selection method in RxSpotlight.

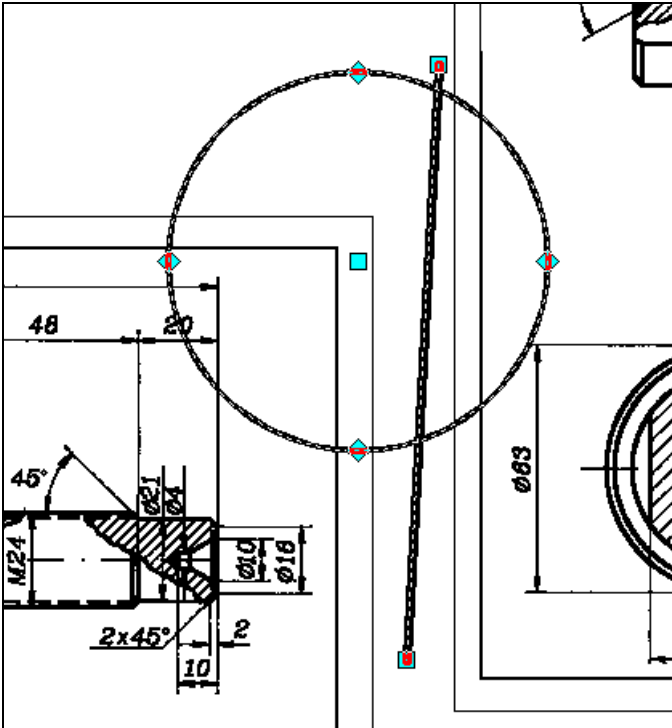
3. *Hybrid selection* is a selection that is composed from both vector and raster data.

To select only raster data in the above example, the *Raster selection* button must be used instead of *Hybrid selection* when defining a *selection composition method*.



The result of selection when the buttons   , and  pressed

To select only vector data in the above example, use the *Vector selection* button instead of *Hybrid selection* when defining a *selection composition method*.



The result of selection when the buttons , , and  pressed


Selection Set Composing Procedure

The RxSpotlight operations used to process data located on unlocked and visible layers can be applied to selection sets composed of the following kinds of data.

1. Vector objects.
2. Raster images.
3. One or several raster areas selected from various raster images.
4. Raster objects.


A selection set is composed of *steps*. A *selection step* is a single selection operation that uses one of the selection methods. To specify a method, choose what to select, how the selection is performed and how the recognition algorithms would work (if applied) by pressing the appropriate buttons on the *Select* and *More Select* toolbars. In the example above the selection set was composed by one *step* and the method was specified by pressing three buttons.

Vector object selection

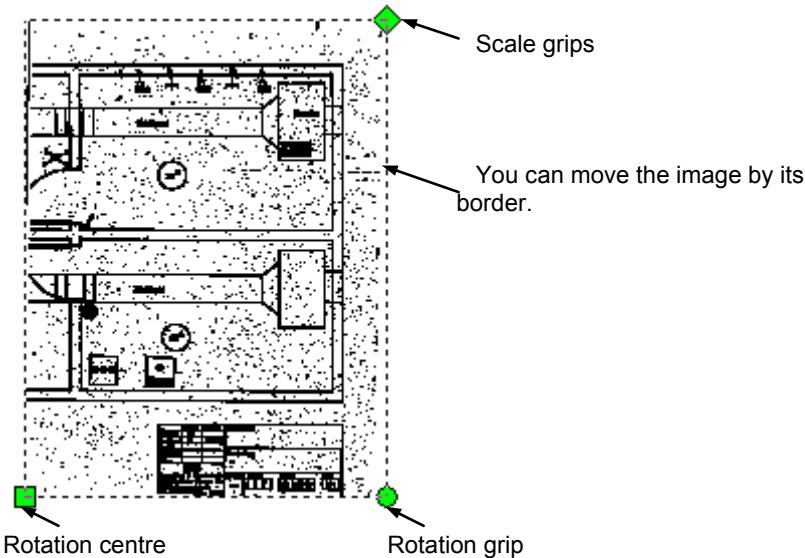
To select a vector object, press the  button and click on the object border. Grips on the object indicate that it has been selected.

Entire Image selection

The image frame and grips of a raster image allows user to move, scale and rotate it in a similar way to processing a vector object. The frame shows also extensions of the raster image.

In *Vector selection* mode (the  button) the user can select an image by picking its border with the mouse. The border becomes dashed and grips are shown; the user can move, rotate, and scale an image using these grips.

The border is a special object created by RxSpotlight to facilitate image handling; it is created when opening but not saved with the image in file.



To select several images, use the *Image Selector* dialog.

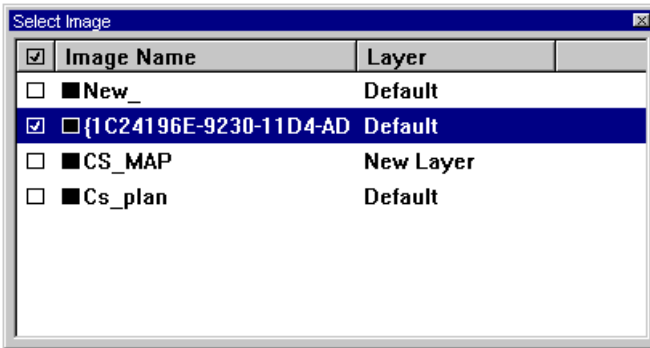
To select a raster image

1. Turn on the *Vector selection* mode.
2. Click on the image border. The grips will indicate that an image is selected.

-
- ❖ If an image is selected entirely in the *Raster selection* mode, then all its contents will be highlighted in colour and with a dashed border. For many operations both methods give the same result, however it is recommended for a beginner to use the first of the described methods. Selecting an area on the document in *Vector selection* mode selects vector objects, but not images, encompassed by selection.


To select several raster images

Open the *Image selection* dialog, pressing the  button.



Moving the mouse on the screen, click on the images to be included in the selection set. Checkmarks will appear next to their names; these can also be turned on or off in the dialog manually. The *Image Name* field contains the logical name of image (or automatically created identifier if the image was created by RxSpotlight) and the *Layer* shows which layer the image belongs to.

Raster objects selection






To make raster selection tools active, click the *Raster Selection* button  on the *Select* toolbar.


There are two kinds of raster data that RxSpotlight can select.

First, select *raster objects* – the sets of raster dots that look like typical vector objects such as lines, circles, arcs, hatches, symbols, and texts. The intellectual object technology for raster object selection implemented in RxSpotlight makes it possible to edit a raster image using the methods similar to those used when handling vector objects in applications that process vector drawings.

Secondly, select of areas on images.

To select one or several areas on raster images:

1. Make the images, from which a selection is to be made, visible.
2. Turn on the *Raster selection* mode , and select a method of selection set creation: by adding  or single .
3. To select a rectangular area, set the *Window selection* style, pressing the  button. To select a polygonal area, set *Polygon selection* style, pressing the  button.
4. Select the area(s) with the mouse.






5. In the *adding* mode  repeat step 4 until all areas needed are chosen. The styles of selection can be changed from *Window* to *Polygon* and vice versa during any step of selection.

Selection by brush

This additional raster areas selection method uses the “brush to select” ideology. It is useful for intricate areas. Just brush the raster area to be selected.




To select with the Brush Selection method:

1. Turn on the *Raster selection* mode , and select a method of selection set creation: by adding  or single .
2. Click the  button.
3. Open the *Inspector* window and specify the *Brush Style* and *Brush Size* parameters.
4. Brush what to select.
5. In the *adding* mode  repeat step 4 until all areas needed are chosen.

Selection by vector contour

Select raster area inside closed vector contour.

To select with the Selection by vector contour method:

1. Select closed vector contour.
2. Click the  button to select raster area inside vector contour.
3. Open the *Inspector* window and specify the *Brush Style* and *Brush Size*

Selection Set Composing Modes

There are three modes of composing a selection set: *Add*, *Remove* and *Single*.

Single

Selecting data in *Single* mode deselects all previously selected data in the current image. With *Single* turned on, the selection set in the current document consists of the data selected during the latest selecting step or nothing.



To turn *Single* mode on, click the button on the *Raster Selection* toolbar. With the SHIFT button pressed, *Single* mode turns to *Add* mode.

In this mode objects can also be selected automatically when drawing.

Selecting is controlled by settings in *Command Setup* dialog, see page 376.

Add



Raster data selected in *Add* mode is added to the current selection set. To turn *Add Mode* on, click the button on the *Selection* toolbar.

In *Add* mode, composition of the selection set can consist of several steps, every step being a single selection operation. On every step the selection methods can be varied.

With the SHIFT button pressed, *Add* mode turns to *Remove* mode.

Use this mode to automatically select objects when drawing. Selecting is controlled by settings in *Command Setup* dialog, see page 376.

Remove



Use *Remove* mode to remove selected data from the selection set. To turn *Remove* mode on, click the button on the *Raster Selection* toolbar.

With the SHIFT button pressed, *Remove* mode turns to *Add* mode.

Usually a single object is first selected, and then more objects added to the selection set, and after that some of the previously selected data is removed from the selection. Data can be removed from the selection set using the same methods as when selecting it. When data is removed from the selection set it is no longer highlighted.

Selecting/Unselecting all



Two further operations add convenience and flexibility to usage of selection modes: *Select All* and *Unselect All*. Both operations are represented by commands in the *Edit* menu and buttons on *Select* toolbar.

In *Vector selection* mode pressing *Select All* yields all vector objects, but not images. In *Raster selection* mode pressing *Select All* yields all rasters. In *Hybrid selection* mode pressing *Select All* selects all vector objects and all rasters, not supplied with borders. *Hybrid* and other modes of selection are also influenced by *Disable Hybrid Objects On/Off* toggle (see page 295).

Selection Targets

The following buttons define, what kind of data is supposed to be added to a selection:



Vector selection – only vector objects are included in the selection



Raster selection – only raster objects are included in the selection



Hybrid selection – objects of both types are included in the selection

Selection Styles

Auto, Window, Polygon and Image selection styles can be used.



Auto – RxSpotlight automatically interprets the mouse actions and selects a vector object if its border is clicked or raster areas if a rubber band rectangle is drawn over the raster image. Command equivalent *Edit > Select Auto*.



Window – selection is made in rectangular area.



Polygon – selection is made in polygon area.

Selection Types

Selection types are the algorithms used in selection procedure.

Object raster selection methods are based on algorithms that analyze *raster objects*. The raster object may be interpreted in different ways:

- *Isolated raster object* – raster area (contiguous set of raster dots);
- *Raster polyline segment* – a part of raster line limited by endpoints or intersections with other objects;
- *Raster entity* – a raster analogue of a vector entity: raster line, arc, and circle.

Most intellectual selection methods can manage all types of raster objects. When using those methods, specify the type of raster objects to be processed. The *current selection type* determines it.

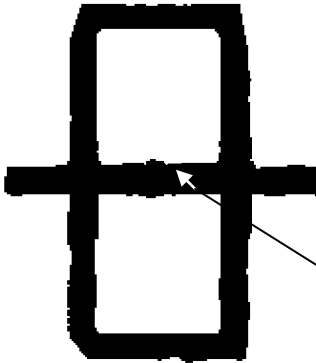
There are three raster selection types.

Selection type	Raster object type
<i>Floodfilling</i>	Isolated area on the raster image
<i>Line Following</i>	raster polyline segments

Selecting Raster Object by Picking

The *Object Type Recognition* or *Object* method selects raster objects by picking. When selecting by picking, specify a point on image, and the program selects one *raster object*.

Object method is a basic one for all other object selection methods. Further, all of those methods can be represented as a combination of the standard selection method and the *Object* method.



This figure illustrates the result of selection by picking with the use of various selection types.

The raster objects selected are shown as outlines. In each of these three cases the picking point is defined in the centre of the horizontal raster line as shown in the figure on the left.

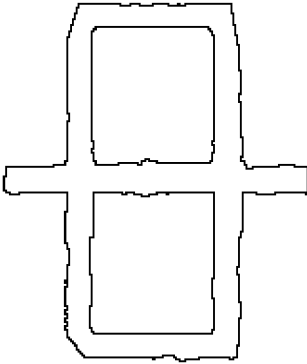
Picking point

Selecting Isolated Raster Object

Picking on the raster using the *Floodfilling* type selects isolated *raster areas*. The program selects all raster dots connected to the point specified - these dots form contiguous set.

This method can be also treated as *forced* selection, since the type of selected object is predefined. See other methods of *forced* selection below in this chapter.

A set of raster dots is *contiguous* only if any dot belonging to the set is only adjacent to the dots of the same set. A contiguous set of image dots is surrounded by background dots that separates it from other objects in the image and makes it an *isolated raster object*.



In this case the entire object is selected, as all its dots are contiguous.

This method is convenient when selecting standalone objects of arbitrary shape: characters, symbols, etc.

To select an area on the raster



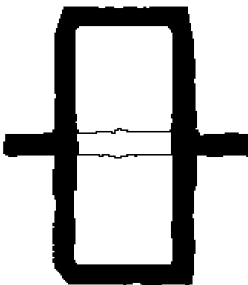
1. Click the button on the *Select* toolbar.
2. Click any point of the raster object.

Selecting Raster Polyline Segments

Picking on the raster using the *Line Following* type selects an object called a *raster polyline segment* – sets of dots that look like line or arcs of approximately constant width, and with the length much greater than its width. The length of a raster object is the length of its centreline. The raster line shape is arbitrary.

After picking, the selection extends along the raster line from the specified point to a *node of the raster line*. A *node of the raster line* is either its endpoint, or a point where the line intersects with another raster object. So, using this method, a part of an arbitrary raster line bounded by two nodes of raster line can be selected – a *raster polyline segment*.

To distinguish raster lines from other raster objects the program uses the value of the maximal accepted raster line width. Objects of greater widths are not recognized as raster lines. A raster line may have breaks that should not be taken as endpoints. Define the value of the maximum break to be ignored. For description of *Max Width* and *Max Break* see “Tuning Selection” on page 122.



The figure shows that the program has selected part of the raster line until it meets the intersection with the other raster objects.

Selecting Raster Entities

Raster entities are raster objects shaped as basic vector objects – vector image entities. From here on we shall use the terms *raster circle*, *raster arc*, and *raster line* to imply raster objects that have a shape of a circle, arc, or line. However, note that real raster entities might have defects that hamper their identification by the program such as breaks, elliptical arcs and circles, varying width, etc.

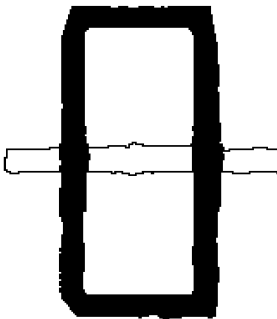
If the *Type Recognition* selection is set, then the *Object* method can handle both raster lines and arbitrary *raster objects* with approximately equal width and length.

When a raster line is picked, the program identifies the type of a raster entity (line, arc or circle) and then tries to select the object of the most likely size. It ignores the points of intersection with other objects, and the selection extends until the symbol of the selected object becomes identical to the entity recognized. Since real raster objects may differ from ideal raster entities, the recognition tool uses the *Approximation Accuracy* parameter. This parameter defines the accepted level to which the real raster objects may differ from the ideal ones.

Selecting a raster entity preserves its intersections with other objects. Therefore, transforming and deleting raster data selected when *Object Type Recognition* is on does not create breaks in remaining raster objects. This allows the user to process raster data in the same manner as processing vector objects. For example, deleting a raster line that crosses the circle leaves the circle intact in the image, exactly as it happens when deleting a vector line that lies over a vector circle.

In case the raster object selected is not a raster line, the program detects its boundary and selects the object. An arbitrary raster object width should be greater than the maximum allowed width of a raster line.

☒ To distinguish raster lines from other raster objects the program uses the reference value of the maximum accepted raster line width. For description of *Approximation Accuracy*, *Max Width* and *Max Break* see “Tuning Selection” on page 122.



If selecting by picking with object recognition is on, then the program selects the entire raster line as shown with outlines on the left figure. Note that, when selecting, intersections of the selected line with other raster objects are not removed.

To select a raster entity



1. Click the *Auto* button on the *Raster Select* toolbar.
2. Click a point on the raster image.

Forced Selection

There are 5 buttons that define forced methods of selection: *Line*, *Circle*, *Arc*, *Floodfill*, and *Symbol*.

☒ The *Floodfill* method is described in the “Selection Types” section on page 108. There are also 5 “violet-styled” buttons in *More Select* toolbar that use the floodfilling selection method described in “Selection with Window and Polygon” section beginning on page 113.

The *Line*, *Arc*, and *Circle* methods select *raster entities* of a specified type. These selection methods require drawing a *reference rubber line* of an appropriate type over a raster object to be selected. The program selects the specified raster object if it is recognized as a raster entity of the specified type.




These methods work in the similar way to the *Object* method (in *Entity Recognition* mode). Transforming and deleting raster entities selected with these methods do not break raster objects they cross, since intersections are preserved. The *Approximation Accuracy*, *Max Width* and *Max Break* parameters influence these methods. For description of these parameters see “Tuning Selection” on page 122.

Forced selection is also influenced by the *Auto Extend Vectors* mode, which is toggled in the *Trace* tab of *Conversion Options* dialog (see page 175).

Unlike the *Object* method, *Line*, *Arc*, and *Circle* allow users to select a part of a raster entity, as well as considerably deformed entities. These methods only select raster lines.

While selecting with the *Line* or *Arc* method the endpoints (one or both) of *reference rubber lines* or *rubber arcs* can be picked outside the raster objects being selected - on their imaginary extension. In this case the raster object is selected up to its endpoints. If the *reference rubber line* endpoints lie on a raster object, then the program selects the part of the raster object underneath the reference *rubber line*.

To select a raster entity underneath the reference rubberline

From the *Raster Select* toolbar, click the appropriate button to the reference rubberline: , , or :

Line Specify the endpoints of the reference rubber line. They can be either on a raster line or on its extension.

Arc Specify three points of the reference rubber arc. The end points can be either on the arc or on its extension.

Circle Specify two opposite points of a rubber circle over a raster circle.

The reference rubber line is removed, and the raster data underneath is selected.

Raster Symbol Selection

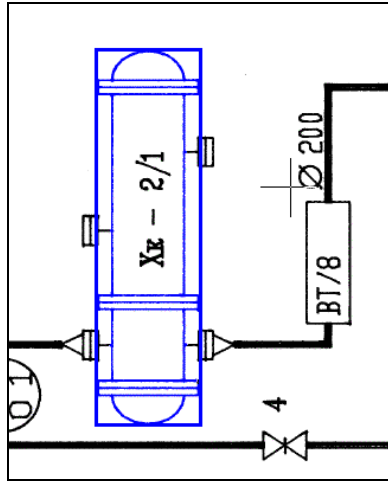
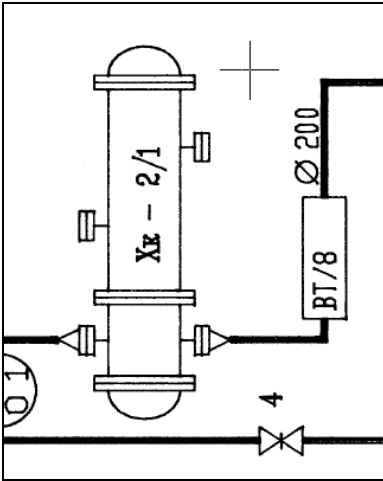
The *Symbol* selection method allows selecting by picking raster objects, which have matching predefined templates.

The procedure of symbol sample defining is described in “Setting Up Symbol Recognizing Options” on page 85 of this guide.

To select a raster symbol



1. Click the button on the *Raster Select* toolbar.
2. Pick a point on the raster symbol.



These figures illustrate raster symbol selection. Using this method the user can choose notation conventions in scanned electrical, hydraulic schematics, maps, and similar images.

Selection with Window and Polygon

One of the ways to select raster objects is to enclose them in a selection window or a selection polygon. A selection window is defined by picking two opposite points, and a selection polygon is defined by sequential picking of its vertices.













These methods are divided in two groups. The first group includes methods that select raster data inside a specified area *excluding* raster objects crossing the area boundary - *Within Window* and *Within Polygon* methods. The second group selects raster data inside a specified area including raster objects crossing the area boundary. These methods are called *Crossing Window* and *Crossing Polygon*.

These methods are object modifications of the standard Window and Polygon selection methods that select all raster data inside a specified area up to its boundary.

The work of *Within Window* and *Within Polygon* methods can be represented as a combination of two other selection methods. At first, with the appropriate standard method (*Window* or *Polygon*) all raster data inside the area is selected. Then all raster objects crossed by the area boundary are selected by the Object method and subtracted from the data obtained from the first stage. Picking points are the intersection points of the area boundary with raster objects.

With *Crossing Window* and *Crossing Polygon* operating the data selected at the second stage (objects crossing the boundary) is added to the raster data selected on the first stage.

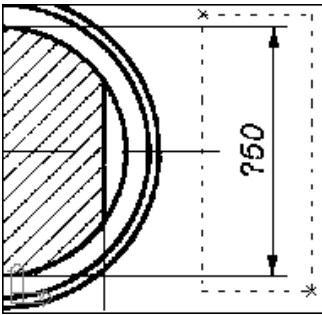
The current *raster selection type* determines the type of raster objects selected by the *Object* method, and thus affects the type of subtracted or added raster data.

Style	Selection type	Button and Toolbar
Within Window	Object Type Recognition	 green Raster Select
	Floodfilling	 red Raster Select-2
	Line Following	 violet Raster Select-2
Crossing Window	Object Type Recognition	 green Raster Select
	Floodfilling	 red Raster Select-2
	Line Following	 violet Raster Select-2
Within Polygon	Object Type Recognition	 green Raster Select
	Floodfilling	 red Raster Select-2
	Line Following	 violet Raster Select-2
Crossing Polygon	Object Type Recognition	 green Raster Select
	Floodfilling	 red Raster Select-2
	Line Following	 violet Raster Select-2

Comparing the Crossing Window selection methods

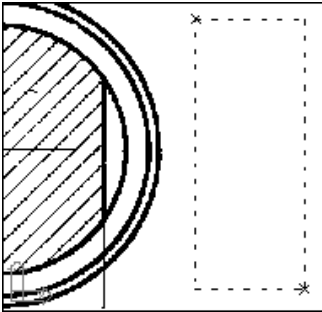
Let us consider several examples that illustrate the difference between raster selection types that apply to the same selection methods. In the first example we select a raster using the *Crossing Window* method with different raster selection types. Note that when selecting a raster with *Crossing Window*, click on two opposite

corners of a rectangular area. Once the area is defined, the program selects all raster data that lie entirely inside the area and adds the raster objects crossing the area boundary.



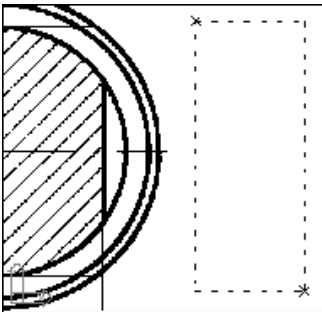
In the examples below we select objects and then delete the selection in order to see which raster objects have been selected.

In all three cases the selection window is defined in the same manner. The dimension line and the text lie inside the window, the extension lines cross the selection window. The selection window boundary is shown as a dashed rectangle.



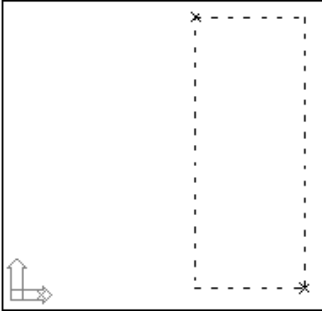
Entity Type Recognition

In this case the program selects the entire dimensional object including the extension lines up to their intersections with the third circle, endpoints of the crossed *raster entities*. After deletion of raster graphics (see the figure) the raster circles that were crossed by the deleted extension lines are not broken.



Line Following

In this case the program selects the entire dimensional object as well, but extension lines are selected only to their intersections with the first circle. Parts of the crossed raster lines limited by nodes are added to the selection set. This shows in the figure that represents the deletion result.



Floodfilling

Here the selection window is defined by the same points as in the two previous cases. However, using the *Floodfilling* selection type, selects all raster object parts - the entire raster, as shown in the figure, and deletes everything.

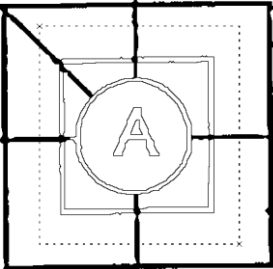
Comparing Within Window selection methods

As in the first example, in this example we will select a raster using the *Within Window* method with different raster selection types.

When selecting a raster with the *Within Window* method, click on two opposite corners of a rectangular area. The program selects all raster data that lie entirely inside the area, and then finds those raster objects that cross the area boundary and removes them from the selection set.

The figures below show selected raster objects as outlines. The selection window is displayed as a dashed rectangle.

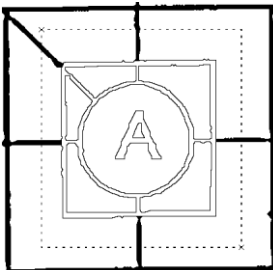
Object Type Recognition



The program selects a character, circle, and rectangle that lie inside the selection window.

Note that the entire raster lines crossing the selection window boundary are excluded from the selection.

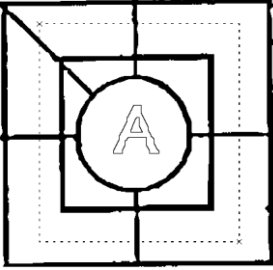
Line Following



When using the *Within Window* method based on the *Line Following* algorithm, the selection includes raster character "A", circle, rectangle and the parts of raster lines between the raster rectangle and the circle.

The program does not select the parts of raster lines from the window boundary up to their first nodes - where lines intersect the raster rectangle.

Floodfilling



The figure shows the result of using the *Within Window* selection method based on *Floodfilling*. The program only selects an isolated raster object (character "A"), and excludes all the other raster objects because they are contiguous.

Selecting by Fence

To select with the *Fence* method, specify a set of points, which determine vertices of an open polygon. All raster objects crossed by the open polygon become selected. Raster data selected using this method can be represented as the integration of data obtained as a result of applying the *Object* method to every object crossed. The picked points are intersection points of a specified open polygon with raster objects. The current *selection type* determines the type of raster objects selected by the *Object* method, and thus affects the raster data selected.

To select raster objects by fence



1. Click a coloured button on the *Raster Select* or *More Raster Select* toolbar:



Green, to select several raster entities (lines, arcs or circles).



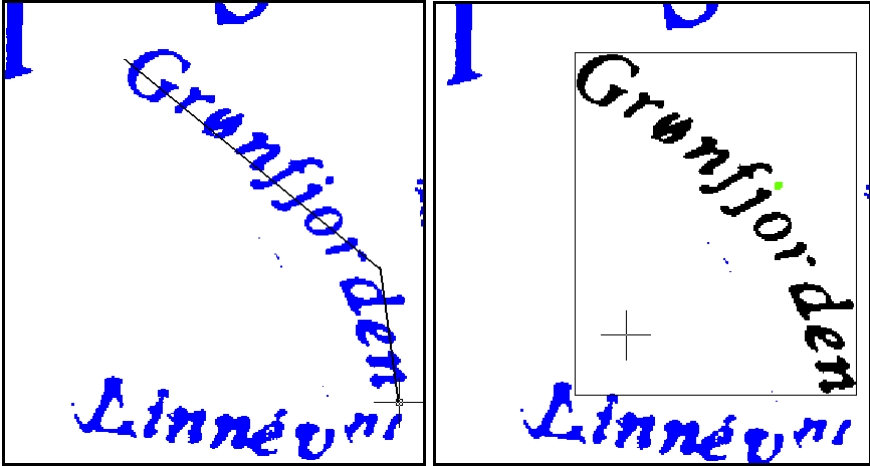
Violet, to select several segments of raster polylines.



Red, to select several isolated objects

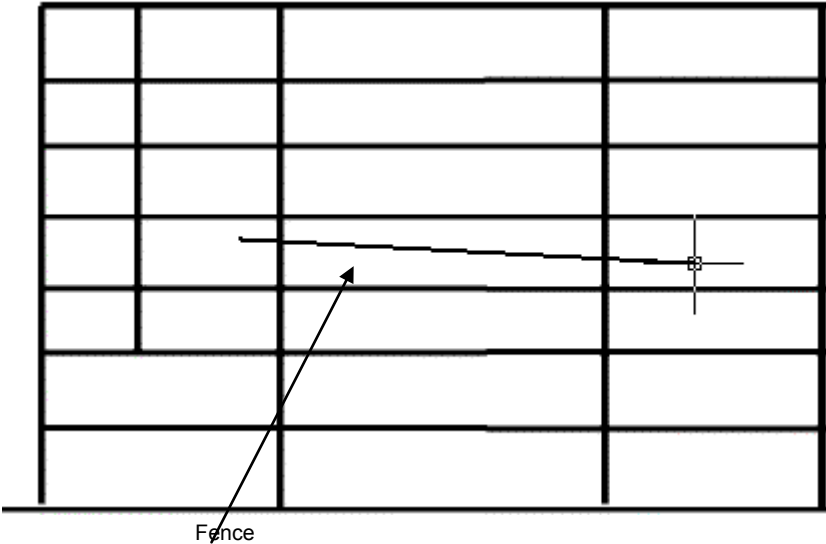
2. Specify the vertices of an open polygon, crossing the selected objects. Press ENTER or right-click to complete the selection.

The following figure illustrates an example of isolated object selection by fence (the red-styled button on the *More Raster Select* toolbar).

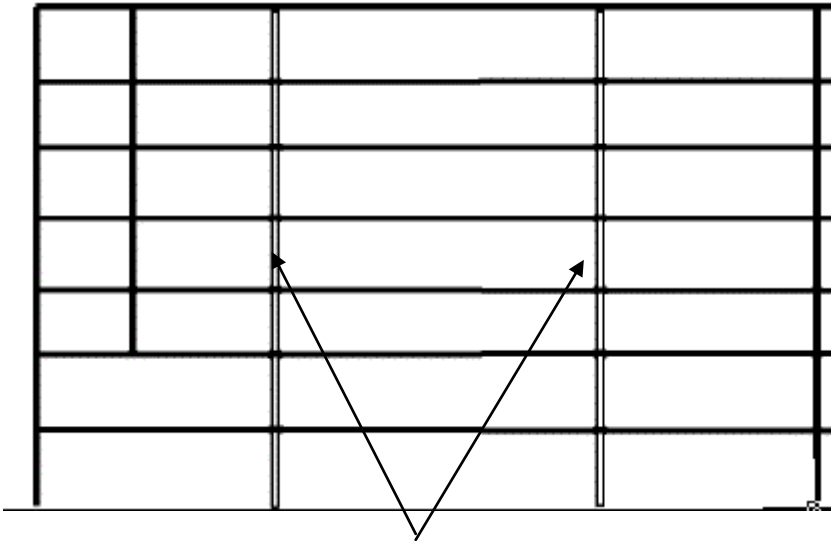


The figure on the left shows the open polygon that is used to select the text, in the figure on the right the selected raster objects are shown.

The following figures illustrate the difference between selection by fence with raster objects recognition and selection of raster segments by fence. The first figure shows a table grid. We cross two vertical lines by fence, as shown in the figure.



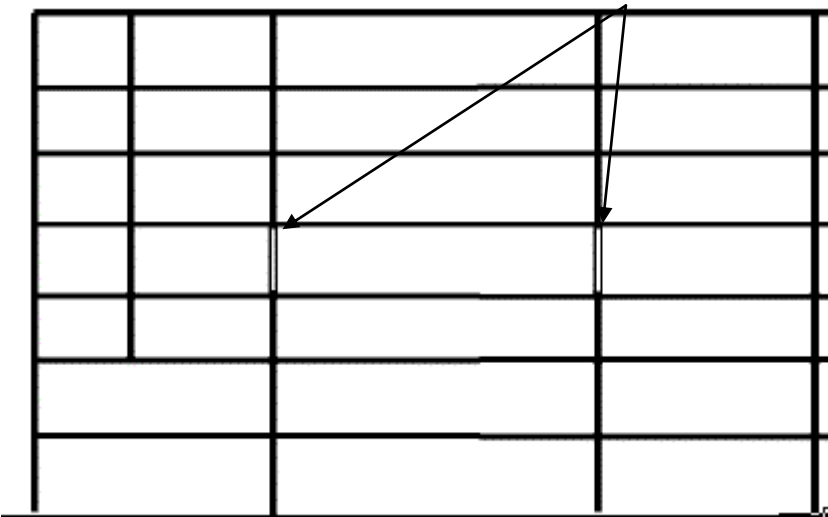
In the following figures the selected raster objects are indicated with outlines. In the first figure there are two vertical lines, selected entirely after the use of the *Object type recognition* method (the green-styled button in the *Raster Select* toolbar).



Selected lines


In the second figure there are two segments of these lines, located within the table adjacent horizontal lines. In the second case the *Fence* method with the *Line Following* type was applied.

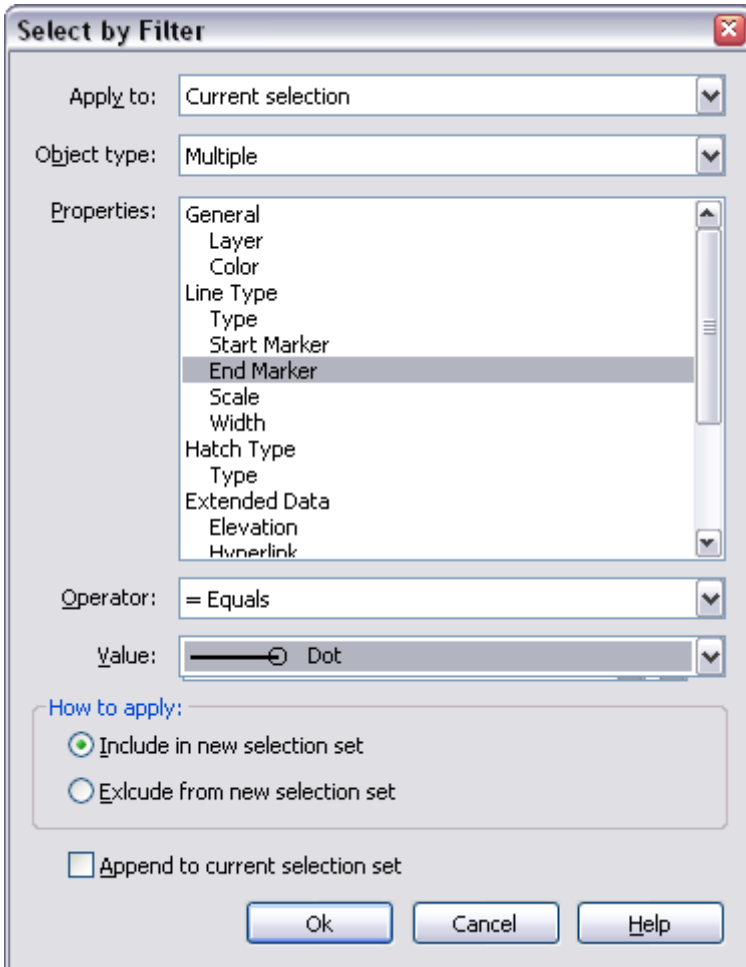
Polyline segments



Selection by Filter

This tool allows you to select objects according to their type and properties (color, layer and etc.) or geometrical parameters (length, width, scale and etc.). Selection by filter can be applied to entire document or to existing selection set.

To run it – choose *Edit > Select by Filter* or press  button on the *Select* toolbar.



- Apply to* **Applying filter to:**
Entire drawing or Current selection.
- Object type* **Choosing object type to add to the filter. Shows a list of the objects, which are in the document or in**

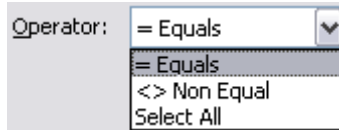
the current selection. The **Multiple** means that the selection will be applied to all types objects which suit to the parameters of the selection.

Properties

Choosing objects property, which should match filter conditions. This list contains properties of an object that specified in the **Object type** field.

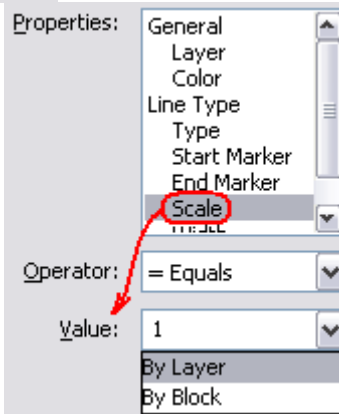
Operator

Setting a range of filter for the selected property: *Equals / Non equal / Select all*.



Value

Setting the value for the object property. Enter value manually or choose from the list. The list of available items in the *Value* box depends on the parameter in the *Properties* field.



How to apply

Include in new selection set – includes filtered objects to selection set.

Exclude from new selection set – excludes filtered objects out from selection set.

Append to current selection set

Switch this checkbox on to append selection that matches filter conditions to previous selection set. Otherwise previous selection will be replaced with new selection set.

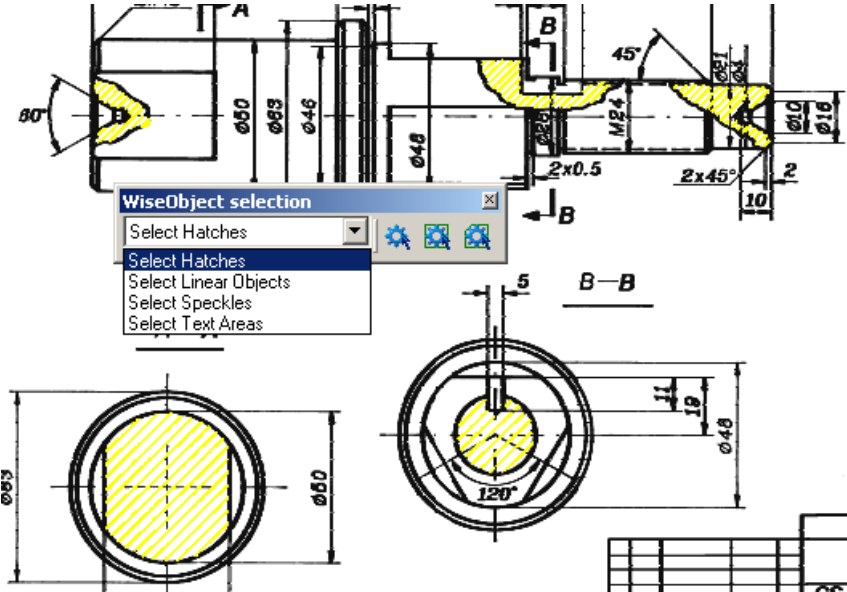
To select objects with different values of a single parameter (for example: BLUE + RED objects; or ARCS + CIRCLES + RECTANGLES) use the *Select by Filter* dialog several times with this checkbox selected.

Objects, hidden by  or  buttons are not selected.

Automatic selection of certain object types

The *WiseObject selection* tool allows selection of such types as *hatch*, *text*, *'speckle'*, *linear objects*, in the whole image or a specified area.

1. Open the *WiseObject selection* toolbar.



2. Choose an object type to select from the combo-box.
3. Press one of the following buttons:



WiseObject selection – to select from the whole image;



Select by WiseObject selection Rectangle – to select from an area specified by a frame;



Select by WiseObject selection Polygon – to select from an area specified by a polygon.

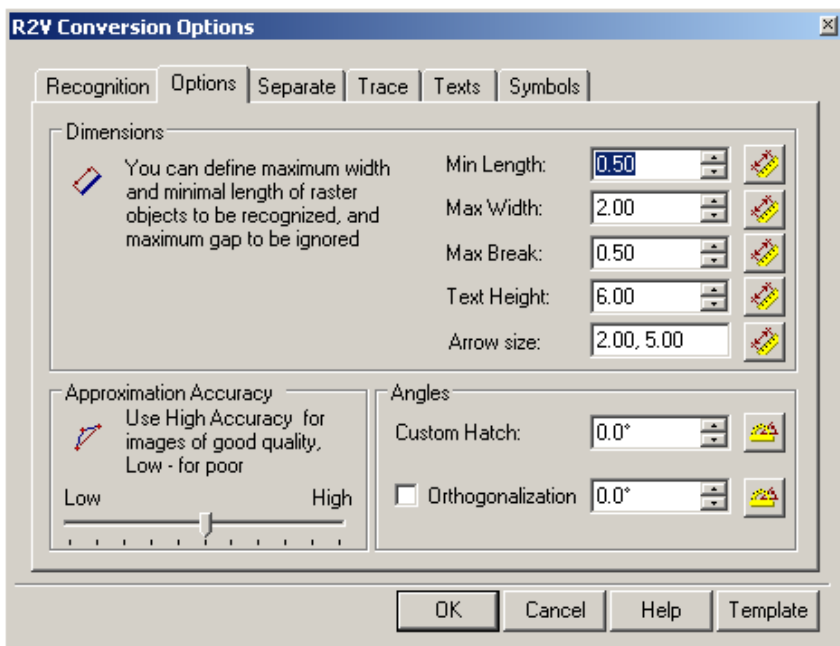
Tuning Selection

Tuning selection is performed in the *Options* tab of the *Conversion Options* dialog box. The user can control the raster object selection methods, based on *Object Recognition* and *Line Following* algorithms.

To set raster selection parameters



1. Click the *Conversion Options* button on the *Raster to Vector* toolbar.



2. Shift to the *Options* tab.
3. Specify new parameters, and then click *OK*.

Raster Selection Parameters

Raster selection is only affected by three parameters in the *Options* tab: *Max Width*, *Max Break* and *Approximation Accuracy*.

<i>Max Width</i>	Defines the maximum width of raster objects that can be selected with the methods based on <i>Object Type Recognition</i> and <i>Line Following</i> . The program does not select lines with widths larger than the specified value.
<i>Max Break</i>	Defines the length of the largest break to be ignored in a raster line. If raster line breaks are less than the specified value, then when selecting the line breaks will be eliminated and the line will be chosen as an entire raster object.

Approximation Accuracy When selecting raster, using the methods based on the *Object Type Recognition*, *Approximation Accuracy* defines the accepted deviation of raster object symbols from their vector prototypes.

If the original raster lines are distorted (for instance, raster circles are elliptical), then selection accuracy can be improved by moving the *Approximation Accuracy* slider to the left (Low). If the original raster image is of a good quality, then move the slider to the right (High).

Forced selection is also influenced by *Auto Extend Vectors* mode, which is toggled in *Trace* tab of *Conversion Options* dialog (see page 175).

The *Max Width* and *Max Break* values can be measured on a raster image.

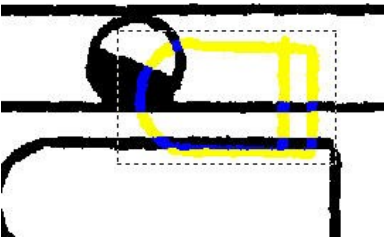
To measure *Max Width* on an image

1. Click the button at *Max Width*.
2. Specify two points in the raster image so that the line connecting these points crosses the thickest part of the raster line.
The program defines the *Max Width* value equal to the length of the line part that covers the raster object.

To measure the *Max Break* on an image

1. Click the button at *Max Break*.
2. Specify two points in the raster image so that the line connecting these points crosses the largest break in the raster line.
The program defines the *Max Break* value equal to the length of the line part that covers the raster background.

Raster Selection Transparency



Raster selection on monochrome images can be switched to semi-transparent mode for convenience. This is often done for operations requiring a higher precision. See *Colours > Raster Selection > Semitransparent* checkbox in *Preferences* dialog.

Transforming raster images

RxSpotlight supports a wide range of operations that change, transform, edit and modify images.

These operations can be roughly divided into 3 groups: correcting, filtering and editing.

This chapter describes the means of image correction that can help to prepare an image for vectorization, tracing and more complex procedures that involve intellectual object recognition.

This chapter also contains descriptions of monochrome filtering operations since they are usually performed in a workflow together with corrections.

Descriptions of colour filters can be found in the DETAILS section (see page 324).

Operations that edit images are described in DRAWING AND EDITING.

Correcting Geometric Distortions

This chapter describes the procedures that allow the user to correct various geometric distortions of monochrome, colour and greyscale raster images. Such operations are recommended, and even necessary, before applying more complicated procedures such as layering or vectorization. For example, if an original raster image is distorted, after vectorization a vector drawing is produced that may be impossible to correct. The calibration procedure can be used to eliminate deformations before applying vectorization.

This chapter describes the procedures that process an entire image.

Use them to:

- Change an image size (this command modifies an image geometry by adding or cropping margins, its contents and resolution are left intact);
- Resample an image (this command modifies an image geometry by changing its resolution or size in pixels);
- Crop an image;
- Mirror an image about vertical or horizontal axis;
- Rotate an image by an arbitrary angle;
- Deskew image manually or automatically;
- Correct trapezoid, parallelogram, and projective image distortions using four-point correction;
- Eliminate arbitrary (both linear and non-linear) deformation using calibration.

The table below shows the more valid targets for raster correcting operations.

Clipped images	Multiple images
----------------	-----------------

Auto Correct	✓	✓
Change Size		
Resample		
Image Clip	✓	✓
Crop by Clip	✓	✓
Crop		✓
Mirror		✓
Rotate		✓
Deskew		✓
Four Point Correction	✓	✓
Calibration	✓	✓

Change Image Size

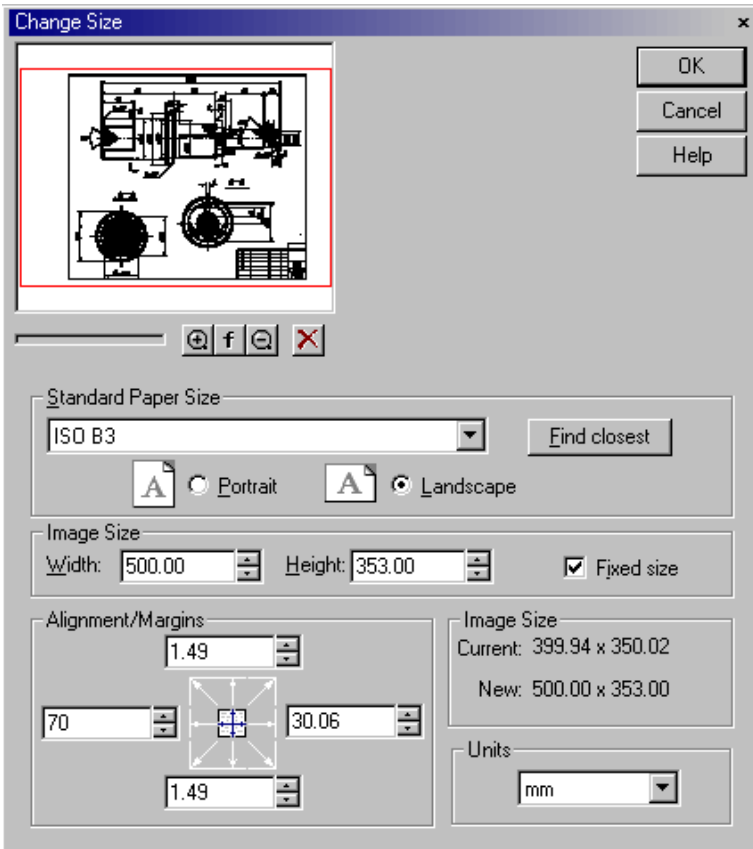
This operation is used to resize an image in order to adjust its size to specified values. It may be necessary after deskewing or image cropping, and also when obtaining an image of non-standard size after scanning. If the new image size is less than the original one, then the image is cropped. If the new image size is more than the original one, then margins are added to the image. All changes can be observed in the preview window.

The operation can only be applied to one image at a time. So if there is more than one image in the document, select the one you need to process.

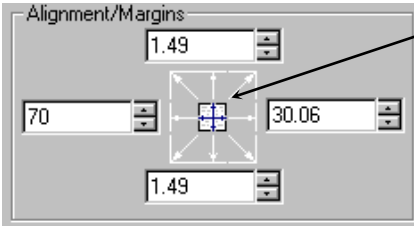
To resize an image

Select an image and start the operation by choosing the *Change Size* command from the *Image* menu.

The following dialog box appears:



1. Choose measurement units in the *Units* box.
 2. Specify the required image size by one of the following ways:
 To choose (from the *Standard Paper list*) the nearest one, which can be more than or equal to the image size, press the *Find Closest* button on the *Standard Paper Size* box.
 Select one of the standard sheet formats from the list of *Standard Paper Size* box. Select the orientation: *Landscape* or *Portrait*.
 Customise the list of *Standard Paper Size* in the *Papers* folder of the RxSpotlight *Preferences* dialog box.
 Set the required width and height of the image in the *Image Size* box.
 For a colour or greyscale image, the colour of the image margins added is specified by the *Fill Colour* parameter in the *Colours* folder of the RxSpotlight *Preferences* dialog box.
-
- ☒ For more information on the RxSpotlight *Preferences* dialog box see “Tuning the application” on page 389.
3. Align the image using one of the buttons in the *Alignment/Margins* box.



For example, align the image to the upper-left side by choosing the upper-left corner button. To put the image in the centre, choose the central button.

4. Determine image margins by one of the following ways:
 - Resize the image size by increasing or decreasing the margin value:
To do so, clear the *Fixed Size* checkbox and using the appropriate boxes in the *Alignment/Margins* box, increase or decrease the margins size in desired directions by entering positive or negative values to the appropriate boxes.
 - Align the fixed size image by changing its margin values:
Set the *Fixed Size* checkbox. It makes the size of the image unchangeable. Then change the values of desired margins by entering required values to the appropriate boxes.

Resampling image

Resampling is used to resize an image by modifying its resolution or size in pixels. An image can be resampled in the three following ways: by changing the image size in pixels, by changing the actual image size with fixing size in pixels, and by changing the actual image size without fixing size in pixels.

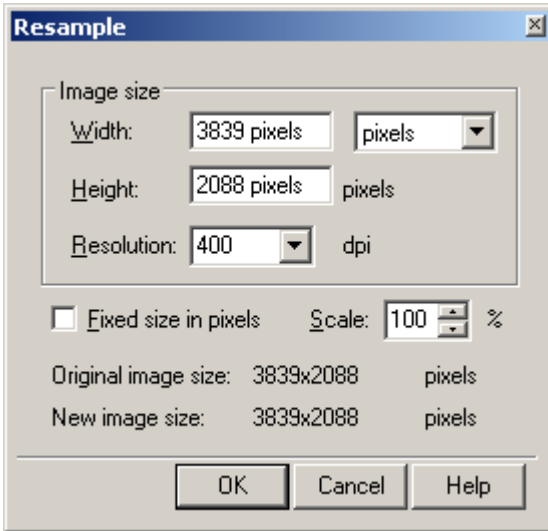
-
- ❖ Note that an image resolution cannot be modified without appropriately changing its size. An image file size is proportional to its squared resolution. For example, an image file with resolution of 200 pixels per inch is four times larger, than file containing an image of the same size (in inches, for example) and a resolution of 100 pixels per inch.

The operation can only be applied to one image at a time.

To resample an image

Select an image and start the operation by choosing the *Resample* command from the *Image* menu.

The following dialog box appears:



1. Set the *Fixed size in pixels* checkbox to save the original image size in pixels,
 - or -
 - Clear the *Fixed size in pixels* checkbox to modify the image size by adding or deleting the image pixels.
2. Choose measurement units from the list:
3. Type in the *Width* or *Height* boxes the new image width or height. (If pixels are chosen as the measurement units and the *Fixed Size in Pixels* option is on, then these values cannot be entered into *Width* and *Height*). When entering any value in one box, the value in the other box is changed automatically in order to maintain the image proportion.
 - or -
 - Type a scale factor in percent based on the current image size in *Scale*. If the *Fixed Size in Pixels* option is on, then the setting of a new actual size influences the resolution value. The image size in pixels is constant. If the *Fixed Size in Pixels* is off, then the setting of a new actual size influences the size in pixels. The image resolution is constant.
4. Change the image resolution by entering a desired value in dots per inch (DPI) in *Resolution*.
 - If the *Fixed Size in Pixels* option is on, then the actual size is changed and the size in pixels remains the same.
 - If the *Fixed Size in Pixels* is off, then the actual size remains the same and the size in pixels is changed.
5. Click OK.


Cropping

Cropping can reduce an image size to a specified rectangular area size. Define this area by specifying a rectangle on the image or by specifying a clipping boundary. Applying a procedure can also crop an image, which automatically finds “empty” image margins and crops them.

This operation can be applied to several raster images at once. For example, to crop a “pile” of images placed one over another.

To crop an image by clipping boundary


1. Select the images to crop (visible and located on unlocked layers) with clip. If no image is selected, then this command processes all visible images located on unlocked layers, which have a clipping boundary.
2. Run the operation using one of the following methods:

Choose *Crop > by Clipping* from the *Image* menu or click the  button on the *Image* toolbar.

☒ For more information on clipping see page 57.


To crop an image to a specified rectangle

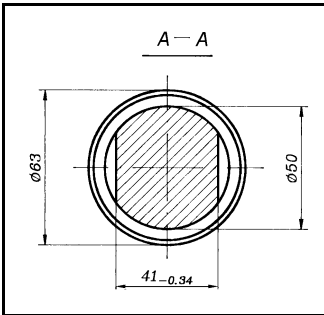
1. Select the images to crop. If no image is selected, then the command processes all visible images on unlocked layers that are inside a cropping rectangle.
2. Specify two opposite corners of rectangular area with the mouse.
The selected image parts allocated outside the specified boundary will be cropped.
3. Run the operation using one of the following methods:

Choose *Crop > by Rectangle* from the *Image* menu or click the  button on the *Image* toolbar.

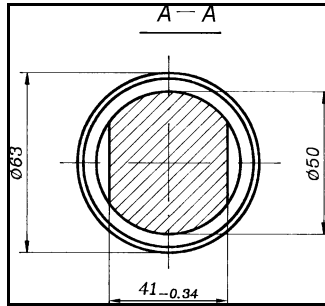
To crop an image automatically

1. Select the images to crop. If no image is selected, then this command processes all visible images located on unlocked layers.
2. Run the operation using one of the following methods:

Choose *Crop > Auto* from the *Image* menu or click the  button on the *Image* toolbar.



Before *Crop > Auto* on the image without a frame




After *Crop > Auto*, the Cropping tool does its best to reduce image width and height size to those of the minimal bounding rectangle covering all raster objects on the image

Cropping by Frame

If the image has a frame, then this command automatically resizes document to the frame size, ignoring insignificant speckle and sometimes even small objects and texts. Note that since autocropping by frame is completely automatic, the skewed frame and/or too many speckles on the image can spoil the results. It would be a good idea to apply *Image > Deskew* and/or *Filters > Speckle Remover* to the image before autocropping by frame.

To autocrop image by Frame

1. Select the image or images to be cropped. If no image is selected, then this command processes all visible images located on unlocked layers.
2. Choose *Image > Crop > AutoCrop by Frame* or press  on the *Image* toolbar.

If there is no frame, then this command works like *Crop > Auto*.

Mirroring

Use this operation to mirror an image about either vertical or horizontal axis crossing the image centre.

This operation can be applied to several raster images at once.

To mirror an image

1. Select images to mirror. If no image is selected, then this command processes all visible images located on unlocked layers.
2. Run the operation by *Mirror > By X Axis* (mirror about horizontal direction) or *By Y Axis* (mirror about vertical direction) from the *Image* menu.

Rotation

By applying this operation an image can be rotated about its central point using three fixed rotation angles (90, 180 and 270 degrees) or an arbitrary angle. When rotating by an arbitrary angle, the new image size automatically expands to fit the rotated image.

- ☒ For a colour or greyscale image, the colour of added “empty” image areas is specified by the *Fill Colour* parameter in the *Colours* folder of the *RxSpotlight Preferences* dialog box described on page 389.

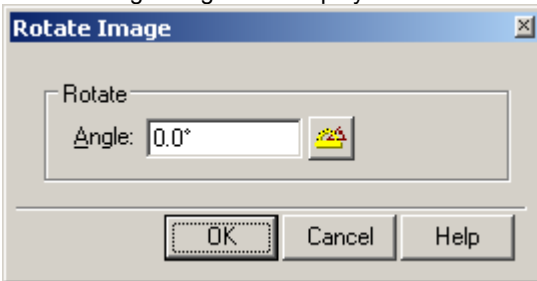
This operation can be applied to several images at once.


To rotate an image by 90, 180, 270 degrees

1. Select the images to rotate. If no image is selected, then this command processes all visible images located on unlocked layers.
2. Run the operation by choosing *Rotate > 90-ccw, 180 or 90-cw* from the *Image* menu.

To rotate an image by an arbitrary angle

1. Select the images to rotate. If no image is selected, then this command processes all visible images located on unlocked layers.
2. Run the operation by choosing *Rotate – Custom Angle* from the *Image* menu. The following dialog box is displayed:



3. Type the desired rotation angle in *Angle* or click the angle measurement button  and specify the start and end points of the segment that defines the rotation angle. The measured value will be automatically entered in the *Angle* box. The angle between the specified segment and X-axis is measured.
4. Click *OK*.

Deskewing

This operation enables an image skew resulting from scanning to be corrected. The whole image is rotated about its central point in order to eliminate either horizontal or vertical skew. When deskewing, the new image size automatically expands to fit the deskewed image.

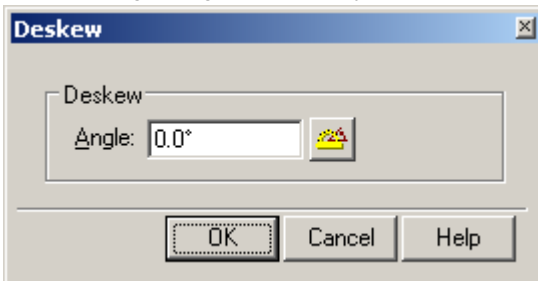
-
- ☒ If you have a colour or greyscale image, then the colour of added “empty” image areas is specified by the *Fill Colour* parameter in the *Colours* folder of the RxSpotlight *Preferences* dialog box on page 389.


There are three ways to deskew an image. The user can define a *deskew line* by specifying two points in the image. This line deviation from either horizontal or vertical axis determines the skew angle. The user can also deskew image by typing a skew angle in the appropriate editing box. Also, the automatic procedure of skew angle calculation can be applied.

This operation can be applied to several images at once.

To deskew raster images manually

1. Select the images to deskew. If no image is selected, then this command processes all visible images located on unlocked layers.
2. Run the operation by choosing *Deskew > Manual* from the *Image* menu. The following dialog box is displayed:



3. Type the skew angle value in *Angle* or click the angle-measuring button  and specify the start and end points of the line that defines the rotation angle – the *deskew line*. The measured value is automatically entered in the *Angle* box.
4. Click OK.

To deskew raster images automatically

1. Select the images to deskew. If no image is selected, then this command processes all visible images located on unlocked layers.
2. Run the operation by choosing *Deskew > Auto* from the *Image* menu.

If RxSpotlight is able to estimate the rotation angle, then raster images will be deskewed. Otherwise, use the manual deskewing procedure.

Auto Correction

This operation processes an image, using a predefined set of standard operations. The set of applied operations is specified in the *Autocorrect* section of the RxSpotlight *Preferences* dialog box.

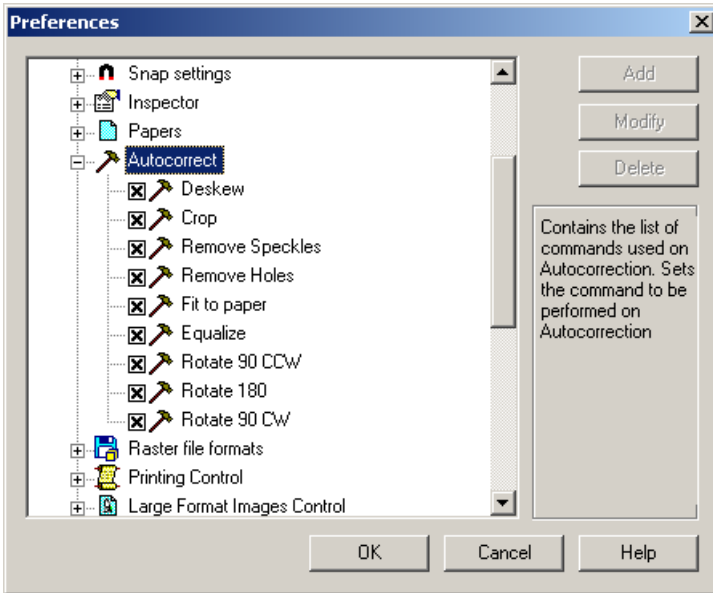
-
- ☒ For more information on the RxSpotlight *Preferences* dialog box see description on page 389.


When performing auto correction the specified operations are applied step-by-step in the order they are arranged in the *Autocorrect* section.

If any of the specified operations cannot be performed, then it is ignored and the next operation starts.

To perform autocorrection

1. Specify a set of operations in the *Autocorrect* section of the RxSpotlight Preferences dialog box.



2. Select the images to auto correct. If no image is selected, then this command processes all visible images located on unlocked layers.
3. Run the operation using one of the following methods:
Choose *AutoCorrect* from the *Image* menu or click the  button on the *Image* toolbar.

Four-Point Correction

Four-point correction is a simple way to eliminate trapezoid, parallelogram or projective distortions in images (technical drawings mainly). This procedure is based on the assumption that an image frame and its contents are distorted in the same way. This procedure can be used to correct image geometry if its frame has a trapezium or parallelogram shape, rather than a rectangular.

This operation can be applied to several images at once. For example, correct a “pile” of images placed one over another.

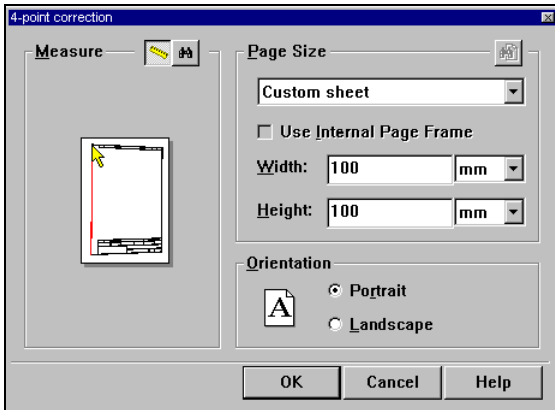
To perform this procedure, specify the desired frame size – its height and width, and the appropriate current position of the frame corner dots on the image. After correction the image is transformed so that the frame corner dots are moved to the rectangular frame corners of the specified size.



To perform four-point correction


1. Select the images to correct by four-point correction. If no image is selected, then this command processes all visible images located on unlocked layers.
2. Run the operation using one of the following methods:

Choose *4-point correction* from the *Image* menu or click the  button on the *Image* toolbar.

The following dialog box is displayed:

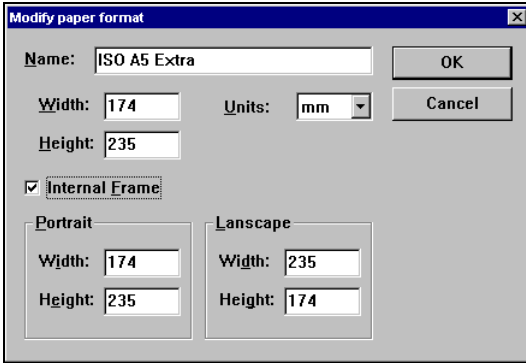


3. Press the  – *Find frame* button. If RxSpotlight is able to find the drawing frame, then you will see a colour polygon over the image close to the raster lines. The frame is shown in the document window. If RxSpotlight can not find the drawing frame, then specify these points manually.
4. To specify the frame corners manually, press the  button and click the frame corners on the image. These points can be specified in an arbitrary order because the program always sorts them so they form the frame without intersections. Watch the rubberline to control, press BACKSPACE to go to previous frame corner if necessary.
5. Type the desired frame size in *Width* and *Height*.
6. Select the orientation – *Portrait* or *Landscape*.
7. Click OK.

The  button, the *Paper size* list box and *Use Internal Page Frame* checkbox control the automatic paper size adjustment. Use these controls to adjust the image to fit a standard paper size.

The *Paper size* contains standard paper formats.

Use Internal Page Frame lets the user use the corresponding drawing frame size that is stored for a particular format (internal page frame size is set in *Tools > Preferences > Papers > Modify* dialog, in *Internal Frame* section).



If *Internal Frame* is not checked in this dialog, then the *Use Internal Page Frame* checkbox in the *4-point correction* dialog is unavailable.

If *Internal Frame* is checked, then settings in *Portrait* and *Landscape* sections are automatically reflected in the *Width* and *Heights* fields of *4-point correction* dialog.

Calibration

Calibrating (also known as “rubbersheeting”) is designed to eliminate arbitrary (both linear and non-linear) distortions in monochrome, greyscale, and colour raster images: scanned graphic documents, geodetic plans, maps in raster format, etc.

To carry out calibration original documents must include points with known coordinates. These points can have a different position in the scanned image, caused by the deformation in original materials or scanning errors. By applying calibration, raster images are transformed so that the current coordinates of such points coincide with their known values.

Calibration can be applied to a selection set consisting of image fragments and also to a clipped area on the image. If several images have been selected, then the command will be applied to those that are visible and located on unlocked layers. If an image is not selected, then this command processes all visible images located on unlocked layers. The calibration procedure needs to be applied before running the procedures of layering and vectorization. If there is non-linear distortion in the original image, then after vectorization a vector drawing is obtained, which is impossible to correct. To obtain a correct vector drawing, eliminate distortion before vectorization.

Terms

The calibration procedure transforms a raster image in such a way that the given set of image points moves to another set of points with pre-defined coordinates. The number of points and their locations are arbitrary.

The calibrating transformation is defined by the set of *calibration pairs* and the *calibration method used*.

Calibration Pairs

To prepare calibration, specify vectors of point movements. This can be done by specifying a set of calibration pairs. Each pair represents two locations of the point - its current location on the image (*measured point*), and its required location (*real point*).

Calibration Methods

A *calibration method* is a parametric transformation function used for calibrating. The program offers a number of calibration methods: affine, bilinear, polynomial, surface splines, etc.

With some sets of calibration pairs and some calibration method, the program cannot make a transformation of the given type that where all measured points move to appropriate real points. This produces calibration deviation distances between the points obtained as a result of transformation and their appropriate real points. When choosing a calibration method, use the minimizing of the square error value for all calibration pairs as criteria.

Calibration Pairs types

Every calibration pair has one of the follow types:

Grid – if a pair is a part of a calibration Grid, used in calculation of calibration parameters and estimating calibration accuracy.

Control – if a pair is used in calculation of calibration parameters and estimating calibration accuracy.

Check – if a pair is used only for estimating the calibration accuracy and does not affect the calibration parameters.

Unused – if a pair is not used in calculation of calibration parameters and estimating calibration accuracy.

The main steps of Calibration

1. Open the *Calibration* dialog box.
2. Create a set of calibration pairs.
3. Specify the measured point's positions.
4. Choose an appropriate calibration method.
5. Run calibration.


Note: it may be useful to define the coordinate system, the coordinate system origin and scale before the calibration

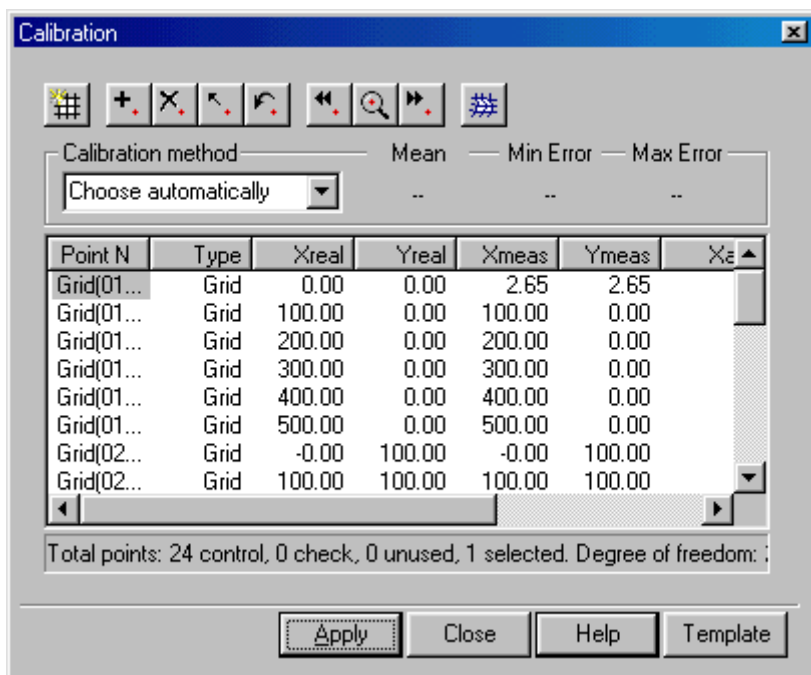
For more information on defining the coordinate system see “Coordinate System of a RxSpotlight Document “on page 64.

Calibration Dialog Box

An image is calibrated using the Calibration dialog box.





To open the Calibration dialog box






From the *Image* menu, choose *Calibrate* or on the *Image* toolbar, click the  button.



Calibration dialog box

Calibration dialog box buttons

Button	Description
 <i>Define Grid</i>	Creates a set of calibration pairs placed in the nodes of rectangular grid.
 <i>Add Pair</i>	Creates a calibration pair using the dialog box.
 <i>Modify Pair</i>	Allows changing the locations of measured and real points and the type of selected calibration pair.
 <i>Reset Pair</i>	Places the measured points to real point positions for the selected calibration pairs.

Button	Description
 <i>Delete Pair</i>	Removes all selected calibration pairs from the list and appropriate points from the drawing.
 <i>View Previous</i>	Pans the drawing to display the previous calibration pair.
 <i>Zoom To</i>	Zooms the drawing to display calibration pairs selected.
 <i>View Next</i>	Pans the drawing to display the next calibration pair.
 <i>Estimate</i>	Estimates calibration accuracy.

Calibration method

Shows the method that will be used for calibrating.

Mean error

Displays the root-mean-square deviation for all calibration pairs.

Max error

Displays the maximum deviation for all calibration pairs.

Min error

Displays the minimum deviation for all calibration pairs.

Calibration pair list

Displays information about all calibration pairs in the following format:

<i>Point Name</i>	Displays the calibration pair names. To select a calibration pair, click its name.
<i>Type</i>	Displays the calibration pair types - Control, Grid, Check, or Unused.
<i>Xreal</i>	Displays the X coordinate of real points.
<i>Yreal</i>	Displays the Y coordinate of real points.
<i>Xmeas</i>	Displays the X coordinate of measured points.
<i>Ymeas</i>	Displays the Y coordinate of measured points.
<i>Xadj</i>	Displays the X coordinate of estimated points.
<i>Yadj</i>	Displays the Y coordinate of estimated points.
<i>Xerr</i>	Displays the X projections of distances between real and estimated points.
<i>Yerr</i>	Displays the Y projections of distances between real and estimated points.

Sort any column by clicking buttons with column names. The first click on the button sorts the list in ascending order, the second click, in descending order.

Creating a set of Calibration Pairs

Creating calibration pairs adds their definitions to the list of the Calibration dialog box. To create calibration pairs:

1. Specify the known theoretical point coordinates (*real points*). There are two ways to do this – define a calibration grid or add them one by one. Both methods may be used simultaneously. Upon creation, each calibration pair has the same measured and real point coordinates.
2. Specify the appropriate measured points for all real points by picking them on the image or entering the point coordinates from the keyboard.

Defining Calibration Grid


A calibration grid is helpful when calibrating images covered with the raster grid with nodes that must have known coordinates. Such images are, for example, scanned images of maps or geodetic plans.

Defining a calibration grid creates a set of calibration pairs placed in the nodes of a rectangular grid. These calibration pairs have the *Grid* type.

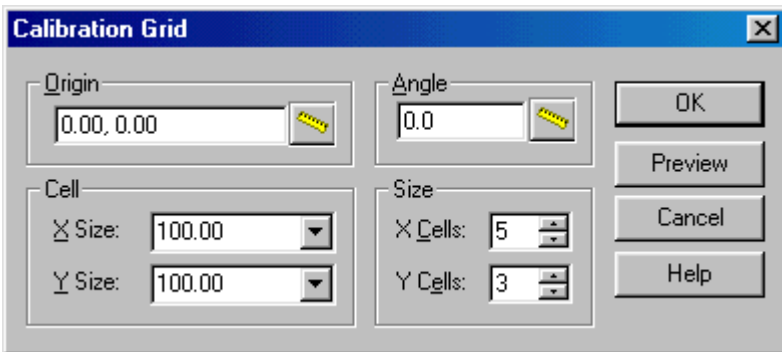
The position of grid nodes is determined by the origin, angle, cell size and the number of cells in the vertical and horizontal directions.

-
- ❖ There can only be one grid defined on the image. Redefining a calibration grid removes all calibration pairs of the present grid from the image.

To define a calibration grid

1. Open the Calibration dialog box.
2. Click the  button in the *Calibration* dialog box.

The *Calibration Grid* dialog box appears:




Calibration Grid dialog box

3. Specify the grid origin.
Enter its coordinates into *Origin*, or press the *Measure* button and click the origin location on the image.
The grid origin is assumed to be in the lower-left corner, and the grid is generated along the positive direction of the X and Y axis. To set a different corner and grid direction, set negative values in *Size* and *Cell* boxes.
4. Specify X Size and Y Size of the grid cell.
If it is necessary, then add grid columns in the negative direction of the X or Y axis by specifying a negative value for the X or Y size.
5. Specify numbers of grid cells along the X and Y axis using *X Cell* and *Y Cell*, accordingly.
6. To prevent mistakes, choose the *Preview* button to view the grid defined. Correct any mistakes if necessary.
7. Choose *OK* to create calibration grid and return to the *Calibrate* dialog box.
8. It is possible to construct a rectangular grid rotated by the defined angle. Otherwise, the grid rows and columns will be orthogonal to the X and Y axis.

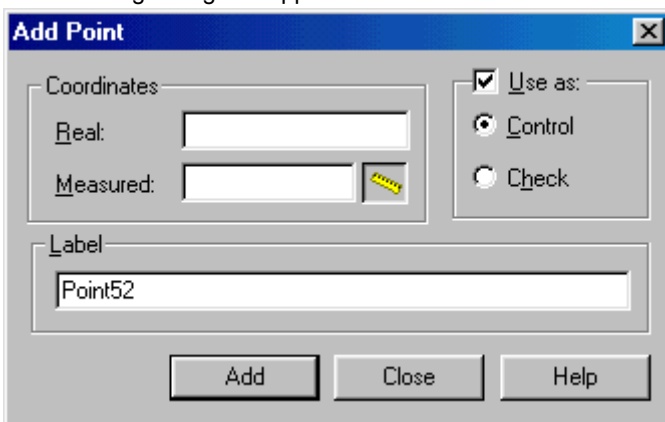
Adding calibration pairs one by one

This method creates calibration pairs one by one. The created pairs may be of the *Control*, *Check*, or *Unused* type. The procedure is designed so that pairs can be created by indicating only the real point coordinates. The measured point coordinates can be defined later.

To add calibration pairs one by one


1. Open the Calibration dialog box.
2. From the cursor menu, choose *Add* or click the  button in the Calibration dialog box.

The following dialog box appears:



Add Point dialog box

3. Type the real point coordinates in *Real*.

4. Type the name for the pair in *Label*. Otherwise the default name of this pair is "PointNN".
5. Type the measured points' coordinates in *Measured* or pick the measured point coordinates in the screen by  button. Otherwise their coordinates will be equal to the real ones and can be modified later.
6. If necessary, then change the pair type in *Use as* from Control to Check or define the pair as *Unused*.
7. Press ENTER or choose *Add* to create the pair and continue the process.
8. Choose *Close* to return to the Calibration dialog box.

Selecting Calibration Pairs

To view, modify, or delete a calibration pair, first select it from the list in the Calibration dialog box.

To select a calibration pair from the list

Click on the name of the pair.

To select several calibration pairs from the list

Click on the name of a pair to select it from the list in the *Calibration* dialog box. Use the CTRL and SHIFT keys to select several pairs at a time.



- or -

Click and drag in the list of pairs to draw the selecting rectangle around the names of pairs to be selected.


Defining the Measured Points on the screen

The measured points can be defined on the screen using the mouse.

To change position of a measured point on the screen

1. Select the calibration pair to be modified from the list of the Calibration dialog or in the screen. RxSpotlight highlights the selected point with grips.
2. Zoom to the selected pair by  button on the Calibration toolbar or Zoom to command from cursor menu.
RxSpotlight pans the image to show the measured point of the selected pair in the centre of the image window.
3. Change the current measured point location.
Place the mouse cursor over the grip and click. Move the cursor and click again to specify its new location.
4. Go to the next or previous calibration pair.
Press N or Tab hot key or the  button on the toolbar in the Calibration dialog box for moving to next calibration pair.

- or -

Press P hot key or the  button on the toolbar in the Calibration dialog box for moving to previous calibration pair.



RxSpotlight pans the image to show the next (previous) measured point in the centre of the image window. The measured point will be highlighted with grips.

- Repeat steps 3-4 for all calibration pairs you need.

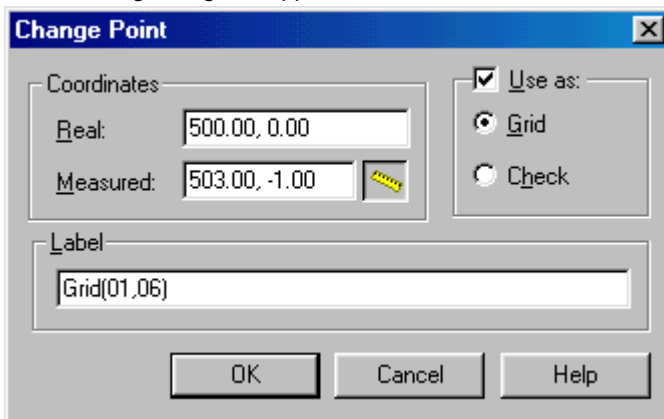
Modifying Calibration Pairs with Dialog

The location of any calibration point and the type of any calibration pair can be changed using the Change Point dialog box.


To modify a calibration pair with dialog

- Select a required pair from the list in the Calibration dialog box.
- Zoom to selected pair by  button on the Calibration toolbar or Zoom to command from cursor menu.
- From the cursor menu, choose *Modify* or click the  button in the *Calibration* dialog box.

The following dialog box appears:




Change Point dialog box

- Type the coordinates of the real and measured points. The measured point coordinates can be picked on the screen by using the  button.
- Select the pair type in *Use as*. Remove the check from *Use as*, and the defined pair will not be used for calibration.
- Type the name for the pair in *Label*.
- Click *OK*.

Deleting Calibration Pairs


Delete the selected calibration pairs from the list in the Calibrate dialog. Note that this action can't be undone.

To delete calibration pairs

1. Select the required pairs from the list in the Calibration dialog box.
2. From the cursor menu, choose *Delete* or click the  button in the Calibration dialog box.

Resetting Calibration Pairs

This operation resets the measured coordinates of the selected calibration pairs to appropriate real ones. Note that this action can't be undone. To reset calibration pairs:

1. Select the required pairs from the list in the Calibration dialog box.
2. From the cursor menu, choose *Reset* or click the  button in the Calibration dialog box.

Choosing Calibration Method

The choice of calibration method is based on the nature of image distortion and the quantity and location of calibration pairs.

If the type of image distortion is unknown, then choose a calibration method automatically. In this case the program automatically chooses the optimal calibration method for the set of calibration pairs.

The following table describes possible distortions and calibration methods, used to correct them.

Method	Distortion
Linear conformal	For linear transformation - moving, rotating, and proportional scaling.
Affine	For linear transformation - moving, rotating, and non-proportional scaling. Raster ellipses can be transformed to circles.
Bilinear	For parallelogram or trapezoid distortions on map or mechanical drawings.
Grid adaptive bilinear	Useful for relatively small raster grid distortions if the grid cells are convex. Can only be used if the calibration grid is defined.
Polynomial	Nonlinear deformations caused by either three-dimensional expansion of the original graphic document or by an image type itself. For example, aerial photos of the Earth's surface.

Surface Splines	For distortions of all kinds, it is more accurate, and works on an arbitrary set of pairs.
-----------------	--

For every calibration method there is a minimum number of calibration pairs that enables the use of this model. If the number of calibration pairs exceeds a certain value, then all models, except Surface Splines, produce a non-zero deviation. The following table describes the restrictions on the number of calibration pairs for each calibration method.

Method name	Number of calibration pairs required	Number of calibration pairs producing non-zero error
Linear conformal	2	3
Affine	3	4
Bilinear	4	5
Grid adaptive bilinear	the calibration grid must be defined.	Non-Grid points are defined
Polynomial 2 degree	6	7
Polynomial 3 degree	10	11
Polynomial 4 degree	15	16
Polynomial 5 degree	21	22
Polynomial 6 degree	28	29
Surface Splines	3	not applicable

To choose a calibration method

Select a calibration method from the Calibration method list of the *Calibration* dialog box.

Estimating Calibration Accuracy

Calibrating transforms the entire raster image by means of the calculated transformation. All image points, not only those defined in calibration pairs, generally move. Accuracy estimation allows for the expected displacement of every raster point to be found for the calibration method chosen, without having to run the calibration procedure.

For every calibration pair, estimating creates one more point called *estimated*. It shows the position of a *measured point* after running the chosen calibration method. Markers of such points are coloured yellow. (The markers of real points are blue; the

markers of measured points are red. Change these default colours in the Preferences Dialog Box). The program then calculates and displays the distances between each estimated point and its appropriate real point. These distances define calibration deviations for each pair.


RxSpotlight calculates the parameters of the chosen method so after transformation, each *measured* point is placed as close to its appropriate *real* point as possible. RxSpotlight only uses *Control* and *Grid* calibration pairs for these calculations.

To estimate the displacement of a certain image point after calibration, create a calibration pair with the measured and real points that have coordinates of the desired image point, and assign the *Check* type to this pair. The pair will not be considered when defining transformation parameters, but the program will find the estimated point for the pair and calculate deviation relative to its real point location.

To estimate the calibration accuracy

1. Create the calibration pairs needed to eliminate the distortion of your image.
2. Specify the locations of the measured point.
3. If needed, then create Check pairs to decide on the arbitrary points' movements.
4. Select the required method from the Calibration method list.

Base the choice on recommendations given above in "Choosing Calibration Method" on page 144. Note that RxSpotlight only allows the use of those models applicable to the specified set of calibration pairs. Estimation cannot be run if these requirements are not met.

5. Press the  button in the Calibration dialog box.

Mean error indicates the average error of the method chosen. Also, pay attention to the *Xerr* and *Yerr* values to estimate the error of the chosen method for every point.

Example of Image Calibration

This example shows the calibration of a colour image from the UTRECHT.TIF file of the SAMPLES subfolder of the program root folder.

Image loading

Choose *Open* from the *File* menu or click the *Open* button in the *Main* toolbar.

In the dialog box go to the SAMPLES folder and double-click the UTRECHT.TIF file name.


- or -

Select the UTRECHT.TIF file and press the *Open* button in the dialog box.



Note that this image sample has raster grid with a X-axis of 2 cells and an Y-axis of 2 cells. The size of cells in this grid is known to be 32x32 mm, and in the original scanned image the grid cells are distorted. We assume that the whole image distortion corresponds to the grid distortion.

Use calibration procedure to eliminate distortion.

Open the Calibration dialog box

From the *Image* menu, choose *Calibrate* or on the *Image* toolbar, click the  button.

Creating a set of calibration pairs using calibration grid

1. Press  in the *Calibration* toolbar. The *Calibration Grid* dialog box appears.
2. Zoom to the image lower-left corner.
3. Enter the exact coordinates of the lower-left grid node to *Origin* the UCS is defined or press the *Measure* button  and click a point at the raster lower-left grid node, as shown in the figure below.





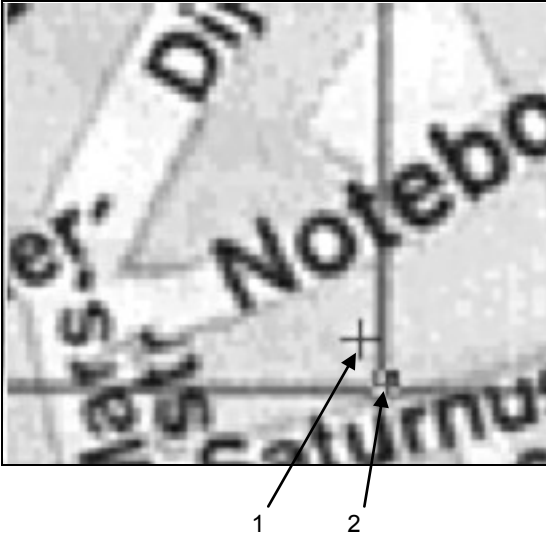
Click here

4. Specify X Size and Y Size of the grid cell.
Enter **32** to X Size and Y Size.
5. Specify numbers of grid cells along the X-axis and Y-axis entering **2** to X Cell and Y Cell, respectively.
6. Choose *OK* to create a calibration grid and return to the *Calibrate* dialog box.
A grid of calibration pairs is displayed.
The real and measured points of each calibration pair have the same coordinates. They represent the known position of raster grid nodes.



Define the measured points

1. Select the first calibration pair Grid (01,01) from the list in the *Calibration* dialog box. RxSpotlight highlights the selected point with grips.

- Zoom to the selected pair by clicking the  button on the toolbar of the *Calibration* window. RxSpotlight pans the image so that the pair is shown in the centre of the screen. Use the standard  button to view the required point more exactly.
- Change the current measured point location. Place the mouse cursor over the grip and click. Move the cursor and click again to specify its new location.



The figure above shows the *real* (1) and the *measured* (2) points positions. The real point of the calibration pair sets the known position of the raster grid node, and the measured point shows the position of the raster grid node on the original (distorted) image.

- Go to the next calibration pair by pressing *N* or *Tab* hot key or press the  button in *Calibration* dialog box. RxSpotlight pans the image so that the measured point of the next calibration pair is shown in the screen centre. To go to the previous calibration pair, press *P* hot key or press the  button in the *Calibration* dialog box.
- Repeat steps 3 and 4 for all calibration pairs to specify the measured point's position.

Transformation method selection


As follows from the table on the page 144, the *Grid adaptive bilinear* method is the most appropriate method to correct grid distortions.

From the *Calibration Method* list, select *Grid adaptive bilinear*.

- or -

Select *Choose automatically* from the same list.

To estimate the calibration transformation precision

Click the  button in the *Calibration* toolbar.

The program will find the *calculated* points' coordinates –the points for the measured points of all calibration pairs to be moved to, and their position will be shown with yellow cross marks on the image. Also, the program calculates the distances between the *calculated* points and the real points of the calibration pairs in order to estimate the mean, maximal and minimal transformation errors. The values of these errors are shown in the boxes: *Mean error*, *Min error* and *Max Error* respectively.

In this case all these values are zeros. It means that all the raster grid nodes will get the required positions after calibration.

To start the calibration procedure

Start the image calibration procedure by clicking the *Apply* button in the *Calibration* toolbar.


Filters

Monochrome filters are used to process bitonal images. Filter application can considerably increase image quality and reduce the size of raster image files.

Data Selection for Monochrome Filtration

The filtration operations can be applied to images that are located on unlocked layers, visible and with the read-only attribute off. Filtration can be applied to four kinds of selection sets.

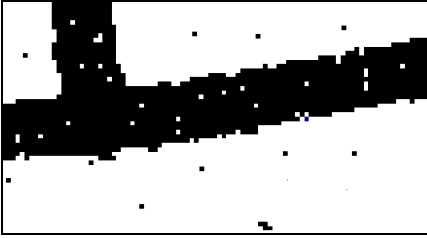
1. One or several raster images (no explicit selection made).
2. Selection set that can contain images and raster areas.
3. Clipped areas.

 For more detailed information on selecting raster images see page 108.

Speckle Remover

The *Speckle Remover* filter removes raster objects (isolated pixel groups) that are smaller than those of the specified value. This filter can automatically estimate the speckle size in the image.

The filter can be used after such procedures as binarization and layering to remove low-sized raster objects in the obtained monochrome images' layers.



Monochrome raster fragment, obtained after binarization



After speckle removing

To remove raster speckle



1. Define the selection set to be processed and choose *Speckle Remover* from *Filters* menu or press the button on the *Filters* toolbar.



2. Specify the maximum size of raster objects to be removed in the current units (left box) or in dots (right box).

- or -

Set the *Auto Estimating* option so that the filter automatically estimates raster speckle size before filtration.



To measure the size of a raster object on the screen, click on pixel inside the object.

- or -



Click the button and pick two pixels on the screen. The program will estimate the speckle size equal to the distance between these points.

3. Choose *Apply*.

Hole Remover

This filter removes low-sized holes in raster objects. Only holes with size less than the specified value are removed. The filter can automatically estimate the hole size on image objects.

The filter can be used after such procedures as binarization and layering to fill undesirable holes in raster images.



Original image

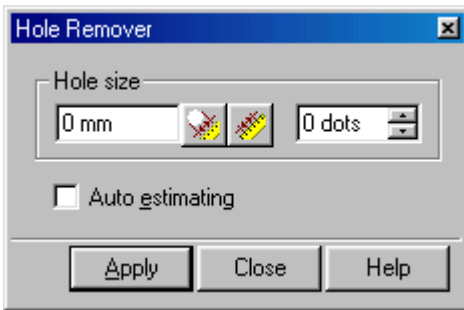


After hole removing

To remove low-sized holes



1. Define the selection set to process and choose *Hole Remover* from the *Filters* menu or press the button on the *Filters* toolbar.



2. Specify the maximum size of raster holes to be removed in the current units (left box) or in dots (right box).

- or -

Set the *Auto Estimating* option so that the filter automatically estimates raster hole size before filtration.



- To measure raster hole size on the screen, click on a pixel inside the object.

- or -



- Click the button and pick two pixels on the screen. The program will estimate hole size equal to the distance between these pixels.

3. Choose *Apply*.

Smoothing

This filter smoothes raster object edges, fills inner background droplets, and partially removes raster speckles.

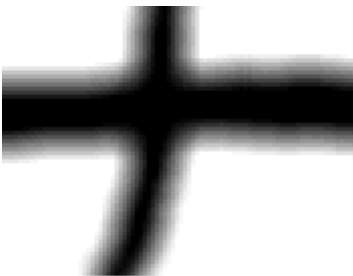


Original image fragment

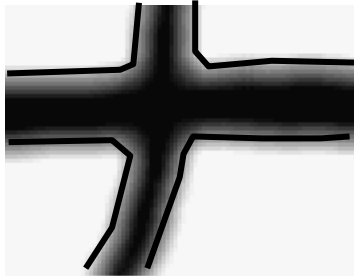


After smoothing

This filter processes images in two steps. During the first step a median operation on a greyscale image (see description on page 327) is performed. This function analyses the area of a specified radius of each pixel and moderates the extremes of brightness. As a result, the outline seems blurred and the raster object edges are converted to stripes of different brightness value. As *Medianing* value increases, gray stripes widen.



First step – edge blur



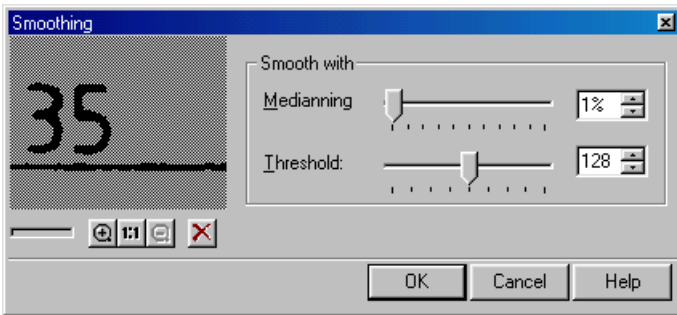
Second step - binarization

On the second step the filter turns the pixels with a brightness value less than the *Threshold* value black. The wide black lines in the figure above show the boundary within which the pixels turn black and outside of which pixels turn white. If the *Threshold* value increases, then it causes the object to thicken, and if the *Threshold* value reduces, it makes them thinner.

To smooth raster objects



1. Define the selection set to process and choose *Smoothing* from *Filters* menu or press the button on *Filters* toolbar.



2. Specify *Medianning* – averaging level in percent.
3. Specify *Threshold* – level from 0 to 255. This value determines clipping level of blurred outlines. As this value increases, smoothing effect increases but raster lines widen.

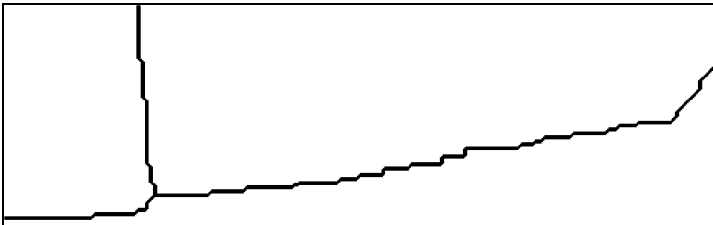
Use the preview window to adjust optimal parameter values.

For more information on preview window see page 34.

4. Click *OK*.

Thinning

The Thinning filter makes raster fragments thinner by a specified number of pixels in specified directions – horizontal, vertical, and diagonal. This filter has a supplementary parameter that allows thinning raster objects up to skeleton (only pixels in the middle are left).

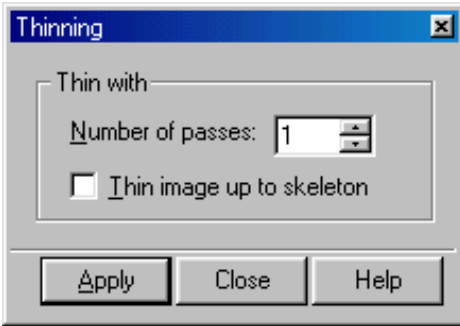


After thinning up to skeleton

To thin an image



1. Define the selection set to process and choose *Thinning* from *Filters* menu or press the button on *Filters* toolbar.

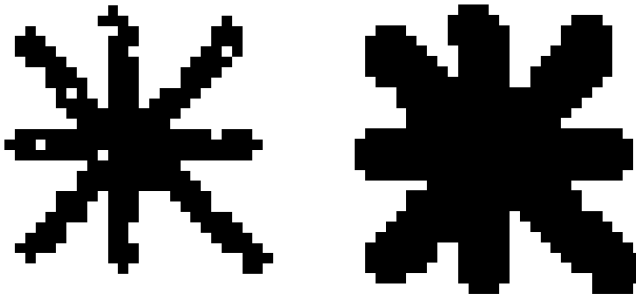


2. Specify the desired number of thinning filtration passes.
- or -
Select *Thin image up to skeleton* to convert all the objects to one-pixel lines.
3. Choose *Apply*.

Thickening

The Thickening filter makes raster objects thicker by specified number of pixels. A combination of thickening directions can be chosen.

The following figure below shows the Thickening filtration effect if all directions are chosen. The left picture shows the original raster image, and the picture on the right shows the result of Thickening filtration after three passes.



Thickening filtration in all directions

The figure below shows the Thickening filtration effect if only the *Vertical* thickening direction is chosen. The picture on the left shows the original raster image, and the picture on the right shows the result of Thickening filtration after three passes.

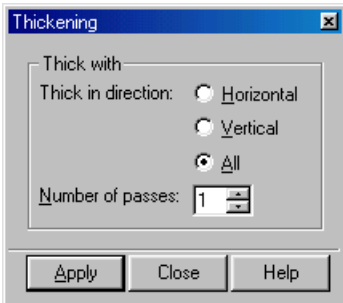


Thickening filtration in vertical direction

To thicken an object



1. Define the selection set to process and choose *Thickening* from *Filters* menu or press the button on *Filters* toolbar.

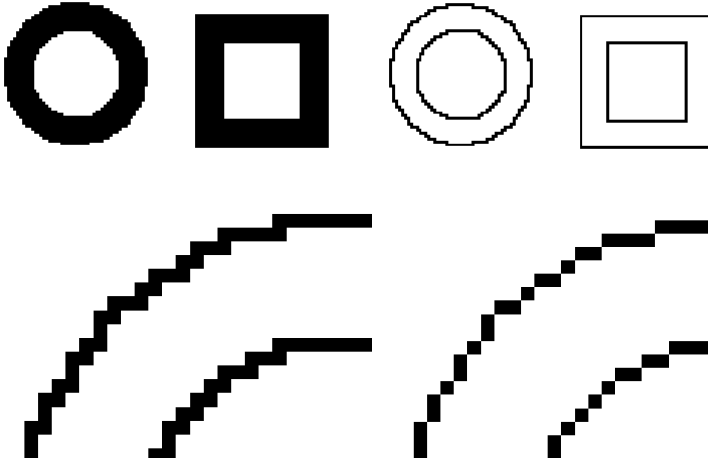


2. Select a desired thickening direction: *Horizontal* – by horizontal, *Vertical* – by vertical, *All* – horizontal, vertical and diagonal.
3. Choose *Apply*.

Contour

Contour filters convert filled raster areas of the image to one-pixel outlines. The 4-coupling filter creates 4-coupling contour; the 8-coupling filter creates 8-coupling contour. In the 4-coupling filter the contiguous areas can only be coupled with their sides; the 8-coupling filter analyses corner contiguity, so such images look thinner.

The figure shows the result of Contour filtration.



Fragments of outlines, obtained after 4-coupling and 8-coupling filtration

To convert raster objects to outlines



Select part(s) of the raster or image(s) and click the *4-coupling* or *8-coupling* from *Contour* submenu of *Filters* menu or press the button on *Filters* toolbar.

Inversion

The Inversion filter reverses the colour of a monochrome image for each dot. Background dots become image dots; image dots become background dots. The following illustration shows the inversion filtration result.



Effect of the Inversion filter

This filter applies only to entire image.

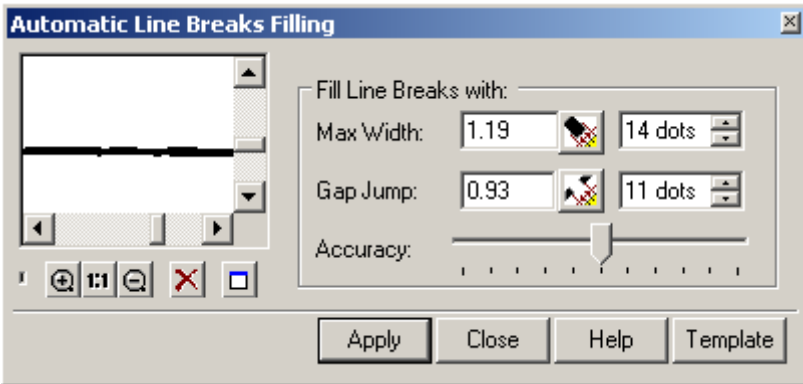
To invert a selected image



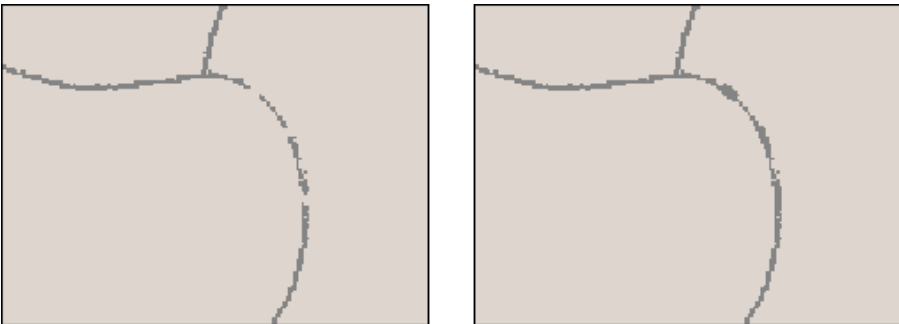
Choose *Inversion* from *Filters* menu or press the button on the *Filters* toolbar.

Filling Raster Line Breaks


To eliminate the breaks in raster lines use *Line Breaks Filling* command.



This operation can be performed only with monochrome raster images. To perform the command, set up the *Max line width* and max *Gap Jump*. These values can be obtained by measuring directly from the raster image by using the appropriate buttons. The accuracy slider allows the user to tune the image, this process is manual and the results must be viewed to determine which will be the most suitable setting.



This command is useful for correction of images processed by binarization or scanning of colour images in monochrome mode. Decreasing the number of gaps positively affects the raster to vector conversion performed using *Trace Polyline* command and *Raster2Vector Conversion*.

To start this command, choose *Filters* from the *Image* menu and then *Line Breaks Filling*. Or click the  button on the *Filters* toolbar.

To perform segmentation do following:

1. Open the monochrome raster image.
2. Run the *Line Breaks Filling* command.
3. Measure the width of a line. Define the gap sizes to eliminate. Measure the biggest of them.
4. If satisfied with the results in the preview window, then move on to step 5 below. If not, then reset the wrong value for Max Width of Max Gap to Jump. Repeat the measurement of required parameters.
5. Play around with the accuracy slider to fine tune the image, if needed.

6. Decreasing the accuracy (slider moves left) causes more holes to be filled and vice-versa.
7. After finding the optimal position, press the *Apply* button.
8. To save the setting for further use, press the *Template* button and define a file name for the settings to be stored as.

Objects Separation by Type and Size

This operation allows separating raster objects of various values into different raster layers. Hatch, text, linear objects and objects by size (isolated groups of adjacent points) can be separated from an original image.

During this operation the program searches for objects in a monochrome image and moves them to a new raster image. The resulting image has the same parameters (size, insertion point, resolution, and scale) as the original image; however it is placed on a user-specified layer. No image objects are lost since they are only moved to a separate raster layer.

This operation can be used:

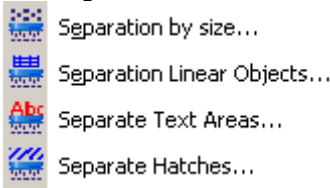
- instead of speckle remover filter, to keep small-size objects which the program may remove as a 'speckle'.
- to apply tools to the objects of a specified type (for example, editing texts and hatches).

If the objects are not to be removed from the original image, then erase the entire raster layer obtained. If any important objects are transferred to this layer, then select them and transfer them back to the original image, and then remove an unnecessary raster layer.

To separate objects

Select objects to separate. With no object selected, the operation will be applied to all visible images located on un-locked layers.

Choose command from the *Image* menu; alternatively press the appropriate button on the *Image* toolbar:



In the opened dialog set the parameters by which the objects should be separated.

The dialog and settings depend on a type of a selected object. The buttons in the

dialog located next to the measurement fields  can be used to measure parameters from the image. For this, press an appropriate button and specify what is needed on the screen. A measured value will appear in the appropriate field.

To fill in the *Output Layer* field you need to make the same actions for all the dialogs:

- Enter a name of the layer to place an image containing selected objects;

- Set a colour for this layer – click on the colour sample located next to the field and select a colour from the dialog.

Observe the result in the preview window. When satisfied, press the *Apply* button.

Setting parameters in the object separation dialogs:

1 Separation by size

Set the minimum and maximum object size in the appropriate fields.

2 Separation Linear Objects

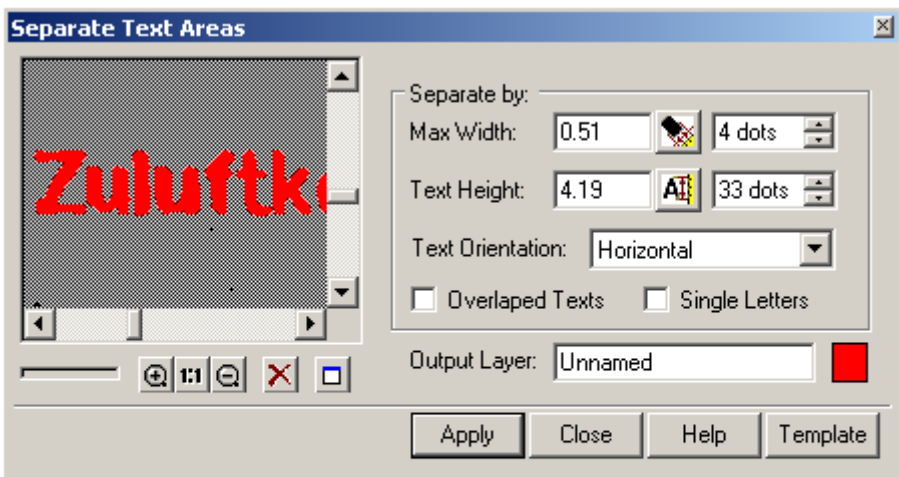
In the *Max Width* field specify the maximum width value for a raster line of the objects to separate.

In the *Gap Jump* field specify the maximum gap value to ignore in the raster lines.

3 Separate Text Areas

In the *Max.width* field specify the maximum width value for a raster text line.

In the *Text Height* field specify the maximum size of the upper case letters.



Select the *Text Orientation* – *Horizontal*, *Horizontal and Vertical* or *Arbitrary Oriented* from the combo-box. If needed, then select the 'Overlapped Text', and/or 'Single Letters' checkboxes to improve the text recognition quality.

4 Separate Hatches



In the *Max Width* field specify the maximum width value for a raster hatch line.


In the *Gap Jump* field specify the maximum gap value to ignore in the raster lines.

In the *Hatch Angle* field specify the hatch angle.


To save or delete a created raster image

A created raster image containing separated objects becomes embedded in the RxSpotlight document automatically; it gets the name of the layer set in the *Output Layer* field. To save this image to a separate file:

- From the *Tools* menu choose *Image*; or press the button  on the *Properties* toolbar;
- In the Image dialog select the created image, press the *Save As* button , set a file name and format.

To delete a raster image containing separated objects press the *Delete* button in the *Image* dialog .

To bring objects back to the original image

Select objects to bring back to the initial image using one of the selection methods. If all the objects are to be brought back, then select the created raster image by its vector frame or use the *Select Image* dialog .

Choose *Merge (Rasterize)* in the *Modify* menu.

Tracing and vectorizing

Tracing

This chapter describes the means and tools of tracing – an interactive procedure that allows extraction of vectors from a raster image, and also to smooth or to delete objects of a monochrome raster image.

Tracing is based on the technology of local recognition of geometrical raster entities. Using this technology, the program identifies raster lines as a line, arc or circle, and generates the appropriate vector objects. Pick raster objects on the image, and the program creates vector objects that approximate the objects chosen.

This method adds power and flexibility to the automatic conversion process. When tracing, it is possible to classify line widths of raster image objects, transform only the necessary ones and transfer the results to separate layers.

Tracing can work on colour or grey-scale, and monochrome images. It is possible to vectorize raster lines, arcs, circles, arbitrary curves (polylines) and also outlines of vector areas.

When processing images; tracing can be used to convert raster objects to vector objects. It can also be used for smoothing, and deleting objects. Depending on the specified tracing mode, the raster object is either deleted, or left intact on the image. Thus, it is possible to transform a raster line to vector object, or only to create a vector copy of a raster line. It is also possible to set a mode in which tracing does not create any replacement vector objects thus deleting them. There is one more mode that automatically replaces a raster line by the rasterized vector object.

On monochrome images lines, arcs, circles, hatches, symbols, and arbitrary curves (raster polylines) and area objects as closed polylines can be traced. On colour and greyscale images all types of objects can be traced, except for hatches and symbols.

Tracing Methods

Various methods are used to trace raster objects. The tracing method sets a user's sequence of operations and defines the type of vector object used for approximating a raster line.

The operation to be applied to the results of raster object tracing (vectorization, converting, erasing, smoothing) is set by the current tracing mode. For detailed information see "Tracing modes", page 170.

Tracing involves local recognition of vector objects on the raster image. For the correct identification of objects the program always uses two numerical parameters defining the maximum width and the ignored break value of a raster line, and also a parameter that specifies the level of accepted deviations of the raster objects from their vector prototypes. Set these parameters in the *Options* tab of *Conversion Options* dialog. To trace raster symbols, create recognition templates or use the existing samples and specify additional parameters of symbol recognition. During tracing, apply the *Orthogonalization* mode and the program will align obtained vector objects parallel and perpendicular to the *Base Angle*. The base angle can be defined

automatically or set in the *Options* tab. This mode can be used, for example, to trace urban maps with buildings.

Detailed information on the parameters defining tracing operation is provided in the section "Tuning Tracing" on page 172.

This chapter describes the tracing techniques on monochrome images. Tracing on colour images is described on page 180.

Tracing with automatic object type recognition (Trace Auto)

This method is used for tracing raster entities of the following types: line, arc, outline and circle.

When tracing in the automatic mode, specify a point on a raster line, and the program automatically selects the type of vector object (line, arc or circle) that is most suitable for a specified raster line and victories the specified raster object. If the indicated object cannot be approximated with one of the above objects, and its width exceeds the value specified in *Max Width*, then the program creates closed polygon that outlines this object.

Raster entities are raster objects of the same form as base vector objects – lines, arcs, and circles. We shall use the terms *raster circle*, *raster arc* and *raster line*, implying raster objects having the form of a circle, arc and line. Raster entities can be also defined as raster analogues of vector objects, for example when printing a vector drawing we obtain a raster representation of the vectors. Note that real raster entities can have defects, which complicate their identification by the program, for example, breaks, ellipticity of circles and arcs, line with deviations, etc.

When tracing a raster line by picking, the program determines its type (line, arc or circle) and tries to trace the object to the greatest possible extent. The intersections of an entity with other objects are ignored, and the set of points representing the object is extended as long as the form of the raster object matches the recognized entity. Since real raster objects differ from ideal raster entities, the recognition tool uses the parameter *Approximation Accuracy* that sets the accepted level of deviation of the real raster object forms from the ideal ones. See the description of this parameter in section "The Options tab", page 172.

When tracing a raster entity, its intersections with other crossing objects are preserved. If the raster data selected during tracing is deleted, then the remaining raster objects are not broken. This allows the user to replace raster objects with vectors without changing the form of other crossing also allowing raster objects to be deleted as if they were vectors. For example, if a raster line intersecting a circle is deleted, the circle remains unbroken in the same way as deleting a vector line lying over a vector circle.

To trace an object with automatic type recognition



Choose *Trace Auto* from *Convert* menu or click the button on the *Raster to Vector* toolbar.

Click on a raster object to start automatic tracing.

For the best results, pick a point on the least distorted and longest segment of the raster object, far from its intersections with other objects.

If the program recognizes a raster entity, then the object will be traced using the most appropriate object type. If recognition fails, then the program beeps.

If the specified object is not a raster line arc or circle, then an approximating vector outline will be created. To distinguish raster lines from other objects RxSpotlight uses the *Max Width* parameter (see page 172).

Forced Tracing

Forced tracing allows the user to replace raster objects with vector ones of a specified type. Select one of three object types to be used as *reference objects* for tracing (line, arc or circle), and then specify points on a raster object, drawing a vector entity above the raster entity. The tracing of hatch and symbol can also be interpreted as forced tracing. The program tries to trace the specified object with a vector figure of the selected type. If possible, then the raster object is traced. Unlike the *Auto* method, this method allows you to trace a selected part of a raster entity as well as entities with significant distortion.

If during forced tracing the raster entities are deleted (tracing modes *Convert to vector and Erase raster*), then the raster objects intersected by them are not broken. The parameters *Approximation*, *Max width* and *Max break* affect these methods. If the object width is greater than the *Max width* parameter value or its form cannot be approximated by an object of the specified type, then the tracing is not performed.

When tracing by the *Line* and *Arc* methods the ends (one or both of them) of reference lines and arcs can be extended beyond the limits of the raster objects to be traced - on their imaginary extension. In this case a raster object is traced up to its end points. If the ends of the reference object lay within the raster object, then only a part of the raster object covered by the reference object is traced. To extend the recognized line to its natural limits, turn on *Auto Extend vectors* checkbox in *Trace* tab of *Conversion options* menu (see more information on page 175).

To trace a line



1. Choose *Trace Line* from *Convert* menu or click the button on the *Raster to Vector* toolbar.
2. By specifying two points, draw a line covering the raster object to be traced.

If the program cannot recognize an object under the vector line, then it beeps.

To trace an arc



1. Choose *Trace Arc* from *Convert* menu or click the button on the *Raster to Vector* toolbar.
2. Specify the start, middle and end points of an arc lying over the raster object to be traced.
3. To trace another raster arc, repeat steps 1-2.

To trace a circle



1. Choose *Trace Circle* from *Convert* menu or click the button on the *Raster to Vector* toolbar.
2. Specify two points - the opposite sides of a raster circle to be traced.

3. To trace the next circle, repeat steps 1-2.

Trace Outline

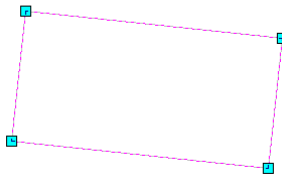
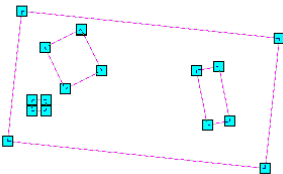
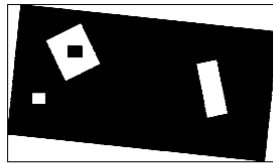
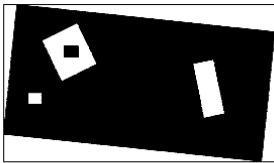
This type of tracing creates an outline polygon with black line and cross-hatched fill around the specified contiguous area.

To trace an outline



1. Choose *Trace Outline* from *Convert* menu or click the button on the *Raster to Vector* toolbar.
2. Click a raster point in the area to outlined.

This command performance is influenced by *Export single contour* checkbox in *Trace* tab of *Conversion options* dialog (see page 175).



The black figure was traced with *Export single contour* checkbox off. The result was selected, exploded and then *Fill* attribute was set to *FALSE*. Note that tiny black square was not affected.

The black figure was traced with *Export single contour* checkbox on. The result was exploded and *Fill* attribute was set to *FALSE*. The result is outer contour.

Trace Hatch

This type of tracing enables the user to trace a raster hatch consisting of straight raster lines with the same angle, enclosed in a raster outline.

To trace a hatch, draw a polyline crossing all the lines which form the raster hatch. The program automatically detects the boundary of the hatched area and creates a hatch.

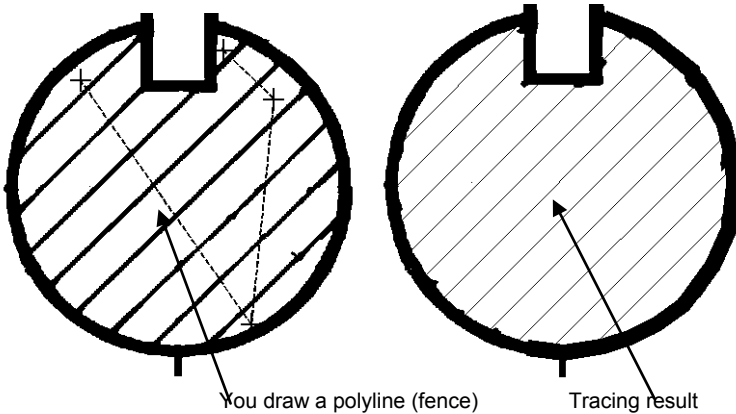
The hatch recognition of this type can be only used on monochrome images.

To trace hatch



1. Choose *Trace Hatch* from *Convert* menu or click the button on the *Raster to Vector* toolbar.
2. Specify the vertices of the polyline, crossing all raster hatch lines.
3. Double-click to trace hatch.

This figure illustrates the original polyline hatch and the result of tracing (right part). The *Create vector and erase raster* tracing mode was applied.



Tracing polylines (*Line follow*)

This method allows the user to trace arbitrary raster lines with an approximating vector polyline. When tracing, specify a point on the raster line, and the program automatically tracks this line (direction of the line follow can be specified) up to the nearest *node* or *intersection point*, and creates an approximating vector polyline that consists of line segments. The *node of a raster line* is either its end point, or a point where the raster line crosses the other raster object. During a single tracing session between two mouse clicks (it is called *tracing step*) you trace a set of *polyline segments*. One tracing step can take an arbitrary number of segments, depending on the line complexity and trace settings.

After each tracing step, choose the direction for further tracing, or complete the procedure. If the traced polyline crosses itself, then the tracing will be automatically completed. The direction can be chosen by specifying a point on the next adjacent part of the raster line. There are options to redo the latest tracing step (except the first one), and the last polyline segment within a step.

The autodetection mode of tracing extension direction can be turned on (see *Trace* tab in *Conversion Options* dialog). In this mode the program offers a possible direction, showing a special marker on the part that is selected as an extension. another direction can be selected during the given period (by default the waiting mode is off – waiting pause is 0), or accept the automatic trace extension. If no direction is chosen, then after the waiting period expires, the program will automatically continue tracing in the selected direction.

When tracing raster polylines the orthogonalization mode can also be used. It allows users to align obtained line segments by the base angle.

More detailed information on polyline orthogonalization mode is provided in section “Trace Tab” on page 174.

Tracing raster polylines is also influenced by the parameters *Max Width*, *Max Break* and *Approximation Accuracy* which specify maximum width of a raster line, value of ignored break and accuracy of a raster line approximation.


More detailed information on these parameters is provided in section "The Options tab", page 172.

When tracing polylines several options are available; these are found in the cursor menu when working in Line Following mode.

Option	Description
<i>Cancel</i>	Cancels the current tracing session; all the polyline created is deleted. After the end of tracing users can undo the result applying <i>Undo</i> command from <i>Edit</i> menu. Users can also cancel the tracing session by pressing ESC.
<i>Start in Direction</i>	Can be used just after activation of Line Following method. If selected, then this option forces the program to treat the first two clicks on the raster line being traced as the direction of the polyline to be created.
<i>End</i>	Ends the tracing; to trace more, activate the Line Following method again.
<i>Back Step</i>	Cancels the last tracing step.
<i>Back Segment</i>	Cancels the last polyline segment.
<i>Force Segment</i>	Enables a linear segment to polyline to be added without tracing. Several segments can be added with SHIFT pressed.
<i>Change Direction</i>	Inverts the tracing direction.
<i>Pan to Centre</i>	Zooms the image to show the last added polyline vertex in the screen centre.

Now we will describe in details the procedure of polyline tracing without autodetection of tracing direction (the fragment of the map used in this example you can find on CS_MAP.TIF in SAMPLES subfolder).

To trace a polyline

1. Choose *Line follow* from *Convert* menu or press  button on *Raster to Vector* toolbar.

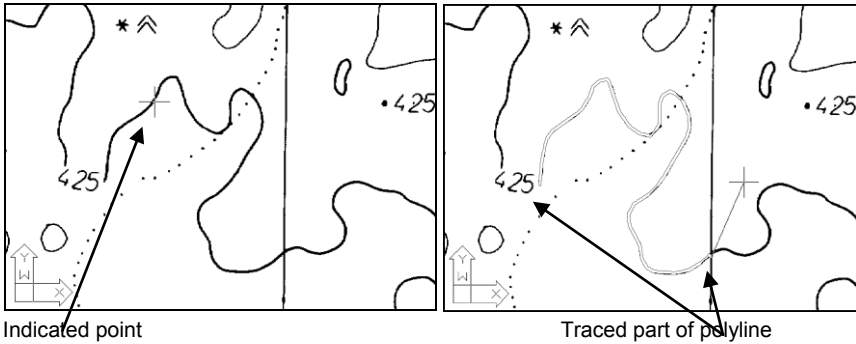
- ❖ To have complete control over the tracing procedure and so that tracing results are clearly visible, be sure to choose contrast *Colour* in the *Inspector* window for a polyline created. Also make sure that in the *AutoDetect Direction* checkbox in the *Trace* tab of *Conversion Options* dialog is off.

2. Pick any point on the raster line.

Starting from this point, RxSpotlight traces the selected raster line in both directions until it meets the two nearest intersections or breaks.

The program automatically determines the tracing direction. The rubber line is stretched out from the mouse cursor indicating the current tracing direction.

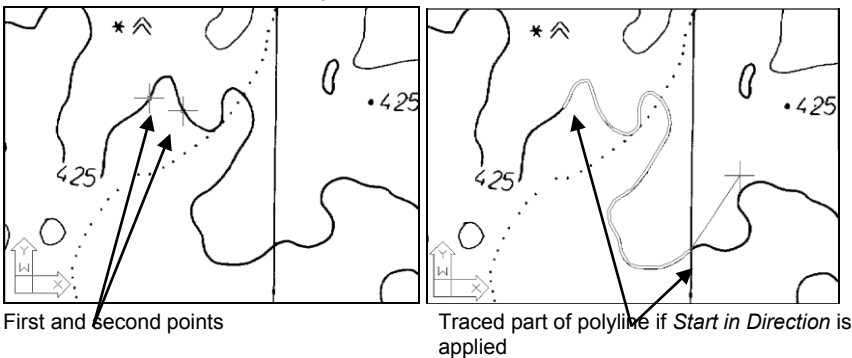
An example of starting the tracing procedure by picking of one point (used by default) is shown in the figure below.



Suppose that we need to trace in the opposite direction. To change the direction, press the right mouse button and choose *Change Direction*. Then specify a point on the raster line.

When specifying a tracing direction in which to start, RxSpotlight starts tracing the raster line at the first of the indicated points and proceeds to the node nearest to the second indicated point.

An example of tracing start with the tracing direction indicated (*Change Direction* option) is shown in the figure below.



3. To trace the next part of the raster line in the current direction, indicate a point on it. RxSpotlight traces a raster line up to the nearest node.

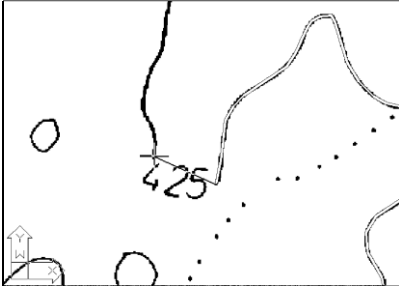
- or -

To change the tracing direction, select the *Change Direction* from the cursor menu and indicate any point on the traced polyline near the opposite vertex.

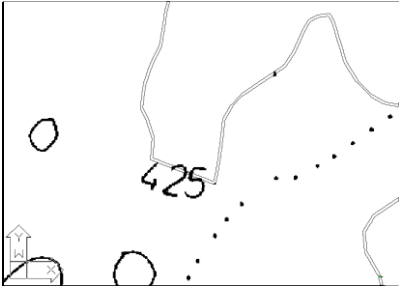
- or -

To create one linear polyline segment manually (without tracing); select the *Force Segment* option. Then indicate a point. The line section will link the indicated point with the last trace point.

This option allows you to eliminate breaks of a raster line, drawing a straight segment of the polyline.



The example shows an isoline on a raster map broken with text. We draw a rubberline over the gap.



Specifying the raster line extension without using the *Force Segment* option results in one linear segment filling the gap.



Use the *Force Segment* option to draw the missing parts, consisting of many linear segments, as the figure illustrates.

4. Repeat step 3 until tracing a raster line is complete.

If the results are not satisfactory, then use the *Back Step* and *Back Segment* options. The first option cancels all polyline segments obtained at the last tracing step, and the second option enables the polyline segments obtained within one step to be cancelled.. These options can be applied several times to cancel any number of steps or segments.

RxSpotlight automatically stops tracing a polyline, if the latest created polyline segment crosses any other segment of the same polyline, or if the latest segment vertex is located close to the first vertex of the same polyline. In the latter case a closed polyline is created, and tracing is completed.

5. To stop tracing press ENTER.

When tracing polylines with autodetection of direction, the program on reaching a node tries to determine the trace direction, and draws a marker on the suggested raster line extension (cross of the current colour).

Pressing SPACE accepts the tracing direction, suggested by the program. You can also select another tracing direction by specifying a point on the required part of the raster line. A choice of direction must be made in the given time period. This interval is set by the *Pause* parameter in the *Trace* tab of *Conversion Options* dialog.

If the program fails to determine a direction automatically, then a prompt to indicate a direction manually will appear, and once selected, tracing will continue operating in the automatic detection mode.

☒ When tracing polylines, it may be useful to split the document window to two or four panes, setting different zoom values in them; both the entire picture and small details can be viewed in the window. The *Split* commands are described in details on page 32.

Several images can be grouped using the *Group* command from the *Modify* menu. The linefollowing tool "jumps" from the end of line on one image to its continuation on another one, creating a single polyline based on several raster sources. This "jump" can be implemented only if the images in the group have the same DPI value.

☒ For information on grouping see page 257.

If the image is clipped, then linefollowing stops at clipping boundary.


If monochrome images overlap each other, then tracing begins and continues on the image raster line of which was clicked first. The polyline is only traced on that image, ignoring visual intersections with raster objects on other images. If the overlapping images are grouped by *Modify > Group* command, then tracing is performed as if the images were merged. The polyline is traced considering all the visible intersections.

Tracing Raster Symbols

The Symbol method of tracing allows you to trace by picking raster objects similar to previously defined samples. Symbol recognition can be only used on monochrome images.

☒ The procedure of symbol recognition is described in the Section "Tuning Symbol Recognition Template Library" on page 198.

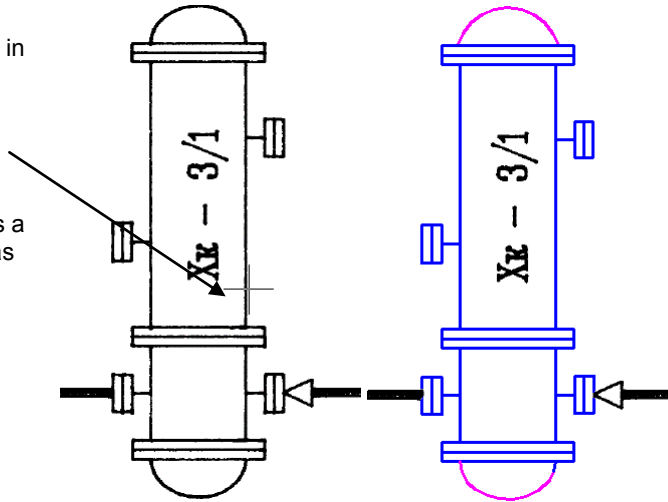
To trace a raster symbol

1. Choose *Symbol* from *Convert* menu or on the *Raster to vector* toolbar click  button.
2. Indicate a point on the raster symbol.

The raster symbol tracing is illustrated in these figures.

The original raster symbol and the indication point are shown on the left.

On the right there is a vector block that has replaced the raster symbol.



Use this method to vectorize the conventional notations on scanned electrical, hydraulic schemes, maps and similar images.

Tracing modes

The *tracing mode* defines an operation made on the original raster object and the produced vector object.

Tracing can be used to create vector objects (*Create vector and keep raster*), to delete raster objects while creating vector ones (*Create vector and erase raster*), to delete raster objects (*Erase raster without producing vector*), and also for smoothing (*Smooth raster without producing vector*). The selected mode remains active until another mode is selected.

Create Vector and Keep Raster

The *Create vector and keep raster* mode creates vector objects and does not delete the original raster. This mode is used by default.

To turn on Create Vector and Keep Raster mode



Click the button on the *Raster to Vector* toolbar or from the *Convert* menu select *Vector (keep raster)*.

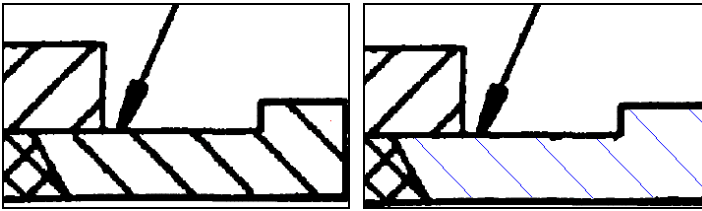
Create Vector and Erase Raster

This mode creates approximating vector objects and removes traced parts of raster lines.

To turn on Create Vector and Erase Raster



Click the button on the *Raster to Vector* toolbar or from the *Convert* menu select *Vector (erase raster)*.



Results of hatch tracing when the *Create vector and erase raster* mode is on

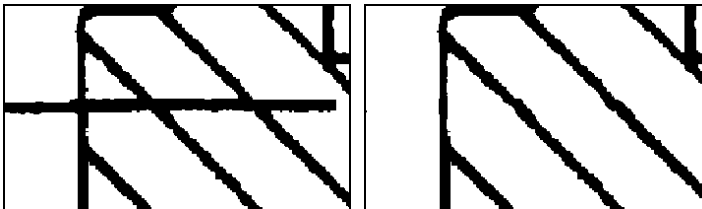
Erase Raster without Producing Vector

This mode removes traced parts of a raster line and does not create vectors. The intersections or the parts of other raster objects under the traced data are left intact.

To turn on Erase Raster without Producing Vector



Click the button on the *Raster to Vector* toolbar or from the *Convert* menu select *Erase raster*.



Tracing a line when the *Erase Raster without producing vector* mode is on

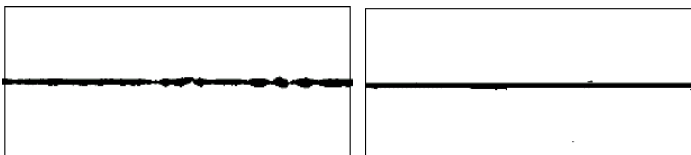
Smooth Raster

This mode removes traced parts of a raster line, creates an approximating vector, and then automatically rasterizes it. Thus the *Smooth raster* mode allows users to correct raster lines.

To turn on *Smooth Raster*



Click the button on the *Raster to Vector* toolbar or from the *Convert* menu select *Smooth raster*.




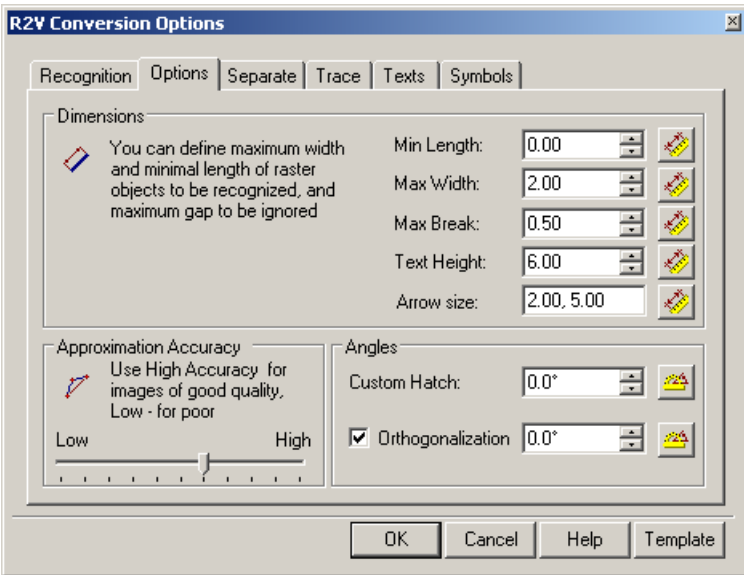
Tracing effect in *Smooth Raster* mode

Tuning Tracing

Users can control tuning tracing procedure using the *Conversion Options* dialog box. Tuning is performed in the *Options* and *Trace* tabs of the *Conversion Options* dialog box. Tracing is also influenced by parameters of the *Separate* and *Symbols* tabs, which are described in the section "Setting up Symbol Recognition Options" on page 196.

To setup tracing parameters

1. Choose *Conversion Options* form *Convert* menu or click the button  on the *Raster to Vector* toolbar
2. Choose *Options* tab.



The *Options* tab of *Conversion Options* dialog.

3. Specify the new parameters by entering values or measuring with a ruler on the image, and then click OK.

Tracing Parameters Description

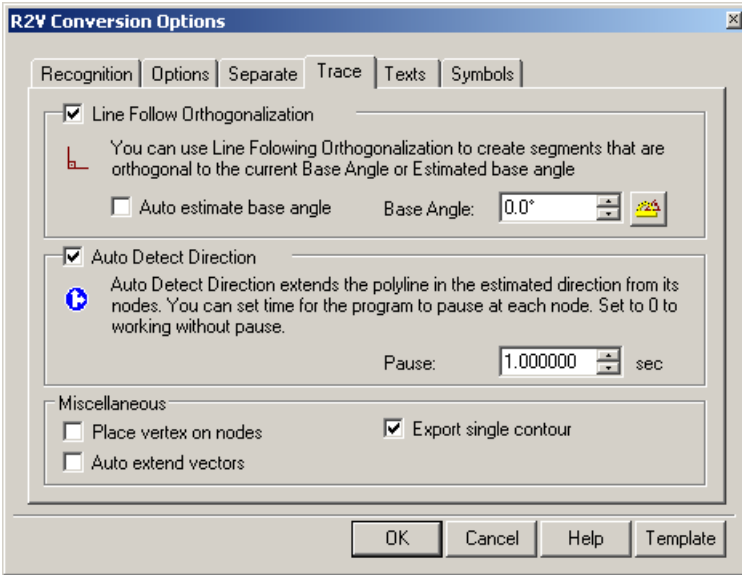
The Options tab

Parameter	Description
<i>Min Length</i>	This parameter defines the minimum size of a raster object that can be recognized.

Parameter	Description
<i>Max Width</i>	<p>This parameter defines the maximum width of raster lines that can be approximated by lines, arcs, circles, and polylines. If the width of a raster line exceeds <i>Max Width</i>, then the only possible mode is Auto tracing and approximating with an outline object.</p>
<i>Max Break</i>	<p>Sets the length of the maximum ignored breaking raster lines. If a raster line is broken into parts it should be traced as an entire object, then the value of <i>Max break</i> should be set to the largest gap between the raster line parts. The program will ignore the breaks and create single vector object, approximating the whole raster line. By setting a comparatively large value of the parameter, users can, for example, trace dash-dotted raster lines, and arcs as single entities.</p> <p>Enter the values of <i>Min Length</i>, <i>Max width</i> and <i>Max break</i> from the keyboard or measure them on the screen.</p>
<i>Approximation Accuracy</i>	<p>This parameter determines the accuracy of approximation of the original raster object with a vector one. If the original image is distorted (,For example, circles have the form of ellipses.), then reduce the value of the <i>Approximation Accuracy</i> parameter. However, this leads to inaccuracies in recognition, for example the program might take a short arc for a line. When the quality of a raster image is high, increase the value of the <i>Approximation Accuracy</i> parameter.</p> <p>Sometimes before tracing the quality of the raster image can be improved by application of a smoothing filter.</p>
<i>Custom Hatch</i>	<p>This parameter defines an angle of raster lines which will be recognized as hatch during tracing.</p>
<i>Orthogonalization</i>	<p>If this option is on, then the tracing in <i>Auto</i> and <i>Line</i> modes aligns created segments either perpendicular to or parallel with the base direction if the deviation of the original object from these directions is insignificant. The base direction is set in <i>Base angle</i>. The accepted deviation is determined automatically by the <i>Approximation Accuracy</i> parameter value.</p> <ul style="list-style-type: none"> • Enter an angle specifying the base direction of orthogonalization. - or - • Click the button at the box name and specify two points on the image. The angle value between the line connecting these points and the axis X will be shown in the <i>Base angle</i>.

Trace Tab

This tab represents parameters controlling the procedure of tracing polylines, described on page 165.

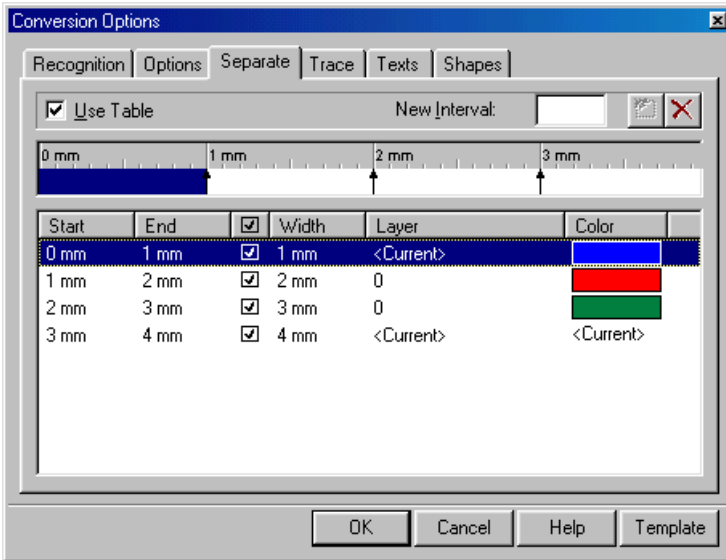


Parameter	Description
<i>Line Follow Orthogonalization</i>	<p>If this option is on, then the line following tracing automatically aligns segments of created polylines perpendicular to each other. Segments become either perpendicular or parallel with the base angle; if they are not too skewed from the main direction. The base angle is set in the <i>Base angle</i> box of the <i>Options</i> tab. If the <i>Auto</i> checkbox is on, then the program automatically defines the base angle by the direction of the polylines longest segment. The <i>Approximation Accuracy</i> setting in the <i>Options</i> tab controls the maximum angle of deviation that segments can have in relation to the <i>Base angle</i> and still fall under orthogonalization.</p> <p>Use this option when tracing raster objects consisting of perpendicular segments, for example when tracing buildings on plans.</p>
<i>Auto estimate base angle</i>	<p>Sets the mode which automatically defines the base direction of polyline segments orthogonalization. The base angle for each traced polyline is defined separately.</p>



Parameter	Description
<i>Base Angle</i>	<ul style="list-style-type: none"> Enter an angle specifying the base direction of orthogonalization. - or - Click the button at the box name and specify two points on the image. The angle value between the line connecting these points and the axis X will be shown in the <i>Base angle</i>. Setting on <i>Auto estimate base angle</i> has priority over this option.
<i>Auto Detect Direction</i>	Sets the mechanism by which the program will automatically define the direction of tracing. After the program reaches a node, it tries to find the following raster line part, which is an extension of the traced object.
<i>Pause</i>	Sets a period in seconds, during which a segment to extent tracing should be chosen when the <i>Auto Detect Direction</i> mode of tracing is on. Unless the user manually specifies another extension during this time interval, the program will continue tracing in the automatically selected direction. Setting <i>Pause</i> to 0 disables this option.
<i>Place vertex on nodes</i>	When this checkbox is on, the program when tracing polylines inserts vertices at intersections of a generated vector polyline with raster objects (nodes).
<i>Auto Extend vectors</i>	<p>This feature simplifies forced selection and tracing of arcs and lines.</p> <p>While recognizing a line, click two arbitrary points on it and RxSpotlight automatically extends the resulting line to its endpoints.</p> <p>While recognizing an arc you can click three arbitrary points on it; and RxSpotlight automatically extends the resulting arc to its endpoints.</p>
<i>Export single contour</i>	This checkbox tunes the performance of outline tracing (see page 164). If the checkmark is present, then tracing creates the outer contour of the object. If the checkmark is absent, then tracing yields the outer contour and the inner one, if there are "holes" in the raster object.

Controlling Properties of Created Objects

Using the *Separate* tab of the *Conversion Options* dialog box, users can control the properties of created vector objects, calibrate the widths of obtained vector objects, place vector objects corresponding to raster lines from the specified ranges of width on new layers and/or assign various colours to created objects.



Separate Tab

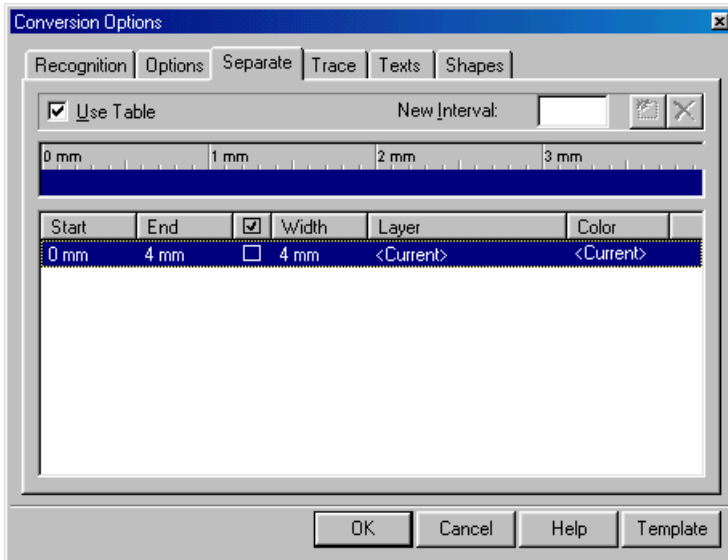
Parameter	Description
<i>Use table</i>	If this checkbox is on, then the program places objects on specified layer, the width of lines is set by the table values.
<i>New interval</i>  	Allows users to create and delete intervals of widths in the table.
<i>Width table</i>	Allows users to edit the intervals of objects widths, and to assign colour and layer of the line to an interval.

Width table

To tune the width table correctly, define width interval boundaries so that the objects obtained after vectorization of raster lines with the same width fit in the same width interval.

The width table can contain any number of *width intervals*. Each interval is defined by two values – a lower and high width boundary which recognized objects must fall into the specified interval. Width, colour and layer are defined to each interval, and these properties are assigned to the objects that fall into each interval according to its width.

Real raster lines widths vary around the true value. For example, if vectorizing raster lines with a width of 0.25 mm, objects with widths from 0.18 to 0.33 mm can be obtained, and lines with width of 0.5 mm turning into vector objects with width from 0.35 up to 0.7 mm. Users can set widths, colours and layers for the created intervals and check out the operation of vectorization or tracing tools with the use of the obtained width table (with the *Use the table* checkbox on). All intervals are set within a width range from zero to the value of the parameter *Max Width* specified in the *Options* tab of the *Conversion Options* dialog box.



To create a new interval in the width table

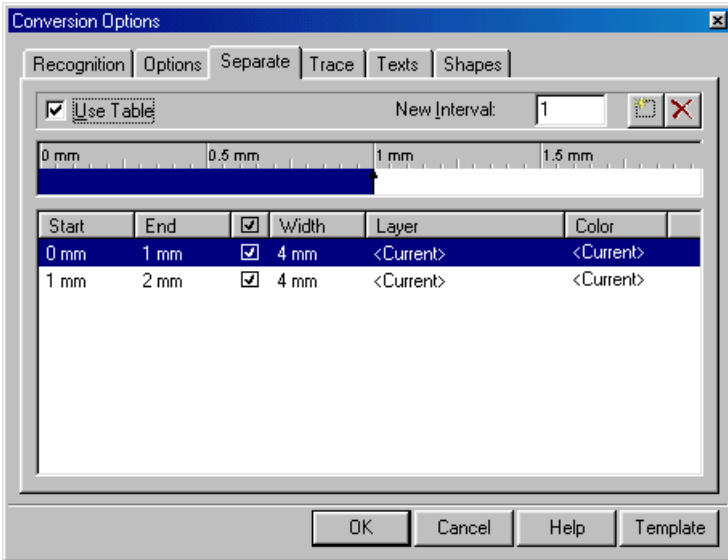


Enter a value for the upper boundary of the width interval into *New interval*, press the *Create interval* button.

Users can also create an interval by clicking on the appropriate position in the width table ruler.

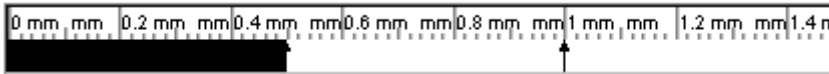


An arrow appears on the ruler indicating the upper boundary of the created interval. The existing interval is divided into two intervals. The properties of a new interval are inherited from the existing one.



Users can modify boundaries of all intervals except the highest and the lowest, which always have the values *Max Width* and 0 respectively. Changing the boundary of one interval affects boundary of an adjacent interval. If the upper value of a boundary is set to be greater than the upper value of an adjacent interval, then this interval will be deleted. Intervals can also be deleted using the *Delete* button.

Boundaries and delete intervals can be changed by moving the arrow symbols on the ruler.



To change the interval boundary


Click in the width table on the line corresponding to the required interval, click on the box in the *Start* or *End* columns in the highlighted line and change the value of upper or lower interval boundary.

-or-

Drag the corresponding arrow symbol on *width ruler*.

All intervals except the default one can be deleted.

To delete an interval from the width table

Select an interval in the width ruler or from the list, and then click  - *Delete interval* button.

-or-

Indicate the left (lower) interval boundary on the *width ruler* and drag it to the left across the boundary of the nearest interval – the adjacent interval will be merged, and

the created interval will obtain a new bottom boundary. If it is dragged across the right (upper) interval boundary, then the interval will also be deleted.

Modifying interval properties

The following properties are set to each interval: source width boundaries, width of created lines, colour and layer. These properties are assigned to objects with widths within this interval.

Start	End	<input checked="" type="checkbox"/>	Width	Layer	Color
0 mm	0.5 mm	<input checked="" type="checkbox"/>	0.3 mm	Layer 1	

The width table line: Start, End, checkbox, width, layer and colour.

To keep widths unmodified

The value of *Width* will be assigned to all vector objects with width within the specified interval if the checkbox of width assignment is on.

To avoid the lines within the interval being rounded to a predefined width, specified in the *Width* box, remove the checkmark in the corresponding row of table.

To assign width to an interval

Click on a width table line appropriate to the required interval, click on the Width column and enter width value.

To assign layer to an interval

Users can assign any name of layer to an interval or select the *Current* value. All vector objects, with width falling into the specified interval, will be created on the specified layer. If there is no layer with the specified name, then such a layer will be created during tracing (vectorization). On choosing *Current*, the objects will be created on the current layer.

Click on the width table line corresponding to the required interval; click the *Layer* column in the list. Select existing layer from the list or enter a name of a new layer, which will be created during vectorization.

To assign colour to an interval

Click on the width table line corresponding to the required interval; click the *Colour* column in the list. Select colour from the list or specify in the dialog box opening by clicking *Other*. Users can assign any colour to an interval, including the values *Current*, *By Layer* and *By Block*. All vector objects with widths within the specified interval will inherit the specified colour. If *Current* is chosen, then the objects of the specified interval will be created with the current colour.

Saving Width Table Settings

Width table settings can be saved in a template file for further use (along with other settings of *Conversion Options* dialog).

To save width table settings

1. Click on the *Template* button; choose *Save* from the list.
2. A dialog box for saving the template file will open.
3. Specify the file name and click *OK*. By default the file will be saved to the *Recognition parameters* subfolder of the RxSpotlight root folder.

To load width table settings

1. Click on the *Template* button and choose *Load* from the list.
2. A dialog box for loading template files will open.
3. Choose the required file and click *OK*.

Colour tracing

All tracing techniques and methods can be used on colour images, including tracing in *Erase* and *Smooth* modes. Colour tracing is supported by additional options: colour accuracy slider and adaptive raster erasing switching button, both placed on the *Colour Accuracy* toolbar.



The leftmost position of *Colour accuracy slider* (0%) corresponds to the coarsest recognition; the rightmost (100%) corresponds to the finest possible.

When the adaptive raster erasing switching button is on, tracing in *Erase* and *Smooth* modes ends by adjusting background colours and filling the erased raster fragment with the most appropriate colour, from the point of view of the program; otherwise the default image background colour is used to replace erased raster areas.

More detailed information about the *Colour Accuracy* toolbar can be found on page 311 where the raster Colour Flood Filling procedure is described.

Vectorization

Automatic vectorization is a procedure of generating vector objects from original raster images. There are two types of vectorization: recognition of raster entities and approximation of raster objects.

The vectorization algorithms of the first type search for raster image fragments, which can be represented as basic geometry such as lines, arcs, circles and hatches, and create appropriate vector objects. These algorithms recognize raster analogues of vector entities. RxSpotlight uses a set of independent recognition algorithms, which can be used in various combinations, thus enabling users to obtain a vector image of optimal structure.

RxSpotlight recognizes objects of the following types: points, lines, circles, arcs, polylines, hatches, texts and symbols. The program can be trained to recognize new texts and symbols.

When vectorizing lines, circles, arcs and polylines, the program can recognize the line style of objects, and also arrows on lines and arcs. Orthogonal alignment of lines which have a small deviation from either the horizontal or vertical axis can be forced.

The approximating algorithms are used to vectorize arbitrary raster objects. Users can also approximate raster objects by outlines if they cannot be recognized as lines, arcs or circles.

Vector objects corresponding to raster lines of various widths on different layers can be placed or different colours assigned to them.

Users can also tune recognition manually or use one of the standard sets of predefined parameters – *recognition templates*.

Running vectorization

Vectorization can work on raster selection, or on a group of images. If a raster selection is created, then the vectorization once started will affect this selection alone.


If raster selection has not been made and several images are inserted in the current drawing and they are available (visible, located on unlocked layers), then all of them will be vectorized.

Vectorization also works on images with a clipping boundary. Using this feature, the vectorization area on any image can be limited by setting its clipping boundary.

☒ For information on clipping boundary see page 130.

To perform vectorization

1. Tune vectorization options and parameters, if necessary (the rest of this chapter describes this tuning; recognition parameters tuning is described on page 182).
2. Specify images to be processed.
3. Run vectorization using one of the following methods:

Choose *Raster2Vector* from *Convert* menu or press the  button on the *Raster to Vector* toolbar.

The vector objects will appear over of the original raster.

4. To interrupt vectorization, press ESC or *Cancel* button.


Setting Up Vectorization

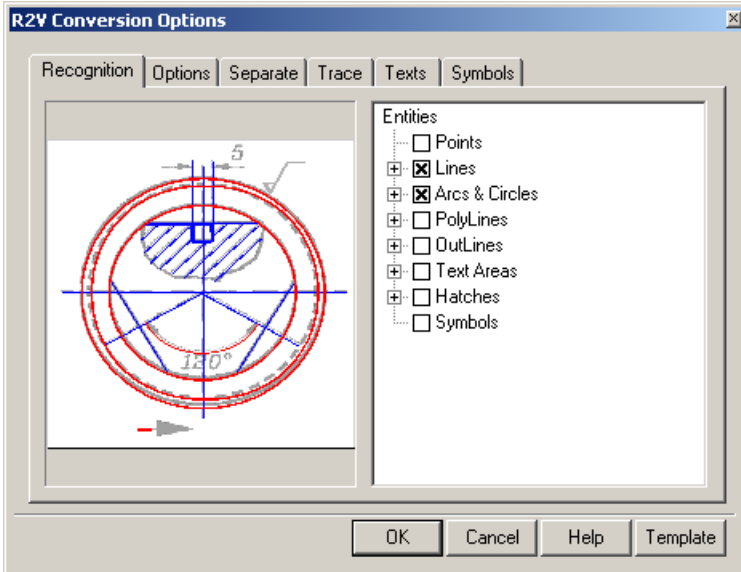
Tune vectorization using the *Conversion Options* dialog box. The main vectorization parameters are set in the *Recognition* and *Options* tabs. If the search and recognition of the texts and symbols algorithms are used, then also set up parameters in the *Texts* and *Symbols* tabs, described further in this chapter.

The widths of objects obtained after vectorization can be approximated to specified values, and also be placed on various layers and various colours assigned. These operations are made with the *Separate* tab. The procedure of setting up the

parameters of this tab is described in “Controlling Properties of Created Objects” on page 176.

To set up vectorization parameters

1. Open the *Conversion Options* dialog box using one of the following methods:
Choose *Conversion Options* item from the *Convert* menu or click  button on the *Raster to Vector* toolbar.
2. Specify the required parameters, browsing through dialog tabs if necessary, then click *OK*.

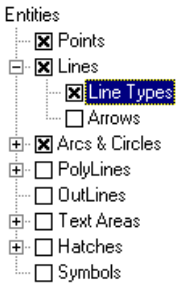


Recognition Tab

In this tab, users can select a set of algorithms to be used for raster image vectorization.

To vectorize raster images of different type, various sets of geometric entities need to be used. For example, to vectorize maps or schemes the use of polylines would be suitable, approximating raster curves of arbitrary form; to vectorize engineering drawings algorithms that create lines, circles, arcs should be used – in this case a vector figure obtained will correspond exactly to the original drawing.

To make recognition of different image structures more versatile, RxSpotlight supports a set of vectorization algorithms that recognize raster analogues of vector entities and generate approximate vector objects of the corresponding types. One or more algorithms can be used in one operation.



On the right side of the *Recognition* tab there is the *Entities tree*. On the first level there are recognition algorithms. To turn on the necessary algorithm, on a checkmark near its name. On the second level of the tree there are additional functions and parameters of corresponding algorithms. Algorithms that have such extra parameters of recognition are marked with "+"/"-" symbols: if the second level is hidden "+", otherwise "-".

To get access to the hidden additional parameters of the algorithm, click on the "+" to the left of its name.

The vectorization process is directly influenced by setting of the geometrical parameters of recognition, which are located in the *Options* tab of this dialog box.

Points

This tool is intended for recognizing elevations marks on geodesic plans and similar images.

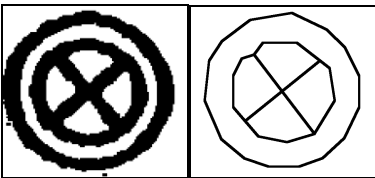
RxSpotlight will recognize a raster point with a size not less than 2x2 pixels (objects smaller than this are considered as speckle and ignored), and which maximum vertical and horizontal extents are not greater than *Max Width* value.

A point-object can be only recognized in automatic mode.

Do not switch this mode on when recognizing images of poor quality or images containing many speckles, since speckles can be recognized as points.

Lines

Turns on the tool for line recognition, the result is that line entities are created.



The figure shows vectorization results when only the *Lines* tool is on. The original raster fragment is shown on the left; the figure on the right represents the vectorization results when objects width display option is off.

There are the following additional parameters:

Arrows	If this option is on, then RxSpotlight searches for raster analogues of dimension lines (lines with one or two arrows at the end points) and, if the arrows are found, then RxSpotlight stores them as <i>Start</i> or <i>End Marker</i> property of the line.
Line Types	If this option is on, then RxSpotlight recognizes dashed and dash-dotted straight lines, creating vector lines with the corresponding line type.

This tool is influenced by the following options of the *Options* tab:

It recognizes raster objects with a length greater than the value of the *Min length* parameter and with a width less than the value of the *Max width* parameter.

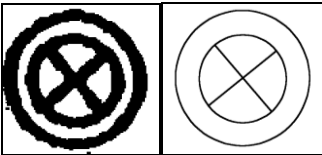
The *Max break* parameter sets the maximum length of ignored raster line breaks.

The *Approximation* parameter sets the accuracy of raster lines approximated by vector objects. If the raster quality is bad, then reduce the parameter value so that the tool can recognize raster objects with significant distortions of form.

If the *Orthogonalization* option is on, then recognized segments are aligned both parallel with and perpendicular to the direction specified in the *Base angle* field. The segments with small angles of deviation from appropriate directions are aligned. The accepted value of deviations, at which the orthogonalization is performed, is determined by the *Approximating* parameter. The closer this parameter is to the *Low* value, the larger the deviation can be.

Arcs and Circles

Sets the tool for raster circles and arcs recognition.



The figure shows the results of vectorization with the help of *Lines* and *Arcs and Circles*. The original raster fragment is shown on the left; the figure on the right represents vectorization results when object width display is off.

There are the following additional parameters:

Arrows	If this option is on, then RxSpotlight Pro searches for raster analogues of dimension arcs (arcs with one or two arrows at endpoints) and, if the arrows are found, creates arc with arrows.
Line Types	If this option is on, then RxSpotlight Pro recognizes dashed and dash-dotted lines, creating vector objects with the corresponding line type.

This tool is influenced by the following options of the *Options* tab:

It recognizes raster circles and arcs with lengths greater than the value of the *Min length* parameter and with widths less than the value of the *Max width* parameter.

The *Max break* parameter sets the maximum length of ignored raster segment breaks.

The *Approximation* parameter sets the accuracy of raster segments approximated by vector objects. If the raster quality is poor, then reduce the parameter value so that the tool can recognize raster objects with significant distortions of form.

Polylines

This tool approximates central lines of raster objects by polylines. The tool creates polylines consisting of linear segments only. This can be used individually (or with the tool *Outlines*) for vectorization of maps and other images consisting of arbitrary lines (curves drawn by hand).

There are the following additional parameters:

Line Types	If this option is on, then RxSpotlight Pro recognizes dashed and dash-dotted lines, creating polylines with corresponding line types.
Create vertices on intersections	If this option is on, then the tool creates vertices on polylines intersections.

This tool is influenced by the following options of the *Options* tab:

Max length defines the maximum length of a recognized segment that will be added to the polyline. The longer segments are not added to the polyline. This allows users, for example, to trace on maps curved isolines that are crossed by coordinate lines; the tool automatically stops on the intersection of traced isolines with the long straight line of grid.

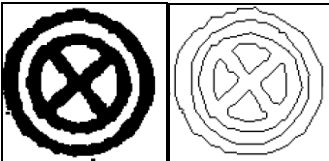
The tool approximates raster lines with a width less than the value of the *Max width* parameter.

The *Max break* parameter sets the maximum length of ignored raster segments breaks.

The *Approximation* parameter sets the accuracy of approximating raster segments by vector polyline.

Outlines

This tool is used to approximate outlines of flooded areas by polylines. It creates closed polylines, approximating boundaries of raster objects. The boundary polylines consist only of straight segments.



The figure shows the results of vectorization with the *Outlines* tool only. The original raster fragment is on the left; the right figure illustrates vectorization result.

This tool is influenced by the following options of the *Options* tab:

The tool approximates raster lines with a width greater than the value of the *Min width* parameter. To obtain outlines of all raster objects, set the *Max Width* parameter to 0.

The *Approximation* parameter sets the accuracy of raster segments approximated by vector outlines.

Hatches

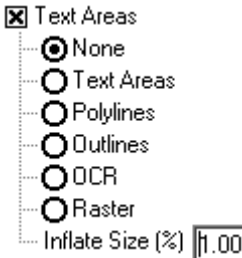
Set the tool for hatch recognition. RxSpotlight Pro recognizes simple raster hatches and creates blocks, consisting of lines. A simple raster hatch is a set of parallel raster lines. The *Hatches* tool searches for hatches only if the *Lines* tool is on.

The additional parameters are accepted angles of raster lines forming raster hatches.

Text Areas

Set the tool for text recognition. RxSpotlight Pro distinguishes areas on the image with raster texts and applies to the retrieved texts the operation set as the additional tool parameter.

Setting up of raster texts search options and the OCR module is made in the *Texts* tab of the same dialog box, the setting up procedure is described further in this chapter.



None - do not produce raster text vectorization. Areas, containing found raster texts are ignored.

Text Areas - creates rectangles bounding raster texts. These areas are not vectorized. Vector texts can be entered manually with the help of the review and correction procedure of recognized texts described below in this chapter.

Polylines - approximates central lines of the raster texts with polylines.

Outlines - approximates boundaries of the raster texts by polylines.

OCR - recognizes raster texts and creates text objects.

Raster – find raster texts and creates raster image with this text.

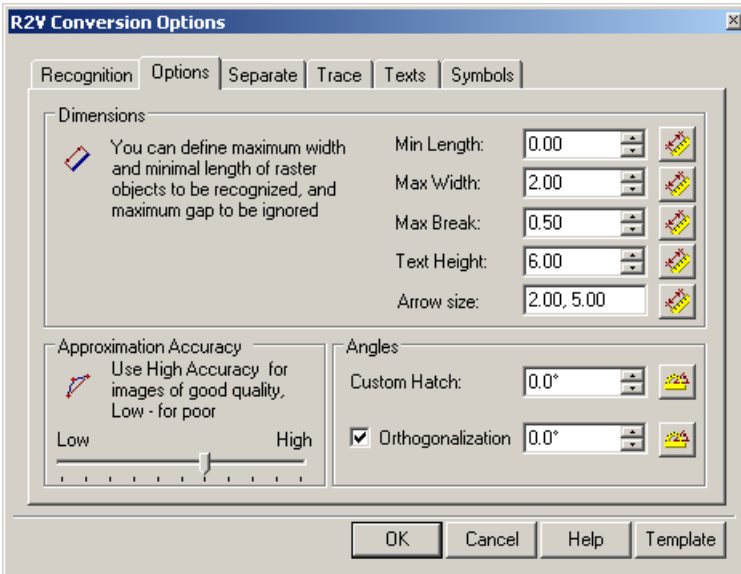
Inflate Size (%) – increases the found text area size in percent relative to the original.

The tool uses the values of the *Height Table* list of the *Options* tab as maximum height of uppercase raster text characters. See more information on this and other parameters that influence text recognition on page 189.

Symbols

Set the tool for raster symbol recognition with specified samples. The tool only works if the tool *Lines* and *Arcs and Circles* are on. Setting up of the tool operation is made in the *Symbols* tab of the same dialog box as described on page 196.



Options Tab



RxSpotlight Pro uses information on the sizes of raster objects, which is set in the *Options* tab, to define the optimal performance of algorithms that should vectorize a given raster object.

Parameter values can be entered from the keyboard or their values measured on the screen.

To measure parameters value on the screen

1. Click on the button near the appropriate input box in dialog ( or .
2. Specify two points on the image.

During measurement the program draws a rubber line connecting the indicated points. When the measurement is completed, the value shows in the box.

Min Length

Sets the minimum length of a raster fragment, which should be recognized as a line, circle or arc in the vectorization process.

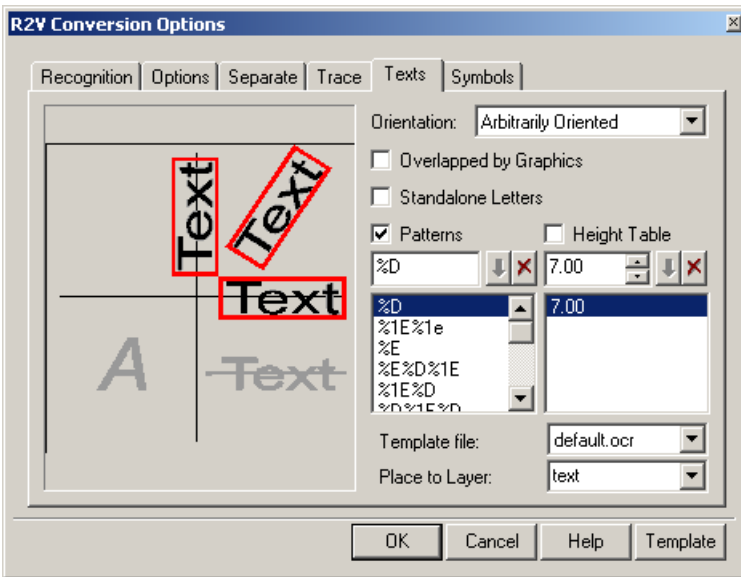
Specify the value of this parameter equal to the length of the shortest raster line or diameter of the smallest raster circle (arc).

To the measure on the image draw a rubberline along the smallest raster line, arc or circle. The value of *Min Length* will be equal to the length of the line covering black (foreground) dots on the raster line.

<i>Max Width</i>	<p>Sets maximum width of the raster object, which should be recognized as a line, arc or polyline.</p> <p>Specify the value of this parameter slightly greater than the maximum width of a raster line to be vectorized using the algorithms: Lines, Arc and Circles or Polyline.</p> <p>If the program does not vectorize raster segments, circles or arcs on the image, then increase this value. If the program does not approximate flooded raster areas with outlines, then reduce this value.</p> <p>During measurement on the image draw a rubberline perpendicular to the widest raster line to be recognized using the tool Lines or Arcs, or to approximate with the Polyline tool. This value will be equal to the length of the drawn part of the line which crosses the raster line.</p>
<i>Max Break</i>	<p>Sets the maximum accepted length of ignored breaks of raster lines.</p> <p>If a segment (arc) on the image that is broken into several parts should be recognized as one vector object, then specify this value as greater than the largest distance between any two adjacent parts. The break will be eliminated, and the parts of the vector segment (arc) will be connected.</p> <p>When measuring on the image draw a rubberline along the largest break of the raster segment (arc). This value will be equal to the length of that part of the line covering white (or background) dots on the raster line.</p>
<i>Arrow Size</i>	<p>Width and length of objects to be recognized as an arrowhead at the end of line object. To specify dimensions of arrowhead enter the values separated by comma or press the <i>Measure</i> button and draw bounding rectangle around the arrow.</p>
<i>Text Height</i>	<p>Specify this value equal to the maximum height of raster text symbol of the upper case.</p> <p>To measure on the image, draw a rubberline above the raster text. The <i>Text Height</i> value will be equal to the distance between the first and the last points of the image within the drawn line.</p>

Texts Tab

Setting up the options of RxSpotlight Pro OCR module is performed in the *Texts* tab.



The processing of raster texts takes two steps. First, RxSpotlight Pro searches for raster fragments containing raster texts. These fragments are named *Text Areas*.

Then RxSpotlight Pro applies the operation that is set as additional parameter of the tool *Text Areas* in the *Recognition* tab to the found raster texts.

The most complicated operation is the raster text recognition using either the built-in module of texts recognition (OCR) or an additional module from a third-party.

The RxSpotlight Pro OCR module recognizes raster texts and creates RxSpotlight Pro text objects. In addition height and rotation angle of the created texts are calculated.

Standard shipment contains two files of OCR characters templates (DEFAULT.OCR and CYRILLIC.OCR), using which the program recognizes the characters of the English alphabet, digits, punctuation marks and special characters (the first half of ASCII table). the OCR module can also be trained to recognize any other text characters.

If the OCR cannot recognize a character, then it is substituted by the "~" (tilde) in the text line. If none of the word characters are recognized, then the OCR does not generate a text object.

Text Recognition Options

Orientation – defines the accepted raster text operation.

Horizontal only	Searches for horizontal text lines. The text areas will only be horizontal.
Horizontal and Vertical	Searches for horizontal and vertical text lines. The text areas will only be horizontal and vertical.
Arbitrary	Searches for skewed text lines. The choice of this option can lower the speed of text areas searches.

Overlapped by Graphic

If this option is on, then RxSpotlight Pro searches for raster texts crossing other raster objects. The choice of this option can lower the speed of text areas searches.

Standalone Letters

Allow searching for standalone text characters. If this option is off, then RxSpotlight Pro will not find single text characters, and will not identify graphics objects as text, such as markers, dash, etc.

Patterns

To customise the OCR, specify a set of word patterns. A pattern is a rule specifying an allowed sequence of characters within one recognized word. This list contains definitions of accepted word patterns. RxSpotlight Pro OCR can generate only words which correspond to one of the specified patterns (if *Patterns* is checked in *Texts* tab of *Conversion Options* dialog).

The *Add* and *Delete* buttons



Used to edit the list of definitions of word patterns.

Here is a formal description of word pattern definition:

" [% [length] character type] || [letter] ... "

[%]	Beginning of character sequence definition
[length]	Any decimal number; absent if length is variable
[type]	Character type (D,E,e,N,n,S)
[letter]	Standalone letter

Character type is specified in the following way:

D	Digits
E	The upper case letters of English Alphabet
e	The lower case letters of English Alphabet
N	Capital letters of national alphabets
n	Small letters of national alphabets
S	Special characters (signs plus and minus, sign of equality and etc.)

%%	Standalone characters "%"
[characters]	Standalone characters

For example:

- The pattern "Rz%D" generates words, which start with "Rz", followed by any sequence of digits, for example, "Rz40", "Rz2.5", "Rz5000".
- The pattern "%1N%n" generates words of the national alphabet with the capital first letter.
- "%D %% " generates percent numbers of the following pattern:
"20 % ", " 1100 % ", " 12.50 % ", etc.
- "%DV" allows the generation voltage numbers of the following pattern:
"5V", "220V", "13.8V", etc.

Height Table

Possible text heights can be specified in this box. If the checkbox is on, then during the generating of the recognized texts the OCR module will create text objects with heights from this list, rounding the recognized height to the nearest value specified in the list.

Character template libraries

Specifies the *character template libraries* that will be used during recognition. Character templates are topological models of text characters (letters, special symbols etc.), with which raster text characters are recognized.

The list contains DEFAULT.OCR and CYRILLIC.OCR files, included in the standard shipment. Using the "default" file, the OCR module can recognize characters of the English alphabet, digits, signs, punctuation marks and special symbols (the first half of ASCII table). CYRILLIC file enables recognition of all the above mentioned plus Russian characters.

-
- Users can also train the OCR to recognize other text characters. See "Training OCR" on page 191.

During the training process, the OCR creates character templates and writes them in the library. These can be saved as character templates in a new or existing library file.

-
- ❖ If using a user created file of character template libraries, then the OCR will recognize characters described in this file only.

To place on layer

Use this box to set the name of a layer, on which the texts obtained as a result of the OCR operation will be placed.

Training OCR

Using the standard RxSpotlight OCR features, the characters of the English alphabet, digits, punctuation marks and special symbols (first half of ASCII table) can be

recognized. These character templates (topological models) are stored in special files of *character template libraries*. These files are by default allocated in the OCR folder of the RxSpotlight Pro root folder.

The RxSpotlight OCR module can be trained to recognize any character. For this purpose users can add new character templates to one of the available libraries or to create their own library.

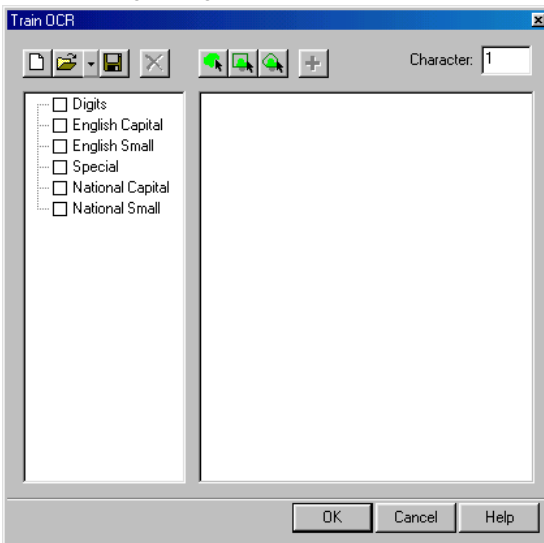
During training RxSpotlight creates templates (topological models) of text characters and places them in the open library of character templates. These can be replaced by any template in the existing library. Several templates can correspond to one text character.

To create a new or to change the existing character template library



1. Choose *Train OCR* from the *Convert* menu or press the button on the *Raster to Vector* toolbar.

The following dialog box appears:



2. To create a new library of characters, press the *New* button.

- or -



To add new templates to the existing library, press the *Open* button, select from the dialog box the desired library file and press *OK*.

3. Create new, replace or delete character templates.



4. Save the library in its own file, or in a new one, using the *Save* button. Click *OK*.

The creation, replacement and deletion of the library templates are made with the help of the buttons of the dialog box toolbar and the *Character* input box.



Tools for raster character selection



Add and *Delete* buttons

Before beginning the training open the *Train OCR* dialog box and load the existing library or open a new one.

To create a new character template

1. Enter a character into *Character* box.
2. Select the raster symbols relating to the specified character with one of the selection tools.



Select by picking. Click on the standalone raster character.



Select by frame. Draw a frame around the raster character.



Select by polygon. Specify the vertices that encompass the raster character; press ENTER to complete the selection.

3. Click the *Add* button.

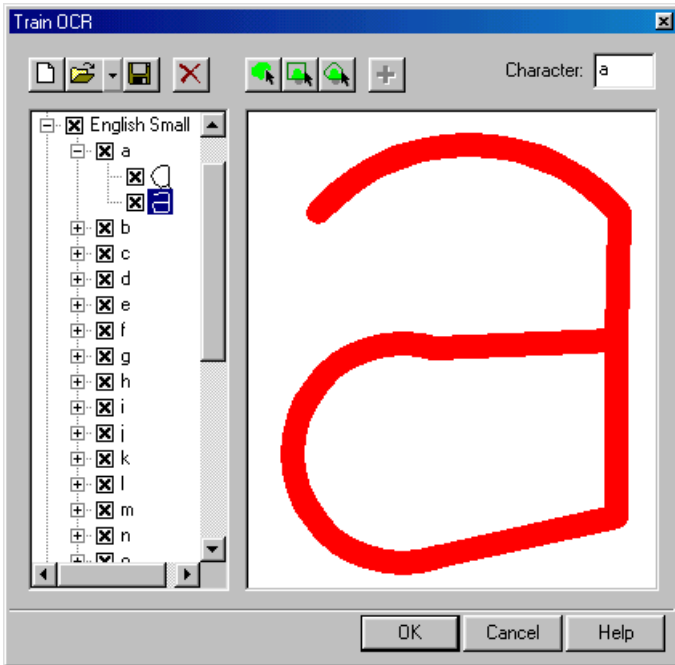
The program will create a topological template of the character and add it to the appropriate place of the template library.

The left part of the dialog box displays the contents of the current template library. This box shows the sections of the template library: digits, English capital (uppercase) letters, English small, special symbols, national capital and national small. Closed and nonblank sections are marked with "+".

- Digits
- English Capital
- English Small
- Special
 - National Capital
 - National Small

By putting a checkmark to the left of the section name, all templates located in this section will be on-line. Removing checkmark cancels the link to all templates of this section. Any section can be opened by clicking on "+" and set on/off necessary templates located in this subfolder, setting/removing the checkmark at the left of the template name.

Several templates can be set for each character. The example for “a” is shown in the figure below. In this case the character is marked with "+". Open a set of templates related to this character by clicking on "+" then select a template by clicking on it. After a template is chosen, its pictogram is shown on the right part of the dialog box.



Templates can be turned off – in this case they will not be used for recognition - or deleted.

To delete a character template

1. Select a template.
2. Click the *Delete* button.








Editing recognized text

The RxSpotlight OCR checks and highlights by bounding rectangles all created vector texts to enable users to review and edit the texts using a special procedure. The edited (or entering a new) text object can be accepted. The acceptance of the recognized text removes the checkmark and excludes it from texts that require editing.

The recognized texts are edited using the special dialog box with the toolbar.



The *Text Correction* toolbar contains a text edit box and the buttons:

-
- | | |
|---|------------------------------|
|  | Finds first text; |
| <hr/> | |
|  | Finds previous text; |
| <hr/> | |
|  | Finds next text; |
| <hr/> | |
|  | Hides / Shows OCR text; |
| <hr/> | |
|  | Deletes OCR text; |
| <hr/> | |
|  | Accepts text; |
| <hr/> | |
|  | Selects all recognized text. |
-

To edit recognized texts

- From the *Convert* menu select *Edit OCR Texts*.
If the program has not detected any recognized text, then a message to that effect is displayed. The command's execution is done.
Otherwise the program selects the first of the recognized texts and pans the image so that this text is shown in the screen centre and opens the dialog box, which shows the first text.
- To modify a text line, enter a new value in the edit box.
Using the *Inspector* window size, font and other properties of text objects can be changed.



To accept the edited text, press the *Accept* button. The program will exclude this text from the recognized text set and will automatically proceed to the following recognized text.



Use *Delete* button to delete text.



Use the navigation buttons to make the text current.



Use the *Hide Text* button to hide or unhide recognized text to better seeing underlying raster text.

- Repeat step 2 for all recognized texts.

To change or delete properties of all recognized texts



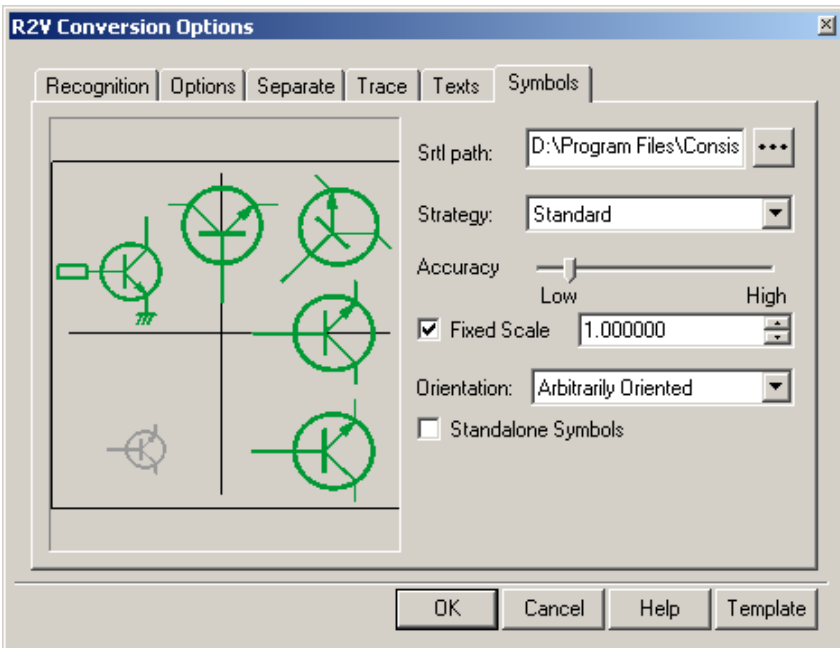
Choose *Selects all* to select all recognized texts. Use the *Inspector* window to change size, font and other properties of all text objects. Pressing *Delete* button will delete all texts.

Using OCR external modules

RxSpotlight allows for using OCR modules produced by third party companies. The procedures of installing these modules as well as working with them are described in the special manual.

Setting up Symbol Recognition Options

The procedures of selection, tracing, and automatic vectorization of raster characters are based on the algorithms of *raster character recognition by vector templates*. Raster symbols can be rotated and scaled in relation to the sample symbol saved in the template; the set of parts with which a sample is composed and saved in the template may differ from the set comprising the recognized object. The basic comparison criterion is the resemblance of the symbol and template geometric characteristics - relations between composing object size, link types, angle value, and so on.



The *Symbols* tab of the *Conversion Options* dialog box

Vector templates need to be created and saved for raster symbol recognition. Also before applying any of the procedures that involve recognition, the necessary templates should be attached in the *Symbols* tab of the *Conversion Options* dialog box. In the same tab specify other parameters for symbol recognition.

- ☒ The procedure for symbol template creation is described in “Tuning Symbol Recognition Template Library” chapter on page 198.

Symbols tab

The table provides a description of the symbol recognition parameters.

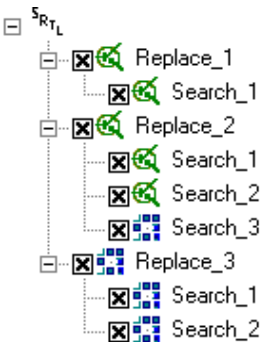
Parameter	Description
<i>Srtl path</i>	Defines the path to Symbol Recognition Template Library file which stores symbol templates and the information on what symbols should be found and with what they should be replaced.
<i>Strategy</i>	Defines the strategy used for symbol recognition. The choice of strategy influences the balance of speed/accuracy of the algorithm. There are three strategies: <i>Fast</i> , <i>Standard</i> and <i>Smart</i> . The <i>Fast</i> strategy has the highest speed of the raster symbol analysis, but it may not find symbols even very similar to the template. The <i>Smart</i> strategy operates at the lowest speed, but yields the most correct results. The <i>Standard</i> strategy is used by default.
<i>Fixed scale</i>	This parameter sets the tolerance for recognizing symbols of various sizes. If the checkbox is on, then only the symbols whose sizes are proportional to templates with the factors set in the numerical box will be recognized. When replacing the recognized raster symbols, this factor will be used for scaling the inserted vector symbol. If the checkbox is off, then all raster symbols will be checked on tolerance, and the scaling factor on replacing will be calculated automatically. In this case the program operation may be slowed down.
<i>Accuracy</i>	This parameter defines the accepted deviation of raster symbol geometry compared with to the sample. At <i>High</i> values, the program will only recognize symbols that are very close in form, scale and orientation to the sample. At <i>Low</i> values more symbols will be recognized but the probability of erratic recognition increases.
<i>Orientation</i>	Sets possible angular deviations of raster symbols from the specified templates. If the value <i>Horizontal</i> is selected, then only the symbols having the same orientation as the specified templates will be recognized; if <i>Horizontal and Vertical</i> is selected, the symbols rotated by an angle 90° will also be recognized; if <i>Arbitrary</i> is selected, the symbols rotated by arbitrary angles will be recognized. Note that the last option considerably slows down the operation of recognition algorithms.

Parameter	Description
<i>Standalone Symbols</i>	This checkbox defines whether the symbol containing raster objects excluded from the template will be recognized. If the checkbox is empty, then all symbols matching the template will be recognized, even if they are crossed by raster objects that do not match objects, set in the template. Otherwise only symbols that are not crossed by other objects will be retrieved.

Tuning Symbol Recognition Template Library

The Symbol Recognition Template Library (SRTL) – is a library of symbol templates that used for symbol recognition and replacing in tracing, automatic vectorization, object selecting and also in *Search and Replace* as alternative method.

The procedures of selection, tracing and automatic vectorization of raster symbols are based on algorithms of raster symbol recognition by vector patterns. These vector patterns should be created before performing recognition activities.



The SRTL is intended for storing the information on what symbols should be found and with what are replaced. Every SRTL represents a collection of vector and raster Replace and Search items. To every Replace item in library put in conformity one or the several Search items.


The Search item is a vector or raster template that should be recognized. The Replace item is a vector or raster template, which should replace the corresponding to it Search item.

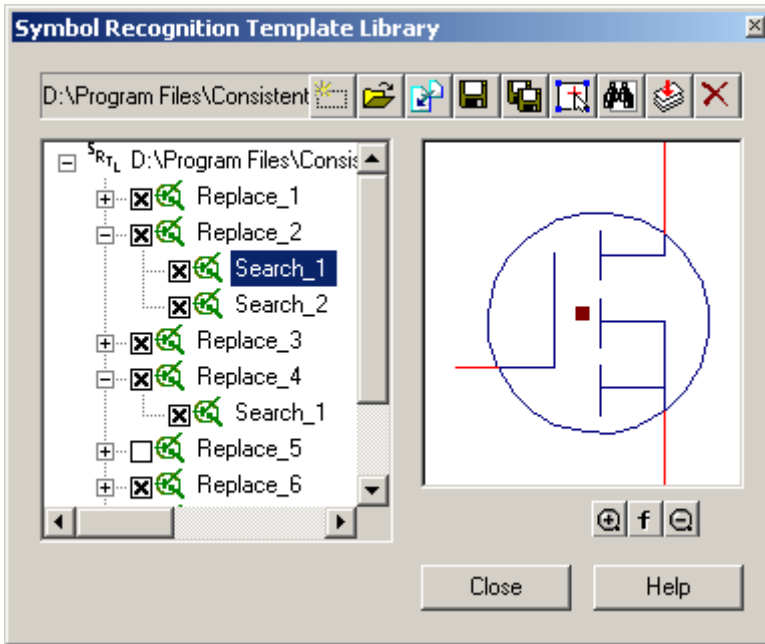
Every RxSpotlight command that uses SRTL tries to find a regular Search template in the document or on the raster image. In case of success, command replaces recognized symbol with the corresponding Replace template.

Symbol Recognition Template Library editor overview

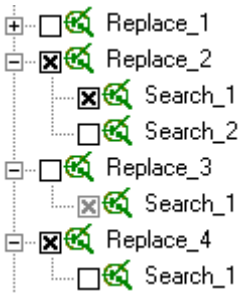
The SRTL can be trained to recognize any raster or vector symbol. For this purpose users can add new symbol templates to one of the available libraries or create an entire new library.

Using the *Symbol Recognition Template Library* editor you can create, save in *.SRT file for future use, open and edit these libraries. The user can select to exclude symbol templates from recognition process by simply deactivating them. You can import obsolete symbol template formats such as *.SST.

To open SRTL editor choose *Edit Symbol Recognition Template Library*: from the *Convert* menu or press the  button on the *Raster to Vector* toolbar.



The left part of the dialog box displays the contents of the current template library. This box shows the topological tree of Replace and Search templates. Collapsed Replace items are marked with "+". Open a set of Search items related to the Replace item by clicking on "+". Select an item by clicking on it. After an item is chosen, its content is shown on right part of the dialog box.







To include a template in recognize process set a checkmark to the left of the item name. Removing checkmark excludes templates and all sub-templates from this process.

- ❖ The Replace item will be ignored during symbol recognition if all its Search items are excluded.


On the left there is an example part of the SRTL, which included only Replace_2 with Search_1 items. The Replace_4 item will be ignored because of excluded Search_1 item.

SRTL basic operations


Choose *Edit Symbol Recognition Template Library* from the *Convert* menu or press the  button of the *Raster to Vector* toolbar to open *SRTL editor*. The current library will be shown in *SRTL editor* dialog that appears.

Any SRTL could be saved to or opened from *.SRT file. To save current library into a file click the  Save button and specify name for .SRT file in the appeared Save dialog. Use the  Open button to open existing library and the  New button to create a new one.

-
- ❖ Since libraries are stored in separate files, these can be deleted and copied, using standard operating system tools.

To insert a symbol template saved in an obsolete format, click the  Import button and choose the *.SST file. The new one Replace item with corresponded to it Search item will be included into the current library.

Vector symbol template

Vector symbol templates are marked with  sign inside SRTL tree. Vector symbol templates are used for recognizing raster symbols in such commands as symbol automatic vectorization, symbol tracing, symbol selecting and *Search and Replace*. In *Search and Replace* vector template can be used not only for finding raster symbols, but for vector too.

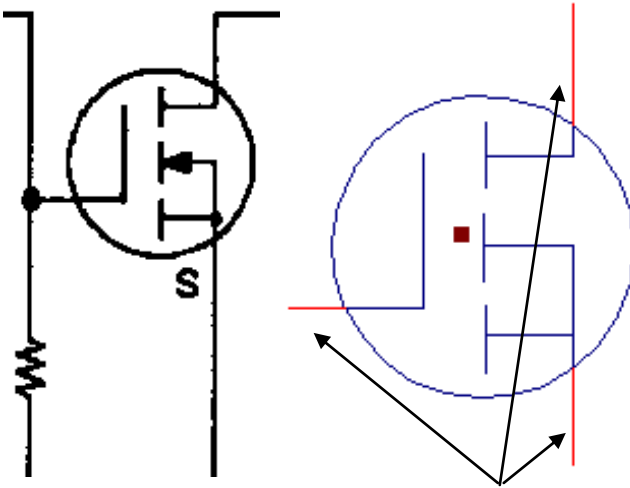
Before defining such a template for raster symbols recognition, create vector objects resembling the raster symbols. This can be done through vectorization, tracing or simply by drawing vector objects.

The set of such vector objects is used as a *vector template*. The template can consist of any set of objects, but for recognition only objects like line, arc, circle and polyline are used. The objects of a template can also be united in the block.

New vector template could be added to SRTL as Replace item or as Search item. When “Add Replace item” was performed, SRTL create new Replace item and associated new Search item with the same topological structure. The Search item could be added only to existing and selected Replace item.

Search item can have *connecting lines*. The setting of connecting lines increases the accuracy of symbols recognition, due to more exact and flexible description of the symbol geometry.


The *connecting line* is a vector object included in the template. One end of the *connecting line* joins the other objects in the template; the other end is free. The length of symbol parts corresponding to connection lines can be arbitrary. What matters are the position of points at which these objects join other symbol objects and contiguity angles.




The figure illustrates a symbol template where the connecting lines are worth adding


An arbitrary number of connecting lines can be specified. If the connecting lines are set in the symbol template, then only those symbols will be retrieved which have raster straight lines similar to the symbol's, with the same points and at the same angles, as on the template; their lengths can differ from the length of the connecting line set in the template.

To create new vector symbol template

- 1 Draw vector objects, approximating symbols, or create them using vectorization or tracing procedures. Because of SRTL editor window is modeless, these operations can be done even this dialog is open.
 - ❖ It is recommended to unite objects of a vector template in a block. After vectorization with symbol recognition or after the *Search and Replace* operations all named blocks can easily be replaced with other graphic symbols, for example, by applying the standard procedure of block redefinition.
- 2 Select created objects, using standard vector selection tools.
- 3 To add selected vector objects as Replace item click the  *Add Replace Item* button. The selected objects will be included as new symbol template into SRTL. The new one Replace item with corresponded to it Search item will be included into the current library.

To add selected vector objects as Search item select appropriate vector Replace item in the left dialog window, because the Search item could be added only to existing Replace item. It is not possible to add vector symbol template as a Search item for a raster Replace item. Click the  *Add Search Item* button. The selected objects will be included as new symbol template into SRTL. The

new one Search item corresponding to the specified Replace item will be appeared in the left dialog window.

- 4 Select the newly added Search item in the left dialog window.
- 5 Click the  *Select Connection Lines* button. Click in the right dialog window on those symbol template objects, which should be the connecting lines. The connecting line is highlighted with red colour. If the object is assigned by a line of connection by mistake, then click on it once more to deselect. The object colour will be changed to the original one.

-
- ❖ Note that the line of connection should be a segment with one end adjoining to template objects, and another being free. Otherwise, the program will not assign the object to the connecting line.



Raster symbol template

Raster symbol templates are marked with  sign. These templates are used by the *Search and Replace* tool as Search or Replace items.

When raster symbol template is added to the library as Replace item, SRTL does not automatically create a corresponding to it Search item. This should be done manually.

A raster symbol template could be added as Search item for raster or vector Replace item. However, it is not possible to add a vector symbol template as a Search item for a raster Replace item.

To create new raster symbol template

- 1 Open a raster image and select some raster objects, using standard raster selection procedures. Because of SRTL editor window is modeless, these operations can be done even while this dialog is open.
- 2 To add selection as Replace template click the  *Add Replace Item* button. The raster selection pattern will be included into SRTL. To add raster selection as Search template select appropriate vector or raster Replace item in the left dialog window, because the Search item could be added only to existing Replace item. Click the  *Add Search Item* button. The raster selection will be included as new template into SRTL. The new one raster Search item corresponded to specified Replace item will be appeared in the left dialog window.

SRTL editor dialog buttons and controls

Left dialog window (topological tree window)

Shows structure of current Symbol Recognition Template Library (SRTL).

Right dialog window (template window)

Shows content (template) of selected library item.










New

Creates a new empty SRTL.



Open

Load a library from *.SRT file into SRTL editor dialog.

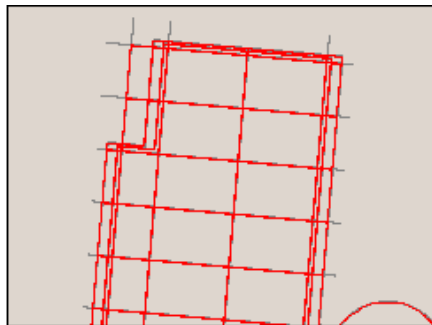
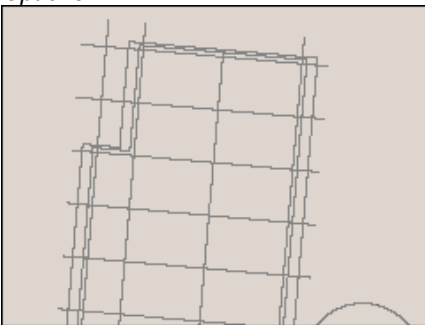
	Import Import an old symbol template format (*.SST) in current library.
	Save Saves the active (current) library in current *.SRT file.
	Save As Saves the library in a new *.SRT file.
	Select Connection Lines Allows to select connecting lines in the symbol template window of the dialog (useful only for vector template of Search item).
	Add Search Item Attaches Search item to the specified Replace item. The Replace item must be selected beforehand in the search-replace topological tree of the dialog.
	Add Replace Item Adds Replace item to the SRTL.
	Delete Deletes selected item from library.

- ❖ To exclude an item from recognition process, just remove checkmark on the left of the item's name without deleting it from the library. The item is deactivated.

Automatic Raster to Contours conversion

Performs a *Raster to Contours* conversion by polylines which duplicates selected closed areas on the image. At the same time, if an area has a mutual border (example shown below), every area (parcel) of polylines will have its own segment.

Setting up the Raster to Contours parameters can be performed in *R2V Conversion Options*.



Increasing the *Radius* parameter causes more places to be treated as area borders. To start this command; choose *Raster to Contours* from the *Convert* menu or click the



button on the *Raster to Vector* toolbar.


To perform conversion to contours do following:

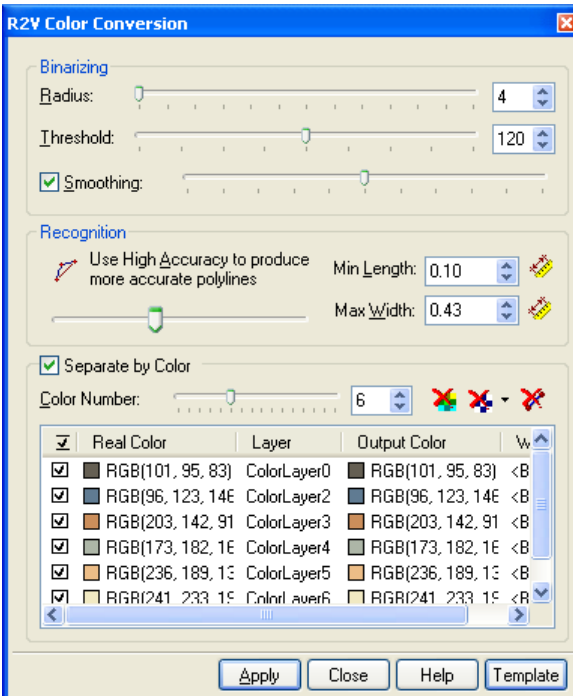
1. Open the monochrome raster image.
2. Run this command.
3. If the Raster to Contours conversion is not suitable, then try changing the parameters in *Conversion Options* and re-running the command.

Automatic Color Vectorization

Color Conversion is intended for recognition of linear objects on color schematic raster images (plans, schemes, topographical maps). It combines such operations as binarization, vector color separation and color vectorization. . As a result, you get polylines broken in places of mutual crossings.

This command works on greyscale and colour images.


To start the *Color Conversion* command; choose *Color Conversion Options* from the *Convert* menu or click the  button on the Raster to *Vector* toolbar.



To tune the colour conversion parameters do following steps:

Step1

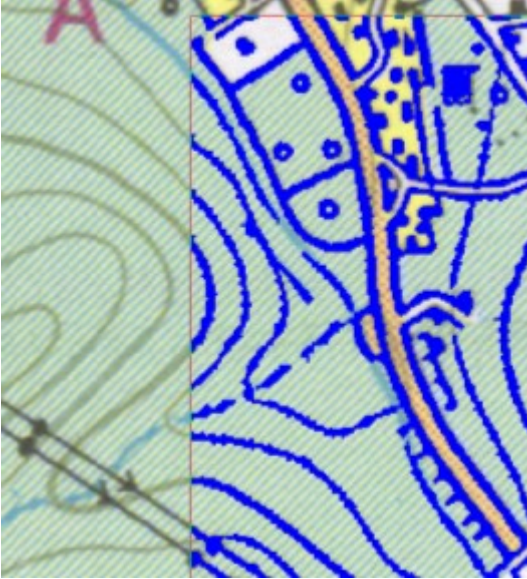
Adjust the binarization parameters (similarly to *Adaptive Binarization*):

Switch on the *Hide Vectors* button  of this dialog, switch off the *Hide Raster* button

 and the *Hide Source Raster* button .

Move the *Radius* slider to its minimum position (equal to 4).
 Gradually increase the *Threshold* value until the required objects appear.
 Use the *Smoothing* filter if the objects have rough borders.

- ❖ At the same time, closely positioned lines might conglutinate and small objects might disappear.



related buttons and controls:



Hide
 Source Raster
 button

Turns off the display of source raster image in the Color Conversion preview area.



Hide
 Vectors button

Turns off the display of vector objects in the Color Conversion preview area.



Hide
 Raster button

Turns off the display of raster information in the Color Conversion preview area. Click the arrow to the right of the button to change colour of binorized raster data.

Radius slider

Sets the radius value, which determines the depth (in pixel) of the filter effect on the colour area. Set it to the minimum position.

Threshold
 slider

Sets the threshold value of binarization.

Smoothing Select this checkbox to smooth the image. The Smoothing slider controls the smooth level. Moving this slider right makes the smooth level higher while moving left makes it lower.


Step2

Set the Recognition parameters: *Max Width*, *Min Length* and *Accuracy*.


These parameters are equal to those for monochrome images in the raster to vector *Conversion Options* dialog and the *Raster Properties* toolbar.

related buttons and controls:

Min Length Sets the minimum length of a raster fragment which should be recognized as a polyline in the vectorization process.

- Specify the length of the shortest raster line.
- In order to measure directly from the image, click the  button and draw a line along the smallest raster line.

Max Width Sets the maximum width of a raster linear object which should be recognized as a polyline.

- Specify the value of this parameter slightly greater than the maximum width of the raster line to vectorize.
- If the program does not vectorize raster segments, then increase the value of this parameter. If the program does not approximate flooded raster areas by boundary objects, then reduce the value of this parameter.
- In order to measure directly from the image click the  button and draw a perpendicular line to the widest raster line you want to recognize.

Accuracy slider Sets the accuracy of raster lines approximated by vector objects. If the quality of the raster image is poor, then reduce the parameter value so that the function will be able to recognize raster objects with significant form distortions.

Step3

Switch off the *Separate by Color* checkbox and define a preview area so that all the objects of all the colours present in the raster image can be seen.



Visually check the quality of the recognized objects, their colour and degree of conformity to the raster image. Re-customise parameters if necessary.

To see lines of different colours on separate layers, switch on the *Separate by Colour* checkbox.

Set the *Colour Number* value (usually 1-2 colours more than the real number). The program automatically defines the table of colours and casts the colour of an object to the nearest one. By switching on/off the *Export to Layer* checkbox located at the beginning of every colour table string, all objects of this colour can be checked visually.

After defining the correct number of colours it is possible to define another target colour and a layer for each real colour.

If there is no need to export a line of a certain color, then switch off the *Export* checkbox at the beginning of this string.


related buttons and controls:

<i>Colour Number</i> slider	The <i>Separate by Color</i> section tries to automatically reduce the colours of all raster lines to a fixed number (<i>Real Colour</i> column). Only the number of the colors to reduce to need to be set (usually, 1-2 colours more than the real number). Because the color of a raster line can slightly vary from its beginning to its end after vectorizing vector polylines of two different colours are produced whereas the actual color is the same.
<i>Check box</i> column	Turn it off to exclude polylines of a specified color from the vectorization process.
<i>Real Colour</i> column	A fixed number of colors that is generated automatically by the <i>Color Conversion</i> tool on the basis of the <i>Colour Number</i> value.

- Layer* column Set a layer for the vector set of a specified color.
- Output Colour* column Specify a color for the vectorized polyline set.

Step4


Click the *Apply* button to start vectorization or save the parameters to a file for further use.

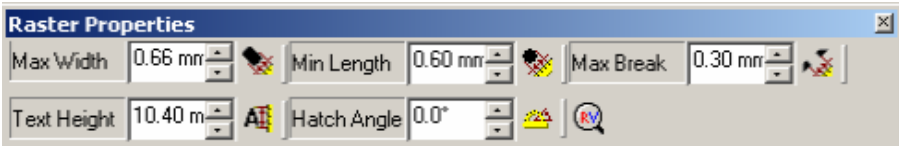
❖ Vectorization can also be launched with current settings through the *Raster2Vector* command (chose the *Raster2Vector* from *Convert* menu or click the  button on the *Raster to Vector* toolbar).

related buttons and controls:

- Apply* button Launches the color conversion process.
- Close* button Closes the *R2V Color Conversion* dialog keeping all its parameters.
- Template* button Allows users to save current settings to a file for future use.

Raster to Vector Toolbars

The *Raster Properties* toolbar allows tune up conversion options on-the fly without digging in *Conversion Options* dialog. This gives an ability to manage main R2V settings immediately. Vectorization results can also be previewed using the  button from this toolbar. Press this button and specify the rectangle preview area.



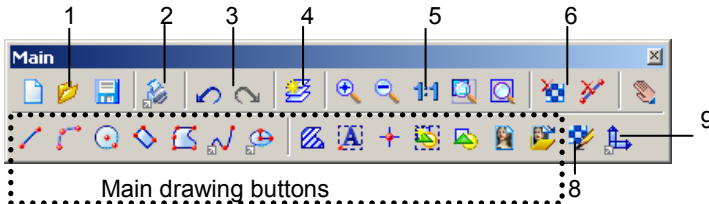
The *Quick Launch Conversion tool* toolbar allows the Automatic Vectorization to start with a specified template.



Drawing and editing

The drawing capabilities of RxSpotlight include tools for the creation and editing of entities and objects, composed of entities, drawing and erasing pixels on monochrome and colour raster images and operations that create or modify vector or raster images.

The simplest drawing operations are represented by buttons in the Main toolbar (they occupy the second row on the picture below).



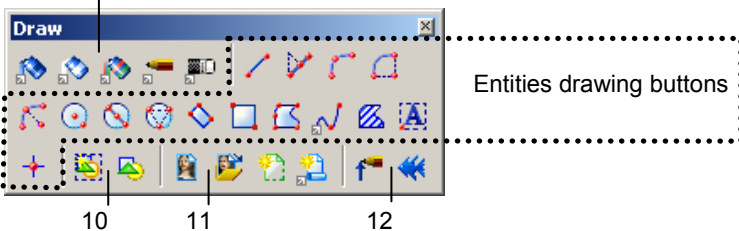
The first row contains buttons for opening, saving (1), printing (2), undoing and redoing (3), manipulating layers (4) and zooming operations (5). At the right of the first row there are two buttons (6) that toggle viewing/hiding raster and vector objects (see page 37) and the pan button (7).

The second row contains main drawing tools, a button (8) that switches raster/vector drawing mode (see page 297) and coordinate system setup button (9).

Using these buttons entities, insert texts and images, can be drawn and blocks created and inserted.

A more versatile set of drawing buttons is located in the *Draw* toolbar and menu.

Pixel drawing tools








Pixel drawing buttons, a complete set of tools for drawing entities, two buttons that control blocks (10), four buttons that insert images (11) and two buttons that create end markers and fill shapes (12) are available.

This is not all. This chapter describes all the RxSpotlight drawing and editing means and modes.

Before drawing

Visibility

Make sure that  and  buttons that control objects visibility are not pressed.

Pressing  button allows newly drawn objects to be added to the selection automatically,  selects only the last drawn object and  removes drawn objects from the selection.

The *View > Show width* commands and commands from submenu *View > Display Order* can be of great assistance for drawing or editing a large number of objects.

The drawn objects can be placed on a specified layer. Any combination of vector objects and raster are allowed on a layer.

The *Inspector* window adds flexibility and precision to drawing operations.

See more information about composing selection sets on page 106; on layers on page 45; on viewing commands on page 30; on *Inspector* on page 40.


Ortho mode

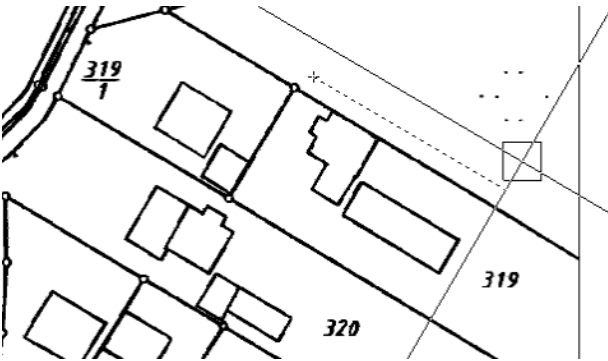
With orthogonalization mode set to on, vector lines and rubberlines for editing can only be drawn in parallel directions to the coordinate axis.

Turn on orthogonalization by pressing the ORTHO button in the right-lower part of the screen (see the picture below).

To draw perpendicular skewed lines (as in the picture below) perform the following procedure:

To draw perpendicular lines with a skew angle to the coordinate axis:

1. Open the *Coordinate System* tab in the *Tools > Coordinate System* dialog.
2. Enter the skew angle value in *Angle*, or measure the angle directly on the image having pressed the button .
3. Press *Apply*.
4. Draw the desired objects. Note that the cursor lines are now skewed by the specified angle.



5. If necessary, then open the *Coordinate System* dialog again and reset the previous value in *Angle*.

Drawing arcs in ORTHO mode is limited by the fact that «rubber lines» are also drawn parallel to coordinate axis.

See more information on Coordinate system setup on page 64.

Other modes and options that affect drawing

When drawing – it is possible to create rasterized copies of vector entities. The effects of toggling the *Switch drawing raster entity* and RDRAW buttons are described on page 297.

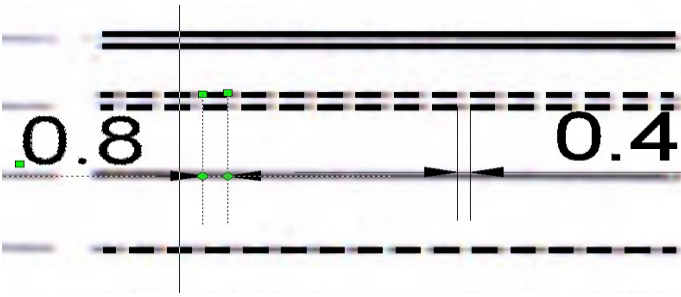
Created text objects can also be rasterized (see description on page 298).

When drawing and editing – snaps and grids can be used to add precision to the operations (see description on page 298).

Drawn objects can be automatically selected. Selection is controlled by settings in *Command Setup* dialog, see page 376.

Line Style management

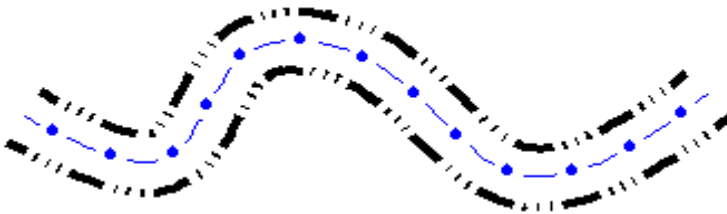
Every RxSpotlight vector object has a line style associated with it (see *Line Type* property in the *Inspector*). The line style is a definition that determines a visual representation of lines of drawing entity. It includes particular dash-gap-marker sequence, the relative lengths of dashes and gaps, styles combination and etc. Any of the standard line styles provided by RxSpotlight can be used, or new line styles can be created and combined.



A wide spectrum of line types can be created:



Line style that uses arrow markers

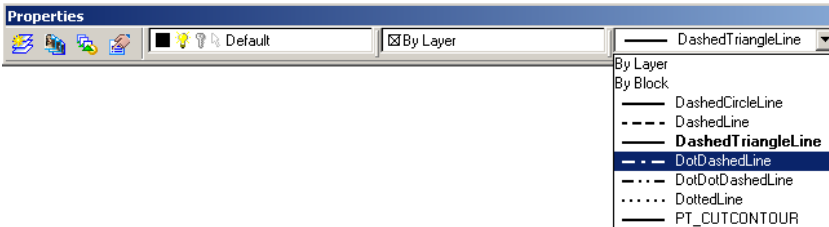


Combined line style

All standard RxSpotlight line styles cannot be deleted or renamed, however they can be freely modified.

To set line type

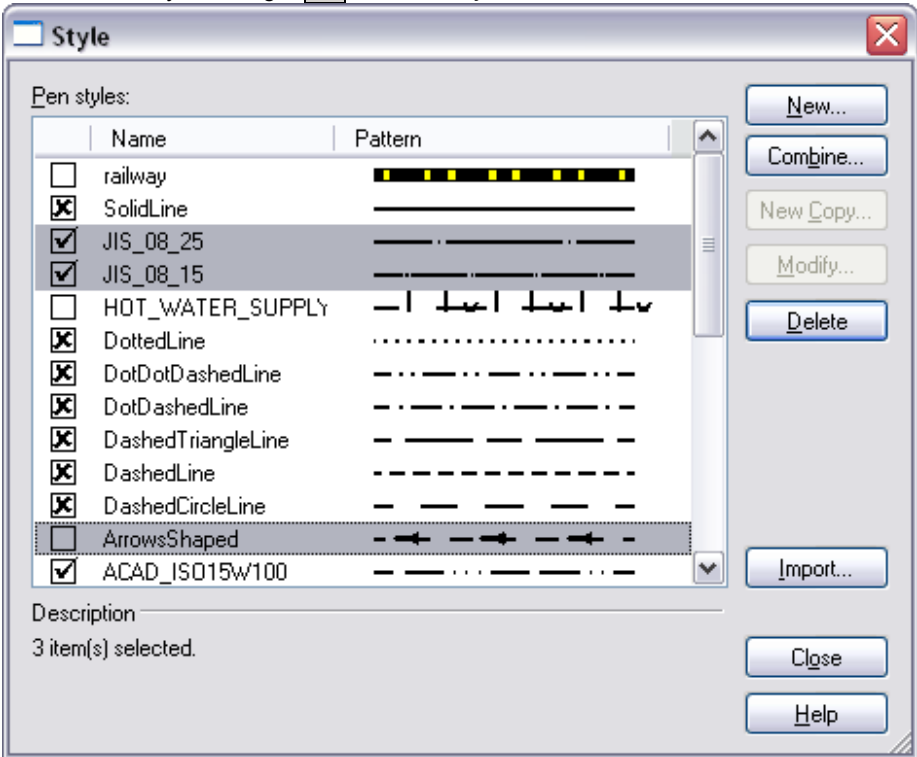
You can set line type on the *Properties* toolbar or in the *Inspector* window.



The Line Style Manager

It's used to create, delete, modify and combine line styles.

To start Line Style Manager , click the *Style* from the *Tools* menu.



The *Pen Styles* list box shows all line styles in the document. It supports multiply selection (with SHIFT or CTRL keys), and drag and drop capability.

Locked field Mark desired line styles with a sign to make them available in the drawing (in the *Inspector* dialog and *Properties* toolbar).
RxSpotlight has a number of standard line styles, which can be modified but not renamed or deleted. These line styles are marked with a sign shown in this field.
All marked () line styles are placed inside saved CWS. Thus they can be distributed with a document.

Name field Displays a line style name.

Pattern field Shows a line style visual representation.

Description Shows full information about a selected line style: name, number of pattern pairs, interval pairs separated by comma.

New button Shows the *Pattern Style* dialog to create a new line style.

- Combine* button Shows the *Combined Style* dialog with included selected line style to create a new combined line style. If line style was not selected or selected style was already combined one, then this button shows empty *Combined Style* dialog.
- New Copy* button Shows the *Pattern Style* dialog window filled with parameters of selected line style to create a copy of this line style. The line style name for the new line style by default is: “*Copy of CopiedLineStyleName*”, where the *CopiedLineStyleName* is the name of a copied line style. If selected style is a combined one, then this button shows *Combined Style* dialog.
- Modify* button Shows the *Pattern Style* dialog to modify a selected line style. If selected style is a combined one, then this button shows *Combined Style* dialog.

- ❖ All standard RxSpotlight line styles, are marked with the key symbol and cannot be deleted or renamed, but can be freely modified.

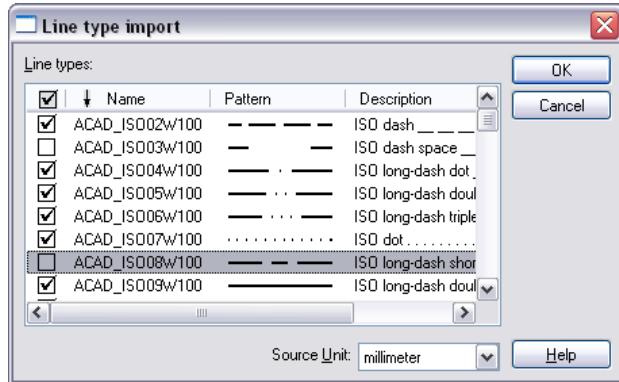
Delete button Deletes selected line style(s).

-
- ❖ All standard RxSpotlight line styles, are marked with the key symbol and cannot be deleted or renamed, but can be freely modified.
 - ❖ Be careful not to delete a line style that is used by some document objects. If a line style used is removed, then after the document is reopened, the name of this deleted style will be displayed in angle brackets for all objects that use this style, but actually these objects will be displayed in a solid line style.

Import button

Import line style(s) from the AutoCAD line type definition file (.LIN file). A LIN file can contain definitions of many simple and complex line styles. This file has an ASCII format.

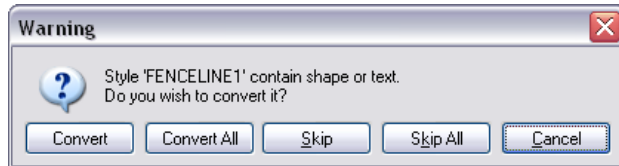
Select desired line styles in the *Line type import* dialog that appears:



RxSpotlight converts shapes and text symbols into markers during line style import:

FENCELINE1	- . - . - . - . - . - .	Fenceline circle	---0---0---0---0---0
FENCELINE2	- . - . - . - . - . - .	Fenceline square	---[]---[]---[]---[]---
GAS_LINE	- GAS - GAS - GAS - GAS	Gas line	---GAS---GAS---GAS---GAS

You can also ignore such line styles:

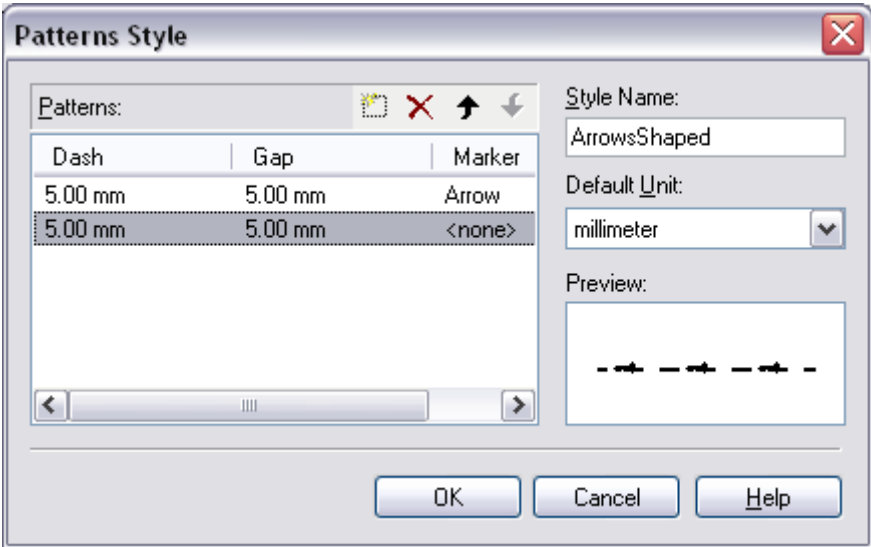


Close button

Closes the *Line Style Manager* dialog.

The Pattern Style dialog

This dialog is called from the *Line Style Manager* and used for creation, modifying and copying line styles.



The format of the line style definition includes a number of patterns consisting of three parts: Dash part length value - Gap part length value – Marker (optionally)

The Marker – is the same marker that is stored in .MRK file and used to place at the entity ends.

It is placed in the middle of the Gap of a current pattern. The user can assign various markers to different patterns of the modified line style.

For example, a standard RxSpotlight line style, called *DotDotDashedLine*, includes three patterns defined as:

Dash Gap Marker
 8mm 2mm <none>
 1mm 2mm <none>
 1mm 2mm <none>


This indicates a repeating pattern starting with a dash 8mm long, a gap 2mm long, a dot, a gap 2mm long, a dot and another gap 2mm long. This pattern continues for the length of the line. The line style would be displayed as shown below:




To create a new line style

Press the *New* button in the *Style* dialog:

Set the style name and select measurement units from the *Default unit* combo-box.

Press the  *New Item* button, enter one by one the size of dash and gap. Specify marker. Observe the process in the *Preview* field.

Edit elements with the buttons  *Delete Item* and  *Move Item Up / Down*.

Press *OK*.

To modify an existing line style

From the *Style* dialog pane choose a style to modify.

Press the *Modify* button, and then make necessary changes (see 2, 3 of the previous section).

Press *OK*. The style name will remain the same.

To create a new line style on the base of an existing one

Choose a line style from the *Style* dialog.

Press the *New Copy* button, make necessary changes.

Enter the name in *Style Name* the field.

Press *OK*.


Pattern Style dialog buttons and controls

The  button

Creates another pattern.

The  button

Deletes a selected pattern from the list

The  buttons

Moves patterns up and down along the list.

The upper patterns are drawn before the lower patterns in the line style.

Dash field

Specify the length of the dash part of the pattern.

Gap field

Specify the length of the gap part of the pattern.

Marker field

Specify the Marker that will be placed in the middle of the gap of a current pattern.

Various markers can be assigned to different patterns of a modified line style.

Style name

Represents a line style name.

A line style belonging to RxSpotlight standard line styles cannot be modified.

Default Unit

Specifies the measurement units for dashed and spaced parts length of the line type.

The Combined styles

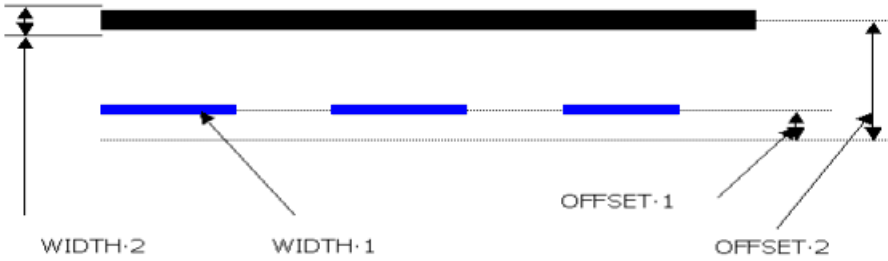
A combined line style consists of several simple ones. An offset, line width and colour can be specified for each included style.

The *Offset* sets a displacement value of a line relative to the central axis of a combined style. Positive values mean displacement to the right, negative - to the left.

The lines with the same *Offset* value will be placed one over another.

The *Line Width* sets a width value for a specified style.

By default, the line *color* corresponds to the color of the included style, it can be changed though.



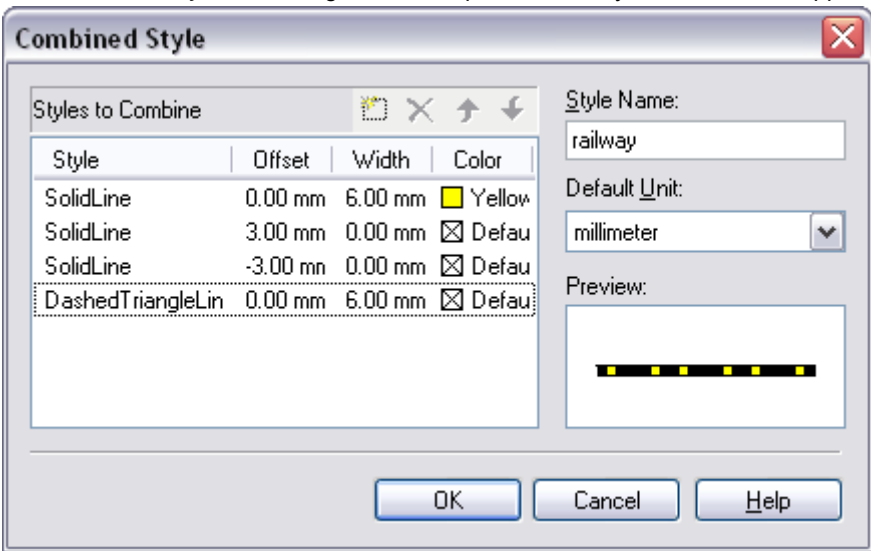
Using combined styles makes it possible to create line styles that can virtually represent any kind of an entity in a drawing such as a state border, railroad and more.

To create combined style


A Combined style can be created using a set of simple (not combined before) line styles. This can be done in the *Combined Style* sub-dialog.


Select all simple line styles which you need to combine in the *Line Style* dialog and click the *Combine* button to create a new combined style.


The *Combined Style* sub-dialog with all the preselected styles included will appears.



There you can edit Offset, Width and Color parameters for each combined style.

To add a new style to a set or include an instance of an existing one, use the  button.

Click the  *Delete item* button to delete any style. Use the

 buttons to change an item order in the set. The *Style Name* box specifies the name of a combined style and the *Default Unit* box specifies the measurement units for the *Offset* and *Width* parameters.

Example: Creation of a railway line style


To create a railway line style follow the steps:

Open the Line Style dialog.

Choose the native RxSpotlight *SolidLine* and *DashedTriangleLine* styles in the list by selecting them with the Ctrl button pressed.

Click the *Combine* button.

In the appeared *Combined Style* dialog type the “railway” style name and specify millimetres as default units.


Click the  *New item* button twice to add two style items to the list. Click on the *Style* field of every newly added item and choose the *SolidLine* style name. Now there are three instances of the *SolidLine* style and one instance of the *DashedTriangleLine* style in the list.

 This set represents a thin solid line.


Set a width value equal to 6mm and yellow color for the first *SolidLine* style instance.

 A wide yellow line appears.

Set an offset value equal to 3mm for the second *SolidLine* style instance and an offset value equal to – 3mm for the third one.

 Now we have a wide yellow line with a thin black *DashedTriangleLine* in the middle bounded with two thin black solid lines.

Set a width value for *DashedTriangleLine* equal to 6mm.

 The line of yellow color and the line of *DashedTriangleLine* style have the same width and offset values so they are imposed one over another.

Text Style management

Every text in a RxSpotlight document has a text style associated with it. A text style defines such text characteristics as: *Font*, *Height*, *Width Factor*, and *Obliquity*. To inherit any text property from the associated text style, this property value must be set to *By Style*.

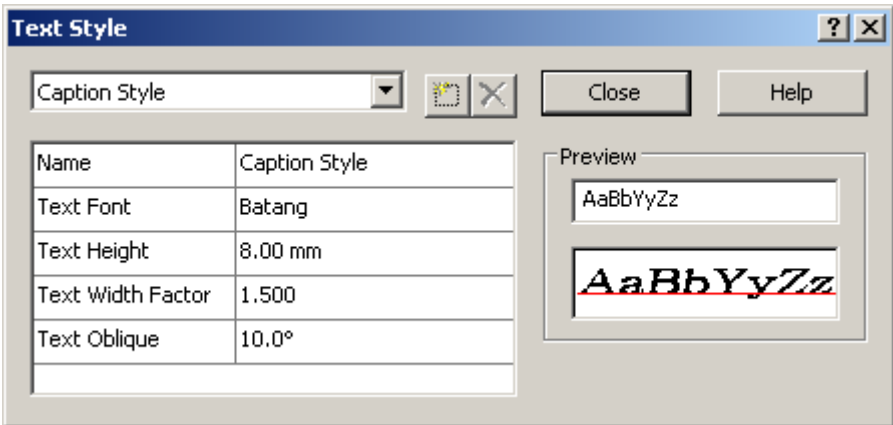
Using text styles, text properties for a number of objects can be changed on the fly. Just modify any parameter of the required text style, and every RxSpotlight text in this document which inherits the value for this property from the modified text style will be changed immediately.

A text style for the following can be changed: Text, Multiline text, Dimension text, Block, by changing a value of the *Text Style* property in *Inspector*.

Text Style	Caption Style
Text Font	By Style
Text Height	By Style
Text Width Factor	By Style
Text Oblique	By Style

Text Style Manager

The *Text Style Manager* is used for managing text styles.



Use a combo box in the upper-left corner to switch between text styles of this document.

The  button

Creates a new text style.

The  button

Deletes a text style. Select a name from the list, and then choose *Delete*. The document current text style or text style used by any object can not be deleted.

The *Preview*

Displays a sample text that changes dynamically when you change any text style parameters. To change a sample text, enter characters in the box above the character preview image.

-
- ❖ It is quick and easily to delete all unused text styles from the document using the Purge command.

-
- ❖ The preview image does not reflect the text height.

The *Close button*

Closes the dialog and applies the changes.

Text style properties

Name	Displays a text style name to be edited. Change it if it is necessary.
Text Font	Changes a style's font.
Text Height	Sets a text height based on the value the entered or chose from the list.
Text Width Factor	Sets the character spacing. Entering a value less than 1.0 condenses the text. Entering a value greater than 1.0 expands it.
Text Oblique	Sets an oblique angle of the text, which defines the forward or backward slant of the text. This angle represents an offset from 90 degrees.

To start *Text Style Manager*, click the *Text Style* from the *Tools* menu.

Drawing entities

Drawing simple objects is easy.


Select a drawing tool (or command in the corresponding submenu of *Draw* menu) and draw intuitively. Any drawing mode can be exited by releasing the button on the *Drawing* toolbar, or by changing the drawing mode, or by pressing ESC.

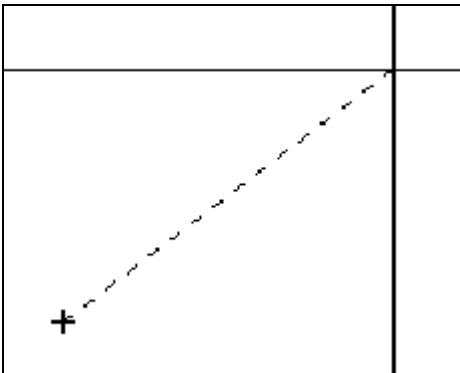
To become acquainted with drawing vector objects, open a blank document and the *Drawing* toolbar and spend a few minutes trying the drawing tools.


It is useful to keep the *Inspector* window open while drawing. Spend some time experimenting with different properties and options of the selected drawing tool. *Inspector* allows drawing with precision and control of many properties of the created objects.

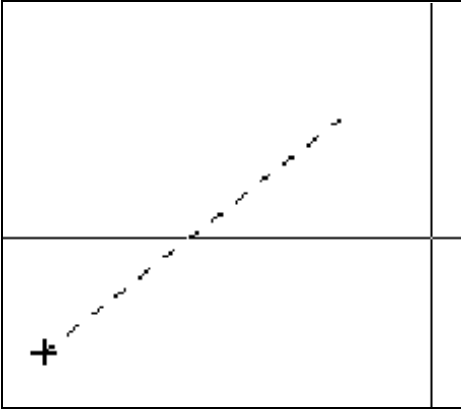
Line

There are two ways to draw a line:

1. By pressing  and specifying two endpoints...



2. ...or by pressing  and specifying three points: two for direction and one for length.

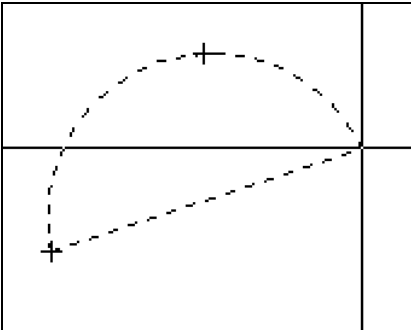



In the latter case the rubberline, after specifying the line direction by two clicks, follows the perpendicular from the cursor on the line, rather than the cursor, until clicked for the third time.

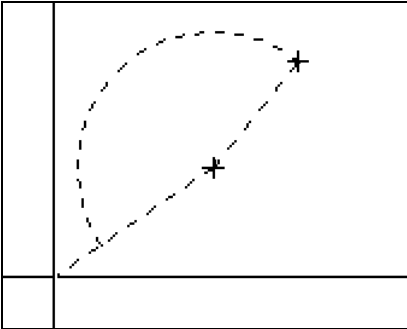
Arc

There are three ways to draw an arc.


1. By three points with  button pressed:



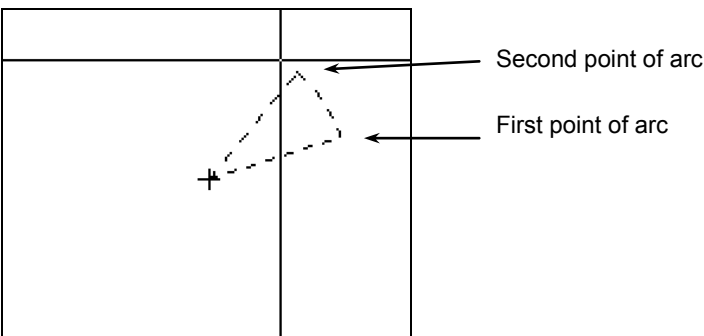
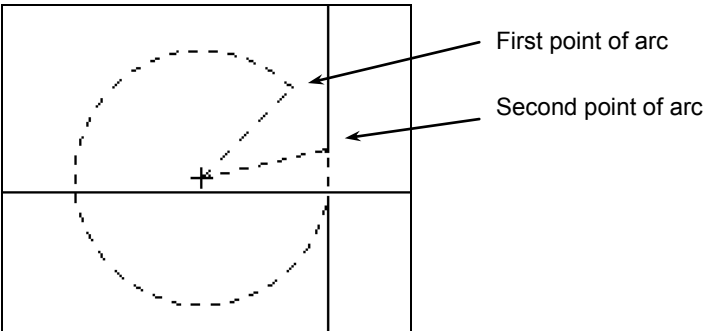
2. By centre, starting direction, and angle ( pressed):



Until the creation of an arc is confirmed by clicking, the rubberlines show its expected shape and angle.

3. By centre, angle, and radius ( pressed):

This method allows two arcs to be drawn: “large” and “small”; it depends on the place clicked after specifying the first corner. RxSpotlight will draw an arc in the direction of the other side of the specified corner.



The pictures show how arcs are drawn

The “direction” in which RxSpotlight draws an arc is set by the current coordinate system. An arc is drawn in the direction of the Y-axis positive direction to the X-axis positive direction; i.e. when the coordinate axis are set in a standard fashion, arcs are drawn counter clockwise from the first point.

Circle

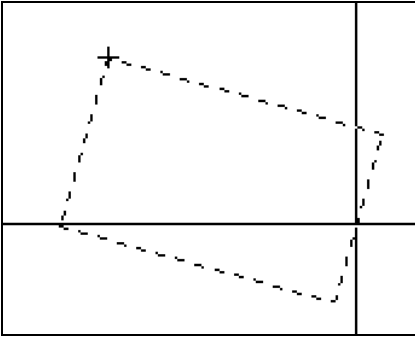
There are three ways to draw a circle:  - by centre and radius,  - by diameter, and  - by three points.


No tricks – just choose a tool, click and watch the rubberline to control.

Rectangle

A rectangle can be drawn specifying either three or two points.

To draw a rectangle by three points, press , click one corner, then click “height” and “width”.



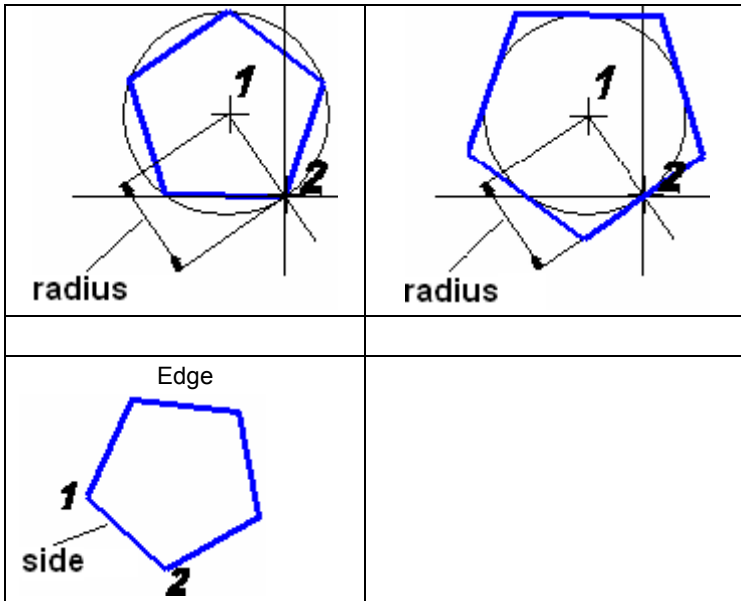
To draw a rectangle by two points, press , click and drag. This drawing mode produces rectangles skewed by the same angle. To change this angle press SHIFT after specifying the first corner, place the rubberline to fit the new angle and click the opposite corner of the rectangle.

Closed Polygon

This command draws closed polyline with specified number of sides.

Drawing methods

Circumscribed	Inscribed
---------------	-----------




To create Closed Polygon


1. Start *Closed Polygon* command from the *Draw* menu.
2. Enter a number of polygon sides in the command line or press Enter to agree with previous value;
3. Choose drawing method in the Command Line:
Inscribed/Circumscribed/Edge
or press Enter to agree with previous one;
4.
 - In case of inscribed polygon specify center and radius of circumscribed circle (for the Command Line use the following format: `Distance<Angle`).
 - or
 - In case of circumscribed polygon specify center and radius of inscribed circle (for the Command Line use the following format: `Distance<Angle`).
 - or
 - In case of drawing by edge specify first and end point of polygon edge.


Ellipse and elliptic arc

An ellipse can be drawn using two different methods. Select *Ellipse by* from the *Draw* menu and a drawing method from the sub-menu:


1. To draw an ellipse by *Centre and Radiuses* press the button . Specify the centre point for an ellipse; moving the cursor, select the first radius on the screen

(or set in the *Inspector*) and a slope angle for the ellipse axis; click to confirm, and then select the second radius.

2. To draw an ellipse by *Diameter and Radius* press the button  Specify the centre, diameter and a slope angle for the ellipse axis, and then the second radius.

To draw an *Elliptic Arc* press the button . Specify a centre, radius and slope angle for the ellipse axis, and then the second radius; click to confirm. After that specify a start angle for the arc (relative to the ellipse axis) and an end angle for the arc.

Point

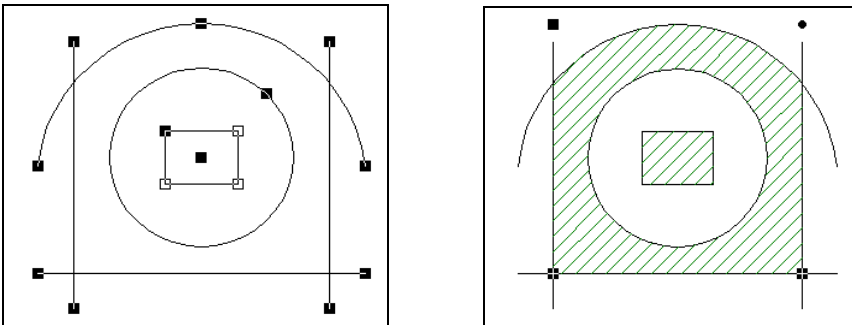
Draw points ( button) to snap objects to them later in snapping mode. From the *Preferences* dialog (*Tools* menu), choose (in *Points* section) the most appropriate way to display points; note that it is just a representation, RxSpotlight saves the screen image of a point apart from its coordinates.

Hatch

Hatching creates a hatched or filled block in a region of the drawing enclosed by a boundary made up of lines, arcs, circles, polylines, and/or rectangle entities.

A hatch boundary is a set of closed contours. RxSpotlight defines the boundary by analyzing all selected vectors. It tries to find all entities that define the closed contours, generates these contours, and adds them to the selected closed region.

RxSpotlight creates a hatch using a style known as the Normal AutoCAD hatch style. Islands remain un-hatched, while islands within islands are hatched, as in the figure below.




Hatching: Selected vectors and the result

To create a hatched (filled) block

1. Select objects that define the hatch boundary.
The selection must be composed of lines, arcs, circles, rectangles, or polylines.
2. From the *Draw* menu choose *Hatch*.

- or -

on the *Main* or *Draw* toolbar, click the  button.

RxSpotlight creates a hatch block. The hatch or fill style can be defined in the *Inspector* window.

✉ For more information on blocks see page 235.

Polylines

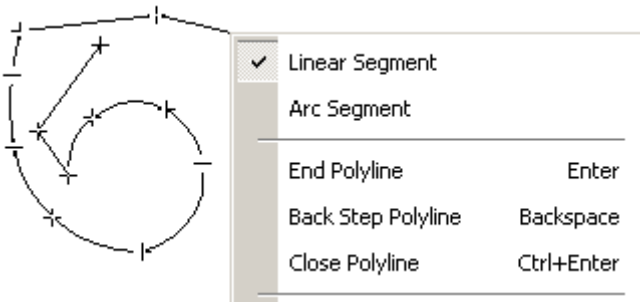
A Polyline is a chain of line and arc segments. The connecting points of these segments are called vertices.

To begin drawing a polyline press  button on *Draw* toolbar or choose the *Draw > Polyline* from menu.

Drawing polylines consists of drawing segments of lines (by two points) and arcs (by three points). The arc segments are drawn with the SHIFT key pressed.

Complete drawing by double-clicking.

During polyline drawing using the context sensitive menu, which appears on right-clicking, to undo the latest drawn segment, and two methods to complete drawing: with or without closing a polyline can be chosen.



The user can also choose between linear or arc segments to draw.

If the polyline is not closed immediately, then it can be closed later.

To cancel drawing a polyline press ESC.

The polyline can be exploded to separate arcs and lines.


The mechanism of editing polylines is represented by buttons in the *Polyline Edit* toolbar.

Polylines can be edited by closing and breaking them and also by moving, adding, or deleting individual vertices. Line segments can be converted to arcs and vice versa, modify polyline properties such as width and line type, its belonging to a certain layer, colour and elevation.

A polyline can be edited by moving its vertices with the mouse, using the *Polyline Edit* toolbar or the cursor menu.


A line needs to be selected before editing. In RxSpotlight there are two modes of modifying a polyline: *Vector editing* mode and *Segment editing* mode.

Operations in the Vector editing mode

To enter *Vector editing* mode press  button on the *Select* toolbar and select a polyline with one of the standard vector selection methods.

In this mode, users can close a polyline, break it at specified points, move its vertices, and add new vertices.

The polyline grips will be highlighted with green or blue if more than one object is selected. Grip colours can be changed in *Grip* section of the *Preferences* dialog.

 For more information about the *Preferences* dialog see “**Tuning the application**” on page 389.



To close a polyline:

A polyline can be closed and opened in two ways – by joining two extreme vertices or adding a supplementary linear segment.


1. Select a polyline in the *Vector editing* mode.
Choose *Close polyline* from the cursor menu – the polyline will be closed by the addition of a linear segment

- or -


2. Select a polyline in the *Vector editing* mode or the *Segment editing* mode (see description of this mode below).

Open the *Polyline Edit* toolbar and press the *Close polyline* button  - to close the polyline by joining two extreme vertices; or the *Extend to Close* button  – to close the polyline by adding a linear segment.

To add vertex to polyline:

1. Select a polyline in the *Vector editing* mode or the *Segment editing* mode and press the *Add vertex* button  on the *Polyline Edit* toolbar.
2. Specify a point on the polyline to insert new vertex in.

To break a polyline:

1. Select a polyline in the *Vector editing* mode or the *Segment editing* mode.
2. Press the *Break* button  on the *Polyline Edit* toolbar.
3. Specify the vertices on the polyline to break it.

To explode a polyline:

1. Select a polyline in the *Vector editing* mode.
2. Choose *Explode Polyline* from the cursor menu or *Explode* from the *Modify* menu– the polyline will be exploded into constituent parts.

Operations in the Segment editing mode


As regards the polylines, the *Segment editing* mode allows work with polyline segments and multiple vertex selections. In this mode, all operations described above for *Vector editing* mode are available, plus these additional functions: deleting

specified segments and vertices, converting linear segments to arcs and vice versa, joining polylines, separating linear or arc segments to a single object, and dragging selected parts of a polyline.

Enter the *Segment editing* mode in the following ways:

Choose *Polyline* from the *Modify* menu and select a polyline

- or -

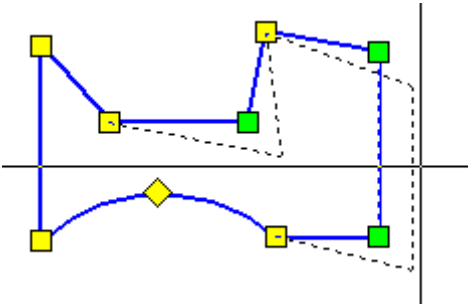
Choose *Segment edit* mode on the *Select* toolbar by pressing  button and click on the polyline.

In this mode the polyline grips are highlighted with yellow and the selected vertices with green. Grip colours can be changed in *Grip* section of the *Preferences* dialog.


There are two simple rules for vertices and segments selection in this mode:

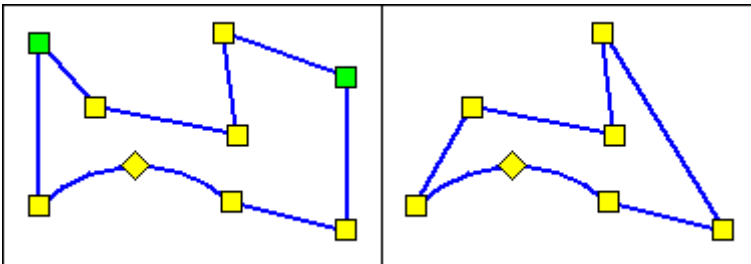
1. If segment is selected, then its adjacent vertices are selected too.
2. If two adjacent vertices are selected, then segment that connected them is selected too.

All standard selection methods are useful in this mode. Dragging of specified vertices and segments stretches the polyline entity. Next example illustrates one polyline vertex and one polyline segment dragging.

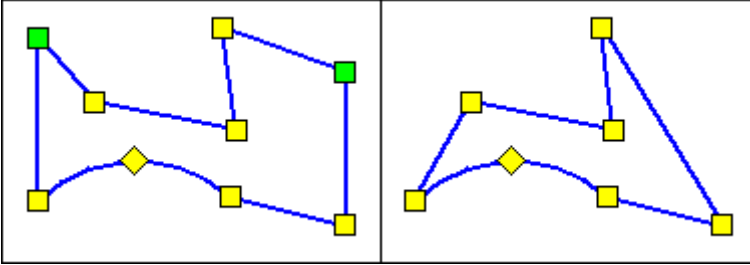


To delete polyline segments and vertices:

1. Select a polyline in the *Segment editing* mode.
2. Select the vertices and segments to delete. The specified vertices and the segments will be highlighted.
3. Press the *Delete Vertex* button  on the *Polyline Edit* toolbar or choose *Delete Vertex* from the cursor menu.




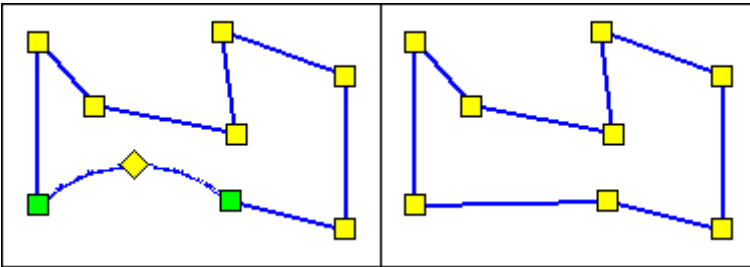
The result of two vertices deleting



The result of polyline segment deleting


To convert segment to line:

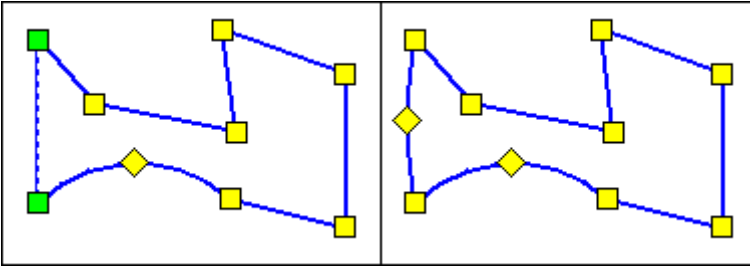
1. Select a polyline in the *Segment editing* mode.
2. Select one or the several arc segments to be converted to linear segments. The specified segments and their vertices will be highlighted.
3. Press the *Convert To Line* button  on the *Polyline Edit* toolbar or choose *Convert To Line* from the cursor button.



The result of arc segment to linear segment conversion

To convert segment to arc:


1. Select a polyline in the *Segment editing* mode.
2. Select one or the several linear segments to be converted to arc segments. The specified segments and their vertices will be highlighted.
3. Press the *Convert To Arc* button  on the *Polyline Edit* toolbar or choose *Convert To Arc* from the cursor menu.




The result of linear segment to arc segment conversion

Joining polylines:


Polylines can be joined with arcs and linear segments. Selected objects can be joined by adding a supplementary linear or arc segment, as well as by connecting their two extreme vertices.

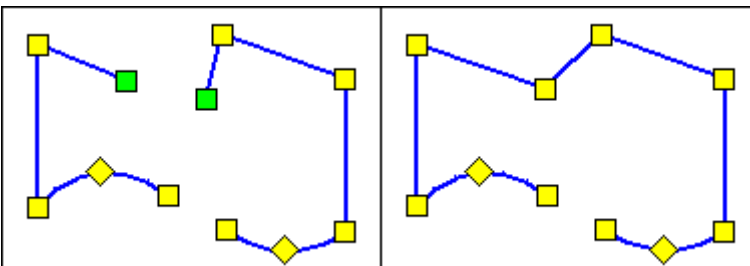
1. Select the objects to join (polylines, arcs, lines) in the *Segment editing* mode.
2. Specify the vertices to join the objects with.
The selected vertices will be highlighted in green.
3. Press the *Join* button  on the *Polyline Edit* toolbar or choose *Join* from the cursor menu to join objects by connecting their specified vertices.

-or -

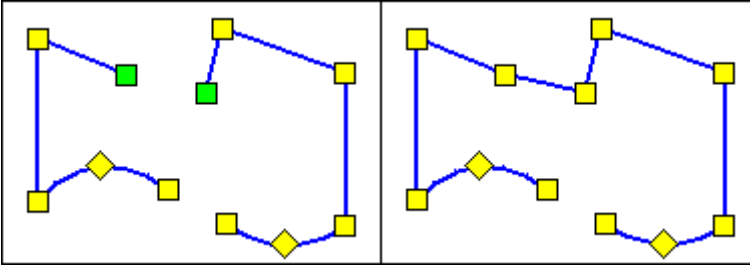
Press the *Join by line* button  on the *Polyline Edit* toolbar or choose *Join by line* from the cursor menu to join objects with a linear segment.

-or -

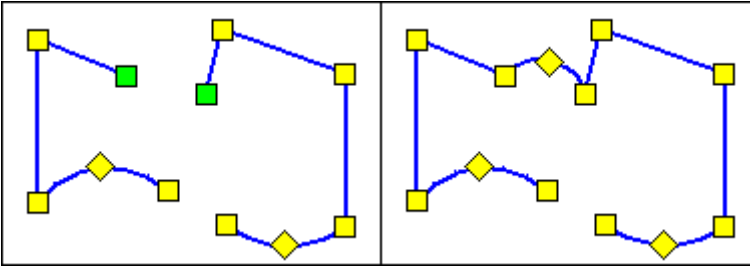
Press the *Join by Arc* button  on the *Polyline Edit* toolbar or choose *Join by Arc* from the cursor menu to join objects with a linear segment.



The result of *Join* method



The result of *Join by Line* method



The result of *Join by Arc* method

Splines

A spline is a smooth curve passing through a given set of points. RxSpotlight works with a particular type of spline known as a non-uniform rational B-spline (NURBS).

Applying NURBS assures sufficient smoothness of the curves passing through specified fit points. Splines are useful for creating irregular-shaped curves, for example, drawing contour lines on maps or complex curves on mechanical drawing.

The *Spline* can be used command to create a spline with a given set of points.

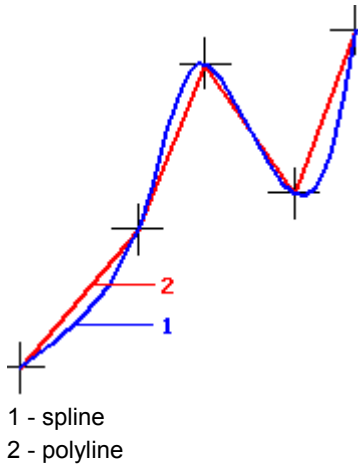
Besides the *Spline* command, splines can be created by converting polylines to splines with the *Convert to Spline* command from the *Correct* menu.

A spline can be converted to an approximating polyline using the *Merge Vectors to Polyline* command from the *Correct* menu.


The advantages of splines as compared with polylines

Splines have the following advantages as compared with polylines:

1. They are created on the base of the same number of points, but they are much more precise in comparison with polylines;
2. A drawing containing splines uses less disc space and memory than a drawing with smoothed polylines with the same number points.



To draw a spline

To run the command; choose the *Spline* from the *Draw* menu or press the  button on the *Draw* toolbar.

Specify points for drawing spline shape. Press BACKSPACE to cancel the latest specified point.

Double-click to complete or choose *Complete* from the mouse right-button menu. To close the spline and continue drawing, choose *Close* from the mouse right-button menu.

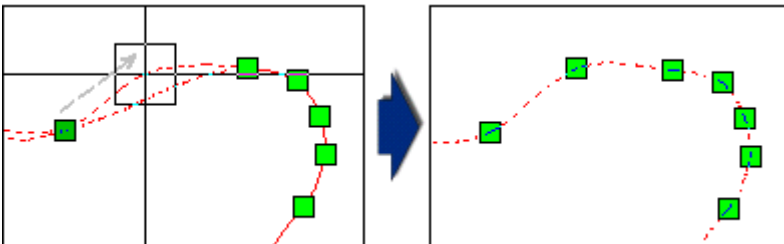
Spline drawing is influenced by ORTHO mode and polar snap.

When drawing vector objects, vector snap, to snap to spline end points and start points, can be used. (*End point* and *Intersection* ✗)


A *Hatch* object can be created on the base of a closed spline. If this hatch is exploded, then a closed polyline is obtained.

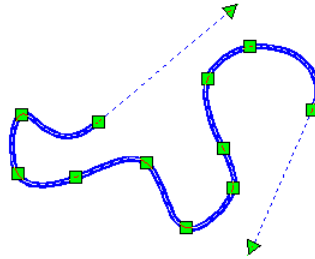
To edit a spline

To edit a spline, the grips of fit points are used. Fit points can be deleted and added to modify spline accuracy. For this, press CTRL, and then move the nearest existing point to the place to add a point. To delete a point, move this point to the nearest one, and then release the mouse button. The point will be deleted. Use vector snap (*Intersection type*) to match points precisely.

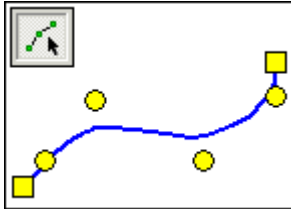


All RxSpotlight splines have start and end tangents (tangent vectors), which specify the tangency of a spline curve at its start and end points. The end points of the tangent vectors have triangular grips, which are used for specifying tangent's direction and length.

Use the *Start Tangent* and *End Tangent Inspector* items to edit tangent properties. Edit vector coordinates there or click the  button to set tangents into the default position.




To change the position of control points, turn on the *Node Selection* mode (*Polyline Selection* mode) on the *Select* toolbar. The spline control points will be displayed.



- ❖ Modifying control points is an irreversible operation during which start points are lost, and their grips are not displayed.

Spline properties

Like any other vector object, a spline has a set of properties.

<i>Closed:</i> YES/NO	Defines spline status. Using this property, you can either "close" or "open" splines.
<i>Start points:</i> N	A number of fit points a spline is created.
<i>Control points:</i> N	A number of control points. This property is displayed after control points have been edited in <i>Polyline edit mode</i> .
<i>Order:</i> N	A spline order.
<i>Start Tangent</i> and <i>End Tangent</i>	Coordinates of spline tangent vectors whose direction and length defines the curvature of last segments in the start and end points. The  button sets tangents into the default position.

Construction objects

Construction objects cannot be used for a number of operations such as vector editing, merging and etc.

Xline

This command creates an infinite construction line.

To create *Xline*

- From the *Draw* menu, choose *Xline* to start this command.
- Specify the first line point
- Specify the second line point.

Ray

This command creates a ray – a semi-infinity construction line.

To create *Ray*

- From the *Draw* menu, choose *Ray* to start this command.
- Specify the base point of the ray.
- Specify the second point that should lies on the ray.

Blocks

A block is a collection of objects that can be associated together to form a single object named *block definition*. A block can be inserted in a drawing as many times as you need.


A *block definition* can contain other (nested) blocks. The only restriction on nested blocks is that you cannot insert blocks that reference themselves.

Existing blocks can be modified only by redefining it, i.e. by creating a new block under the name of an existing one. After modification, all instances of the modified block inserted in the document are automatically converted to the new block.

View and control blocks in the *Blocks* window (menu *Tools*). Modify block insertion properties in the *Inspector* dialog.


Exploding a block breaks it into its component objects.

To create a block


1. Select objects for the block.
2. From the *Draw* menu, choose *Create Block* or from the *Main* toolbar, click the  button.
3. To assign a specific name to a block, type the name in the *Inspector* window or select an automatically generated name such as "Block_<Number>".
4. Select the mode of block creation: *Remove*, *Replace* or *Leave* in the *Inspector* window. Set the other block properties if necessary.
5. Select the insertion base point.

When a block is created in *Replace* mode, objects that make a block are replaced by the block. In *Remove* mode objects that form a block are deleted from the document. In *Leave* mode all constituent objects are left intact.

To insert a block

1. From the *Insert* menu, choose *Insert Block* or from the *Main* toolbar, click the  button.
2. Select the name of the block in the dialog that appears. Then click on the location of the insertion point or to insert an instance of the last inserted block, simply click on the location of the insertion point.

To replace definition of a block

1. Select the objects for the block.
2. From the *Draw* menu, choose *Create Block* or from the *Main* toolbar, click the  button.
3. In the *Inspector* window select the name of the block that you want to modify.
4. Choose the *Yes* button in the confirmation dialog box.
5. Select the insertion base point.

All other instances of the block will change automatically.

To explode a block

1. Select a block.
2. From the *Modify* menu, choose *Explode* or click the  button from *Modify* toolbar.

Block attributes

Users can also set attributes to a block to create. A block attribute is a text included in the block, whose value can be re-defined for each block insertion.

To create an attribute, include a multiline text in the block. After being inserted in the block, the following set of symbols in the multiline text will be defined by the block as an attribute: `</attribute name>`, where *attribute name* represents the name of the block attribute displayed in *Inspector* while the block parameters are being edited.

For example, insert the following multiline text in the block displaying a workstation:

Employee: `</last name>` `</first name>`

Position: `</position>`


Then set in the *Inspector* the values of the attributes for each block insertion: `</ first name>`, `</ last name>` and `</position>`

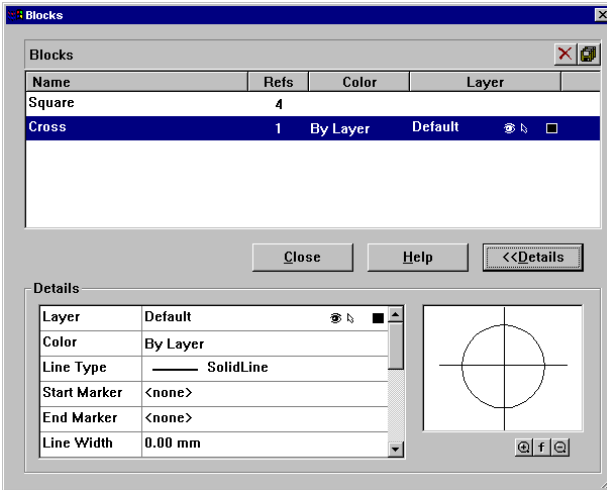
On the screen something like this will appear:

Employee: Smith John


Position: designer

Block manager

The *Blocks* window is opened by pressing the button  on the *Properties* toolbar or by choosing *Blocks* from the *Tools* menu.



This dialog first appears in a reduced form. Clicking on *Details* opens the block properties list and *Preview* window.


The *Refs* field contains the number of block insertions in the document. The value 0 in *Refs* means that the block definition is stored, but the block has not been inserted in the document. To delete a definition, allocated for block storage, press the button .

If the number of block insertions in the document is not equal to 1, then all the property fields are empty and you can only see the block image in *Preview* window.

The *Name*, *Colour* and *Layer* fields and also properties in the *Details* list are enabled when a block is inserted only once.

Text objects

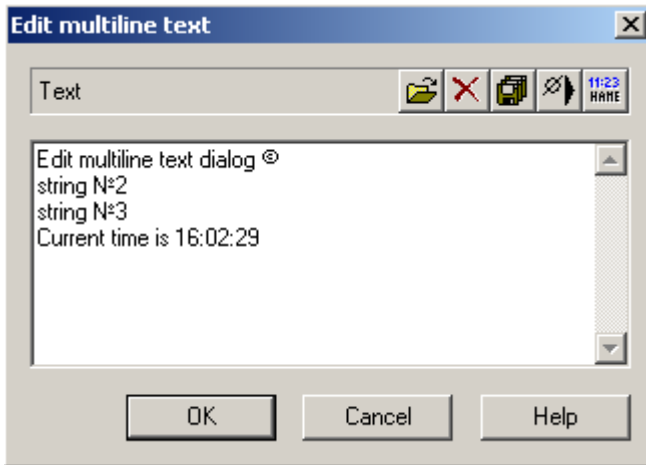
A line of text can be typed from the keyboard or a multiline text object inserted.

To add a line of text, choose *Text* command from *Draw* menu (or press  button on *Main* or *Draw* toolbar), click to define an insertion point, type the text and complete it by pressing ENTER. The text object appears inside a bounding box with selection grip in the document. Before creating text its *Style*, *Font*, *Height*, *Oblique* and other properties can be set in the *Inspector* window.





Multiline text

A multiline text object can be inserted in the document using the *Multiline Text* command from the *Draw* menu.

Use the *Edit multiline text* . dialog to type and edit text or extract text from an existing text file.



There are five buttons in this dialog:


-  opens file with text;
-  saves text to file;
-  deletes text.
-  Inserts the following special symbols. in the text:

Diameter Sign ∅

Degree Sign °

Numero Sign №

Copyright Sign ©

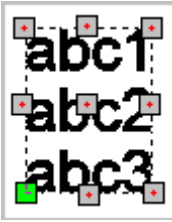
Registered Sign ®
-  Insert special data from the list:
 - Current Date (Short)
 - Current Date (Long)
 - Current Time
 - User Name

After the text is typed and edited, press *OK* and click on the image at desired insertion point of the multiline text object.

Change text font, size, colour and other properties in the *Inspector* window.

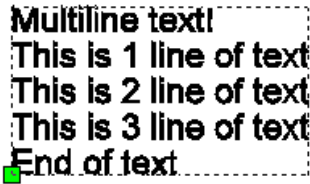
The text is aligned by its base point (see Base Point property in Inspector). To align the text horizontal use *Horizontal* property. There are variants: *Left*, *Centre* and *Right*.

To align the text vertically, use *Vertical* property. After being entered the text alignment is set by the left lower corner.

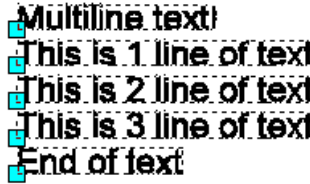


In the figure all possible alignment variants are indicated by grey.

The multiline text object can be exploded to regular RxSpotlight lines of text.



Multiline text inserted...

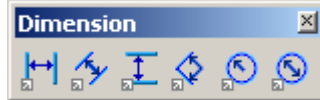


...and Exploded to separate lines

Dimensions

Dimensions are the objects that represent distances, angles, diameters and radiuses. A dimension object usually consists of dimension and extension lines, text and arrowheads.

The dimension object is created using current settings shown in *Inspector* window. Using grips some of the properties of the dimension object can be edited.



Draw menu contains four measurement options in *Dimension* submenu. If choosing *Linear*, then the *Inspector* window offers *Horizontal*, *Vertical* and *Aligned* methods to create dimension objects in *Dimension type* list.

One of the dimension measurement options can also be chosen from *Dimension* toolbar.

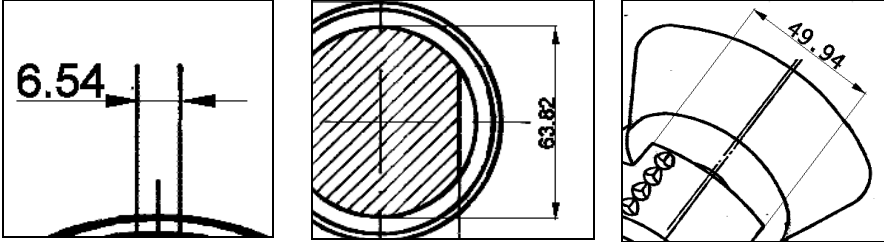
To create linear dimension

1. Select *Linear* from *Draw > Dimension* submenu.
2. Select *Horizontal*, *Vertical* and *Aligned* from *Dimension type* list in *Inspector* window. Set other options in *Inspector* window if necessary.

- or -

Press one of the three buttons  in the left of *Dimension* toolbar.


- Click on end points of measured object. Watch the dashed contours of dimension text.
- Move the mouse pointer until the desired position for the dimension text is reached and click again.



Distance dimensions examples

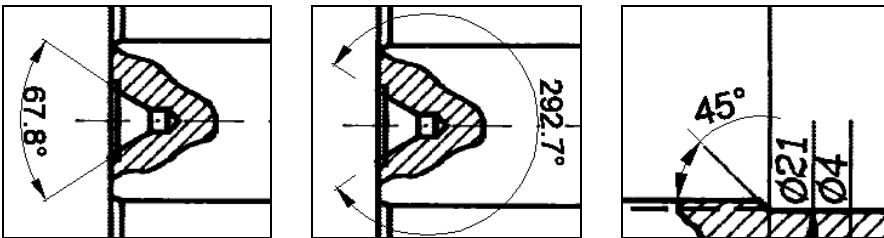
If the vector line is already selected, then there is no need to specify the dimension object. Choose *Horizontal*, *Vertical* and *Aligned* from *Dimension type* list in *Inspector* window and click to specify the dimension object position.

To create angular dimension

- Select *Angular*  from *Draw > Dimension* submenu. Set options in *Inspector* window if necessary.
- Specify the angle by three mouse clicks: first for angle vertex, others for directions. Watch the dashed contours of dimension text.



If the arc is already selected, then there is no need to specify the dimension of the object. Click once to specify the dimension.

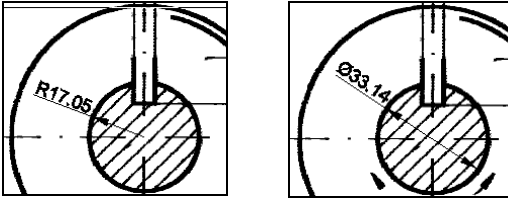
- Move the mouse pointer until the desired position of the dimension text is reached and click again. Note that if the mouse pointer is too close to the angle vertex and the dimension text does not fit in, then it is placed outside the measured sector. If the mouse pointer crosses the inner side of angle, then the outer angle is measured and vice versa.



Angular dimensions examples

To create radial or diametral dimension

1. Select *Radial*  or *Diametral*  from *Draw > Dimension* submenu. Set options in *Inspector* window if necessary.
2. Click on the centre and on a point on the circle (both for radius and diameter). Watch the dashed contours of dimension text.
If the circle or arc is already selected, then there is no need to specify the dimension object. Click once to specify the dimension.
3. Move the mouse pointer until the desired position of the dimension text is reached and click again. Note that the text that does not fit into the circle is placed outside.



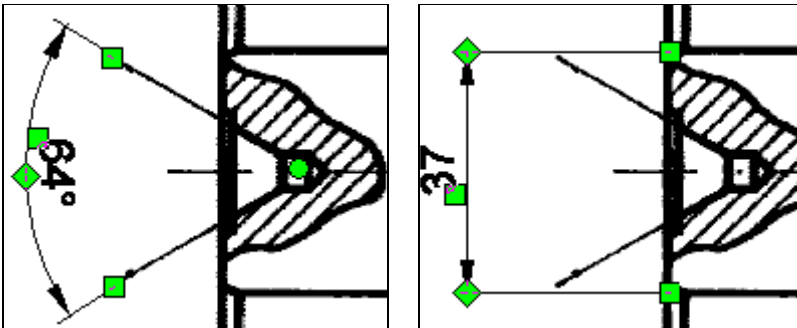
Radius and diameter dimensions examples

Editing dimension objects

The dimension object can be edited using grips and changing properties in the *Inspector* window.

To edit dimension object using grips

1. Select the dimension object. The grips appear. Square and diamond-shaped grips allow the dimension lines to be edited. The position of text can be changed by moving the grip next to it and also the vertex of the angle by moving the round grip of the angular or circular dimension objects.

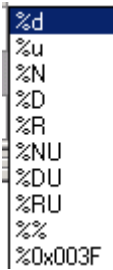


The examples of dimension objects with grips

Some properties of dimension objects

Edit dimension properties in the *Inspector* window.

Line Type	
<i>Scale</i> <i>Width</i> <i>Type</i>	Sets line properties.
<i>Start Marker</i> <i>End Marker</i> <i>Start and End Marker Scale</i>	Defines the shape and scale of makers at the ends of dimension lines.
Text Style	
<i>Style</i>	Select text style.
<i>Font</i> <i>Height</i> <i>Width Factor</i> <i>Oblique</i>	Text properties.
Dimension Style	
<i>Text Color</i>	Sets color for text of dimension object.
<i>Text Orientation</i>	Text can <i>Split Dimension Line</i> or can be placed <i>Above Dimension Line</i> .
<i>Inside Text Orientation</i>	Defines orientation of the dimension text when it is situated inside extension lines. Text can have <i>Horizontal</i> or <i>Parallel Dimension Line</i> orientation.
<i>Outside Text Orientation</i>	Defines orientation of the dimension text when it is situated outside extension lines. Text can have <i>Horizontal</i> or <i>Parallel Dimension Line</i> orientation.
<i>Text Precision</i>	Defines the number of digits after decimal. The text precision value can be set to the <i>Default</i> value, which means that the text precision will be inherited from the current coordinate system precision. For more information about coordinate system see page 64.
<i>Number Decimal Symbol</i>	Specifies a symbol between integral and fractional part of dimension value (period, comma or space).
<i>Text Gap</i>	Defines the gap when text splits dimension line.
<i>Text Offset</i>	Defines how far text is shown above a dimension line.
<i>Extend Line Break Length</i>	Extension lines begin next to measured object.
<i>Extend Line Over Distance</i>	Extension lines end further than dimension line.

<i>Dimension Lines</i>	Shows dimension lines of dimension object: <i>None, First, Second, Both.</i>
<i>Extension Lines</i>	Shows extension lines of dimension object: <i>None, First, Second, Both.</i>
<i>Markers Position</i>	Defines the position of markers related to extension lines.
<i>Markers Leadering</i>	The length of dimension lines when <i>Markers Position</i> is set to <i>Outside Extension Lines</i> . (note that there are two <i>Outside</i> options)
<i>Text Position</i>	Text can be placed anywhere. There are several predefined positions (inside or outside dimension lines) and also the <i>User Defined</i> option, which can be used to precisely set the text position. The <i>On Shelf</i> option draws a connecting line between text and the dimension line.
<i>Number Scale</i>	Scales (increases or decreases) value of dimension object. (Suitable if the drawing isn't at a scale of 1:1).
<i>Scale Overall</i>	Sets scale of displaying graphic elements (text, arrows) of dimension object on the screen.
<i>Brackets</i>	Encloses dimension text in brackets of specified shape: [<i>Square</i>], (<i>Round</i>), { <i>Braces</i> }, < <i>Angle</i> >, <i>None</i> .
Dimension	
<i>Style</i>	Sets dimension style for dimension object.
<i>Orientation</i>	This parameter is available only for linear dimension objects and specifies orientation (type) of linear dimension object in the drawing: <i>Aligned, Horizontal, Vertical</i> .
<i>Text</i> 	Contains text and special symbols that are interpreted when creating and editing the dimension object in the document Special symbols are the following: %N for linear dimensions, %R for radial, %D for diametric and %NU for radial. They are inserted automatically into the <i>Text</i> field when choosing dimension type. They can be combined with other text symbols, for example, the string "This line %N cm" in <i>Text</i> field becomes "This line 12 cm", "This line 15 cm", etc in the document, depending of measured object's length.

<i>Underline Text</i>	Specifies additional text under dimension line.
Geometry	
<i>Centre Radius First Second</i>	Precise coordinates of dimension object components.
<i>Shift Angle</i>	The dimension object is skewed (if applicable).

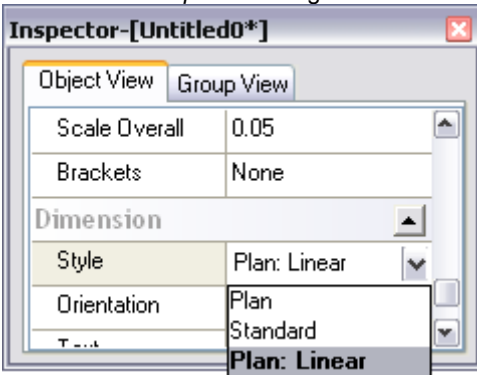
To explode a dimension object

1. Select a dimension object.
2. Choose *Explode* form *Modify* menu.

The dimension object is exploded to separate lines and text.

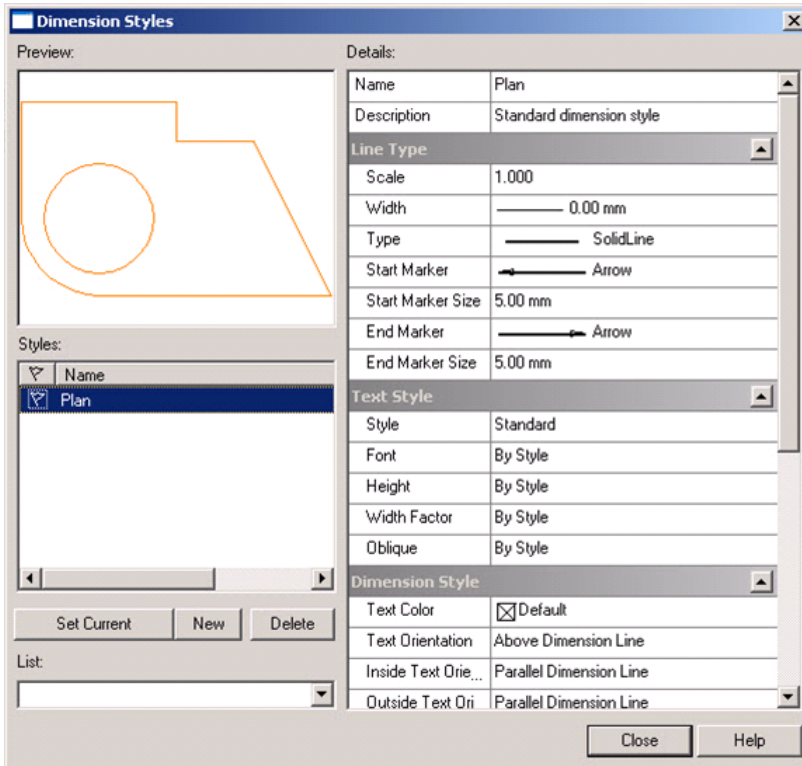
Dimension styles

Dimension objects inherit values of their parameters from dimension styles. A dimension style for a dimension objects defines in the *Style* item of the *Dimension* section in the *Inspector* dialog.




If parameters of dimension style are change, the parameters of all dimension objects using this style are also change.

The *Dimension Styles* dialog uses for creating and editing dimension styles in the program.



The preview window displays dimension objects, which edited dimension style is applied to.

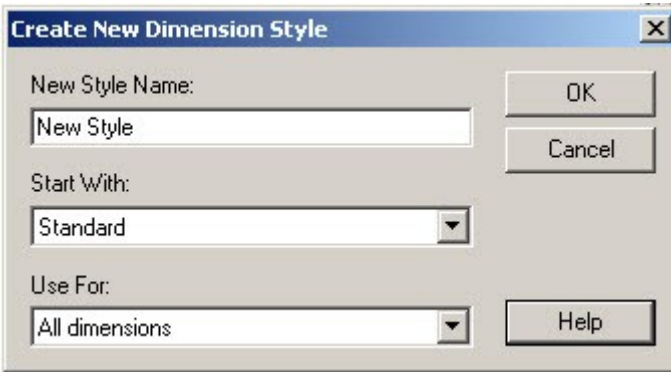
To make a style current

New dimension objects are created on a base of a current dimension style. A dimension style can be made current by selecting it from the *Style* list and pressing the *Set current* button. Current dimension style is marked with a tag .

To create a new dimension style

Press the *New* button to create a new dimension style. The *Create New Dimension Style* dialog will appear.

1. Enter a name of a new style.
2. From the dropdown *Start With* list specify a base style to create a new style. A new style will inherit the values of base style parameters.



3. In the *Use For* field choose *All dimensions*.
4. Press OK. A new style will be displayed in the list of styles.



Substyles of dimension styles

A dimension style can includes substyles for the certain dimension type:

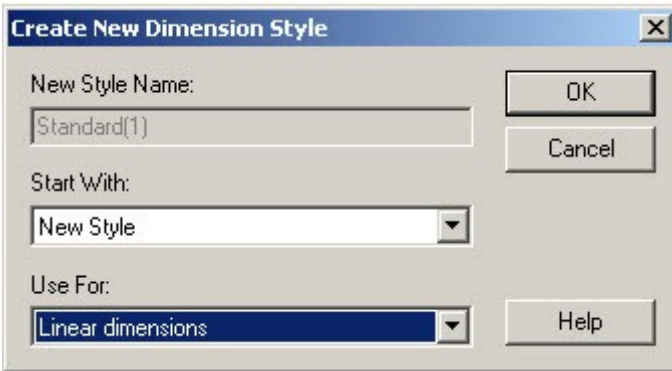
- linear dimensions;
- angular dimensions;
- radius dimensions;
- diameter dimensions.

For example, if the *ISO-25* style is created and contain a substyle for linear dimensions – *Linear*, then any linear dimension object based on the *ISO-25* style will inherite parameters from the *Linear* substyle. If a base style does not have a substyle, then settings of a base style are used.

To create a substyle

Press the *New* button to create a substyle. The *Create New Dimension Style* dialog will appear.

1. The program specifies a name of a substyle automatically. The name of a substyle will have a name of a base style and a dimension type for which the substyle is created. For example, *New style: Linear*. A style name in the top field of the dialog will be blocked.
2. In the *Start With* field specify the style which the substyle will be created for.
3. From the *Use For* dropdown list specify type of dimension objects which the substyle will be created for.



4. Press OK. Substyle will be displayed in the list of styles under the name of a base style.



To delete a dimension style

A dimension style can be deleted in case it is not set current or not appointed for one dimension object in the document. To delete dimension style select it from the list and press *Delete* button.

Editing basics

RxSpotlight offers a wide range of tools for editing vector and raster (hybrid) objects. Raster objects that look like lines, arcs, or circles are treated by many editing operations as if they were vector objects. They can be considered as *raster objects*: *raster lines*, *raster arcs* and *raster circles*.

Separate RxSpotlight objects or groups of objects can be edited, object properties modified in the *Inspector* window or by using grips. They can also be moved, copied, duplicated, rotated, scaled, mirrored, flipped in horizontal and vertical directions, align to other objects, and vector objects or images can be duplicated by such vector objects as lines, arcs, and circles. In many of these operations the Copy feature can be used to create multiple copies of edited objects. Such operations as breaking, extending and trimming objects, correcting to intersection, creating fillets and chamfers, exploding to constituent parts and many others can be applied. The selection set can include both raster and vector objects. After editing operations the nature of objects does not change: That is, raster objects remain rasters and vector objects remain vectors.

RxSpotlight supports a separate set of tools to edit polylines.

There is also a set of *Autocorrection* tools and manual correction tools that can be applied to vector objects resulting from automatic vectorization.

☒ For more information about auto correction of vectors see page 275.

The *Paste Special* and *Paste Separate* commands in the *Edit* menu add flexibility to operations that copy and paste raster data.

Editing with grips and object border

When RxSpotlight objects are selected (vectors, raster images, and raster objects), the form of selection highlighting depends on the nature of the selected object and the combination of selection methods and modes applied.

The grips mark the controls of a selected object. For example, when selecting a line, grips appear on its end points. When selecting a group, each member of the group is marked with its own grips. If selecting a block or special object like multiline text, then grips appear at its insertion point. Using grips, the geometric properties of a selected object can be modified with the mouse. The grip's size and colour can be changed in the *Grips* section of the *Preferences* dialog. The grips are also used to mark a selected image and to scale, move and rotate it. The selected image is also highlighted with a dashed border. The selected fragments of images are highlighted in colour and with a dashed border.

Drag-and-drop can be used on selected RxSpotlight objects to move them inside the document or between loaded documents. Objects can also be dragged in or out the RxSpotlight Clipbook and selections saved for future use. Selected objects can be copied, cut, and pasted inside the document or between loaded documents using commands from the *Edit* menu.

☒ For more information about the selection modes and methods see page 103.

Editing Object Properties

All properties of RxSpotlight objects can be viewed in the *Inspector* window. They can be edited as the layer an object belongs to, colour, type, and line width in the *Properties* toolbar.

☒ For more information about the *Inspector* window and *Properties* toolbar see "Inspector" on page 40.


Universal objects editing operations

These commands can be applied to such RxSpotlight objects as raster or vector objects, raster images, and raster selection.

The *Inspector* window can be used to display the parameters of a current command or selection.


Before running these commands, select some RxSpotlight objects.

Move


1. Choose *Move* from the *Modify* menu or press the  button on the *Modify* toolbar.
2. Specify the start and end points for moving.

Selected objects can also be moved by steps in vertical or horizontal directions pressing the arrow keys on the keyboard. The step size and grid usage are specified in the *Grid setup* dialog, described on page 306.

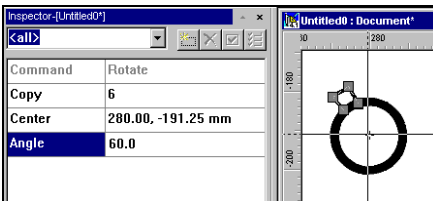
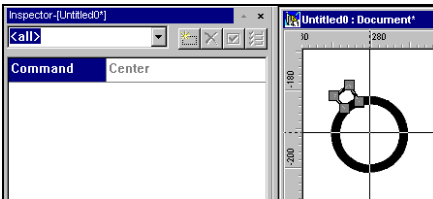
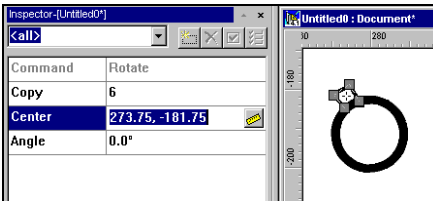
Copy



1. Choose *Copy* from the *Modify* menu or press the  button on the *Modify* toolbar.
2. If necessary, then specify the number of copies in *Copy* of the *Inspector* toolbar.
3. Specify the start and end points of moving.

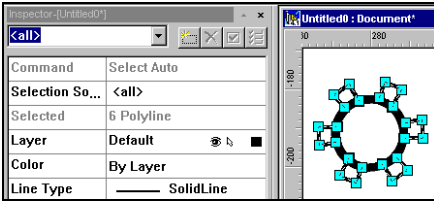
Duplicate

Choose *Duplicate* from the *Modify* menu or press the  button on the *Modify* toolbar. The shift distance of newly created object equal to one RxSpotlight grid step.

Rotate



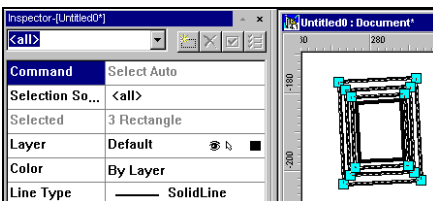
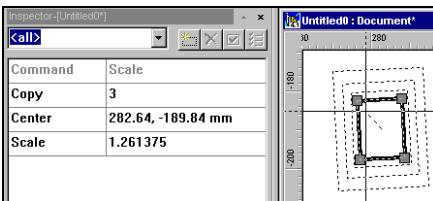
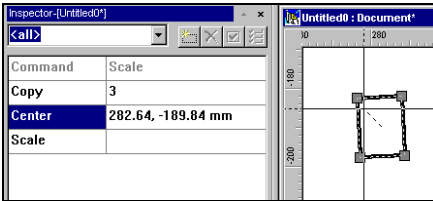
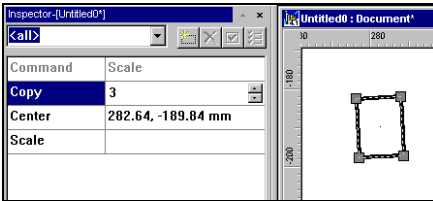
1. Choose *Rotate* from the *Modify* menu or press the  button on the *Modify* toolbar.
2. If necessary, then specify the number of repetitions of rotation in the *Copy* field of the *Inspector* toolbar. Setting *Copy* to 0 removes the original object and creates one rotated copy.
3. Specify a point around which objects are to be rotated: enter its coordinates in *Center* of the *Inspector* toolbar or specify it on the screen, using the tool , which is displayed when this box is activated.
4. Enter a rotation angle in *Angle* of the *Inspector* toolbar or specify it on the screen with two points. In the latter case, the result of the *Rotate* command is displayed on the screen with rubber lines until the command is completed by pressing the mouse button.





The result.

If the rotation centre coordinates is not specified in step 3, then object(s) are rotated around the geometrical centre of selection.

Scale




1. Choose *Scale* from the *Modify* menu or press the  button on the *Modify* toolbar.
2. If necessary, then specify the number of copies in *Copy* of the *Inspector* toolbar. Setting *Copy* to 0 removes the original object and creates one scaled copy.
3. Specify a point by which objects are to be scaled: enter its coordinates in *Centre* of the *Inspector* toolbar or specify it on the screen using the tool , which is displayed when this box is activated.
4. *Scale* field contains a multiplier of dimensions of the selection applied on each scaling step. This can be set by controlling rubber-lines in the screen with the mouse.

The result.



If the scaling centre coordinates is not specified on step 3, then object(s) are scaled from the geometrical centre of selection.

Mirror

1. Choose *Mirror* from the *Modify* menu or press the  button on the *Modify* toolbar.
2. To erase the original object, choose 0 from *Copy* of the *Inspector* toolbar; choose 1 to leave the original object intact.
3. Enter the coordinates of mirror axis start point in *Start* of the *Inspector* toolbar or specify its position on the screen.
4. Enter a rotation angle of the mirror axis relative to the positive X-axis in *Angle* of the *Inspector* toolbar or specify the second point of mirror axis on the screen.

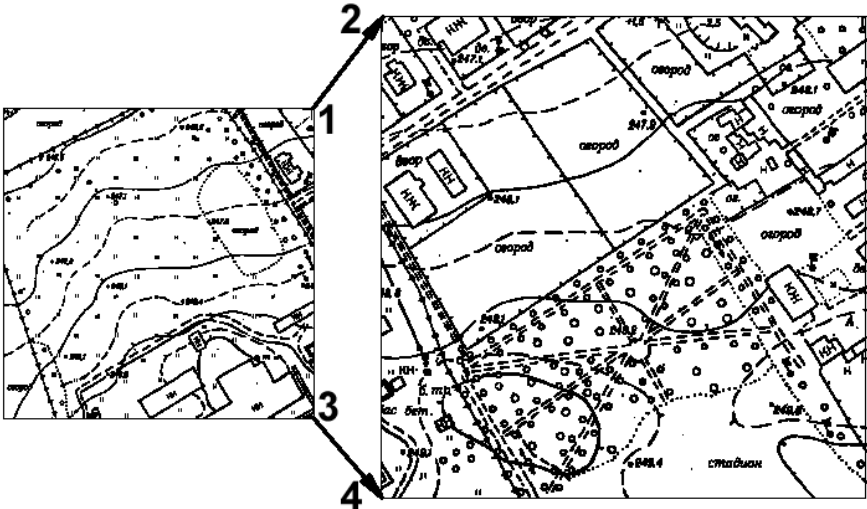
Flip Horizontal or Vertical:

These commands are similar to *Mirror*. The selected objects are mirrored by the central horizontal or vertical axis of the selection without keeping initial objects.

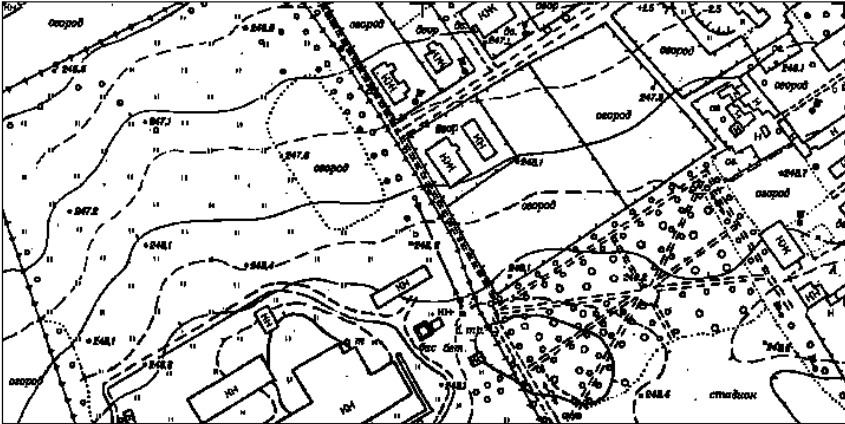
Choose Flip Horizontal or Flip Vertical from the Modify menu or press the  or  button on the *Modify* toolbar.

Aligning


Selected RxSpotlight objects can be aligned to other objects.



This figure presents two fragments of different scales, which can be joined using *Align*. The result of the operation is shown on the next figure.




To align RxSpotlight objects:

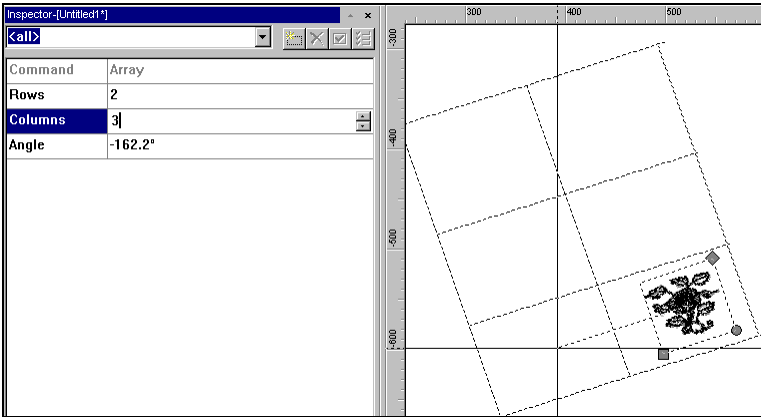
1. Select a RxSpotlight object to be aligned.
2. Choose *Align* from the *Modify* menu or press the  button on the *Modify* toolbar.
3. Specify the first point (point 1) on the aligned object; this point must be pulled to the corresponding point of the object (point 2) - the first object is to be aligned to the second one.
Specify point 2.
Specify the second point (point 3) on the aligned object; this point must be pulled to the corresponding point of the object (point 4) - the first object is to be aligned to the second one.
Specify point 4.

Creating an Array

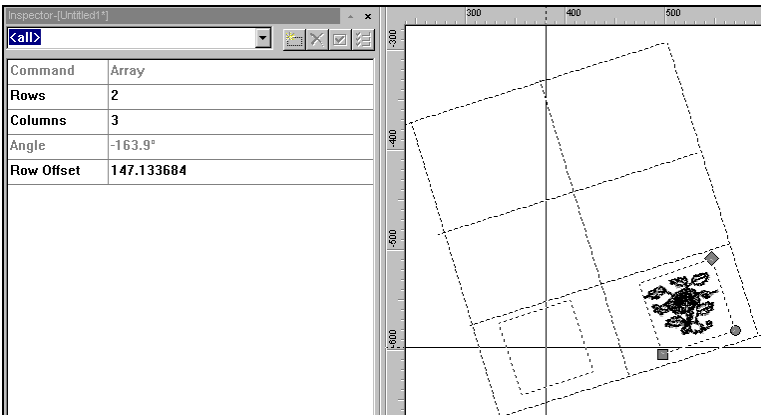
This command is used to create a two-dimensional array of selected objects with a specified number of rows and columns.

To create an array:

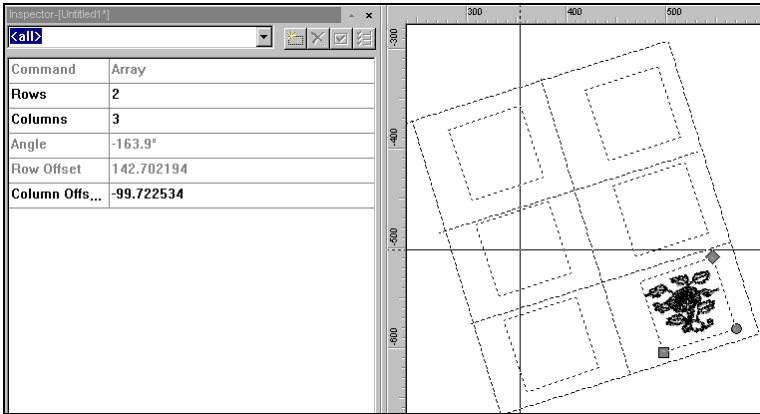
1. Select an object or objects to be multiplied.
2. Choose *Modify > Array* or press the  button on the *Modify* toolbar. The *Inspector* window shows *Rows*, *Columns* and *Angle* fields.
Type in the number of rows and columns in the array; the angle value can be typed in or specified by mouse click in the document.



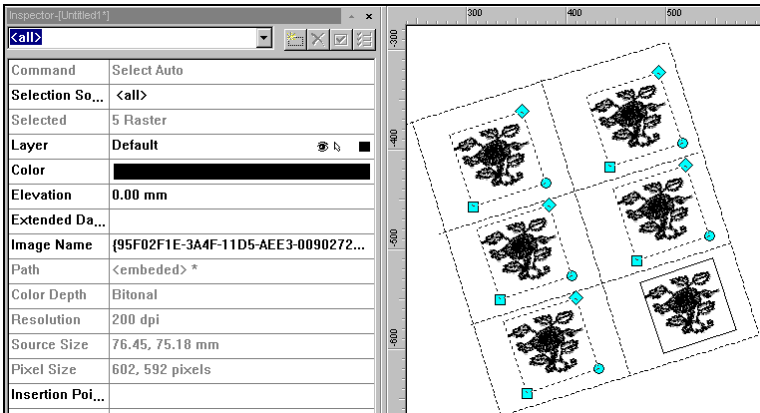
3. After specifying the angle the dashed contours of the multiplied objects are shown and a new field shows in the *Inspector* window: *Row offset*. The distance between objects in a row can be specified by typing it in or clicking the mouse between when the dashed contours fall into the desired position.



4. Finally the *Column offset* field must be filled or click the mouse button when dashed contours of multiplied objects form the columns of the array.



The result – array of flowers.

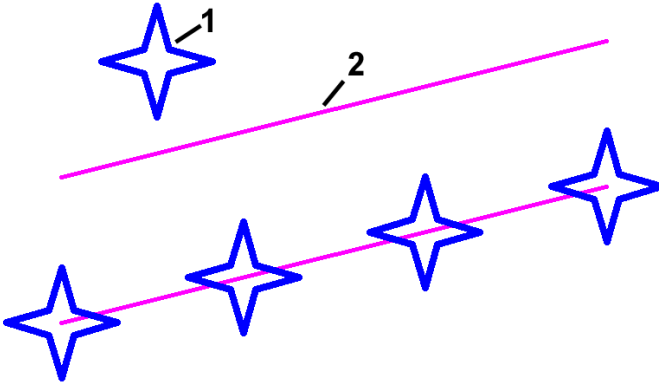


Duplicate by vector

Use this command to copy selected RxSpotlight objects along such vector objects as lines, arcs, and circles.

A vector object, along which RxSpotlight objects are duplicated, is proportionally divided in accordance with the specified number of copies for the duplicated object. The duplicated object insertion point can be specified, were the duplication is to be performed. Otherwise the insertion point will be the selection geometric centre.


The copies are rotated when copying an object by arc or circle.




This figure shows the result of applying *Duplicate by vector* to object 1 by vector line 2

To Duplicate by vector

1. Select the RxSpotlight object or objects to be duplicated by vector.
2. Start the *Duplicate by vector* command:

Choose Duplicate by vector from the Modify menu or press the  button on the *Modify* toolbar.

3. Specify the number of copies in *Copy* of the *Inspector* toolbar.
4. Specify the insertion point for the duplicated objects: enter its coordinates in *Origin* of the *Inspector* toolbar or specify it on the screen using the  tool, which is displayed when this box is activated.

If the centre coordinates have not been specified, then *Duplicate by vector* will be performed by the central point of the selection.

5. Using the pointing device specify an object (line, arc, or circle), by which *Duplicate by vector* will be performed.

Composing complex objects

To insert a complex object composed of several objects in the document, use one of the following methods:

1. Create a block (see page 235). The advantage of using this method is that a block definition is saved with the document and an unlimited number of blocks can be inserted. All block insertions in the document can also be changed automatically by changing the original block definition.
2. Create a *group* of objects (see page 257). A *group* is a unity that can be copied and multiplied using the *Paste* command in the *Edit* menu. When closing the document, the information relating to the objects' grouping is saved.

RxSpotlight can also create and save *Markers* in separate files to indicate line ends (see page 258) and *Fill Shapes* to fill closed areas (see page 261).

Complex objects can also be used in the search-replace procedure, as well as in the training symbol recognition procedure (see page 198).

Note that the RxSpotlight Clipbook feature can also be used (see page 72) to facilitate working with complex objects.


Groups

A *group* is made up of multiple RxSpotlight objects united in order to apply various commands to them. Commands can be applied to several selected objects without grouping them, but in this case the next selection will replace the previous. Forming a group allows the selection to be saved for use at a later time and also allows other objects to be selected without changing the group contents.


A group can be set with the *Group* command, which is applied to selected objects, and ungrouped with *Ungroup*.

An object that belongs to a group is selected, the *Inspector* window displays the message that more than one object is selected. All the grouped objects on the screen can be seen by selecting any of the objects that belong to the group, and then running *Zoom Selected* from the *View* menu.

To set Group

1. Select the required RxSpotlight objects.
2. Choose *Group* from the *Modify* menu or press the  button on the *Modify* toolbar.

To ungroup


1. Select one of the grouped objects.
2. Choose *UnGroup* from the *Modify* menu or press the  button on the *Modify* toolbar.

Exploding blocks and complex objects

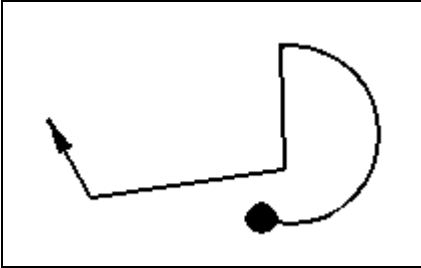
Exploding objects converts composite objects back to their constituent parts. For example, exploding such objects as polylines or rectangles reverts them to simple lines and arcs. A block is exploded to a set of constituent objects.

One operation of the *Explode* command explodes composite objects by one level only. When exploding a block that contains a polyline, the polyline needs to be exploded separately.

To explode objects

1. Select block or vector object to explode.
2. Choose *Explode* from the *Modify* menu or press the  button on the *Modify* toolbar.

End Markers







Polyline decorated with markers of arrow and filled circle shapes

End Markers are special objects that can be added to the end points on linear objects: lines, arcs, and polylines during drawing. The most common example of an End Marker is an arrow.

Several predefined markers can be used, replaced, and new ones created and saved for future use.

To add a marker to the end of the line

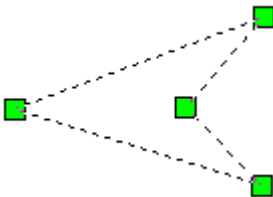
1. Draw an object or select an existing one.
2. Open the *Inspector* window ( button).
3. From *Line Type* select any option other than *By Layer* or *By Block*. The list will change and new fields will appear:

Line Type	 SolidLine
Start Marker	 Arrow
Start Marker Scale	5.00
End Marker	 filledcircle
End Marker Scale	7.00


4. Choose *Start* and *End Markers* and specify *Scale* values – the multipliers of the marker objects size.
New drawn objects can be decorated with chosen markers. .

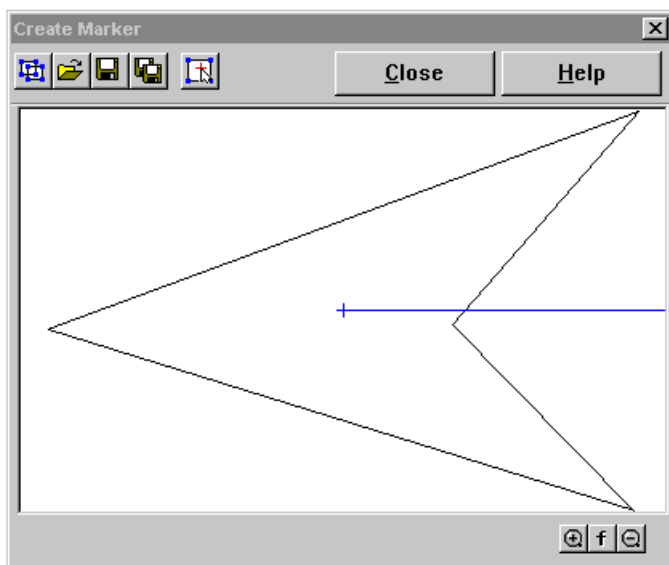
To create End Marker


1. Select one or several vector objects.

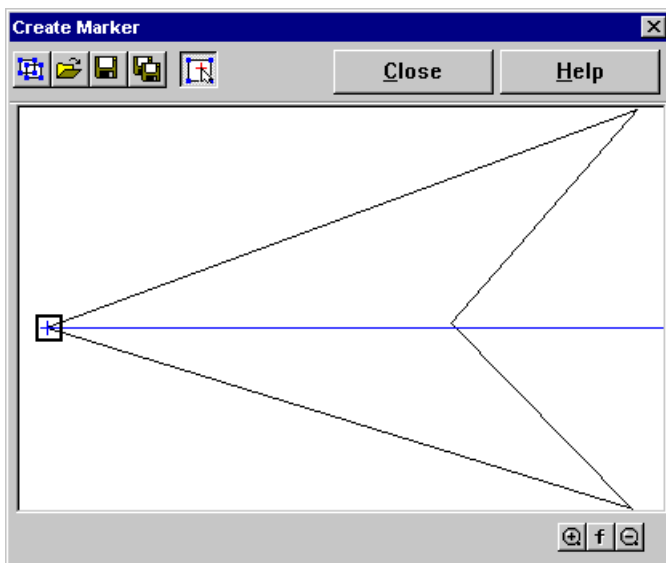



This selected closed polyline is ready to be converted into a marker; it may be filled, and may also be composed of several objects.

- From the *Tools* menu select *Create Marker* command or press  button on *Draw* toolbar.
- The selected objects will appear in the *Create Marker* dialog box:








- To create a marker, click the  button and specify a marker origin as the centre of the square-shaped cursor. Note that end markers must be prepared so that they fit to the horizontal line coming out of the marker origin using the *Create Marker* dialog.



- Click  button to save the marker. The MARKERS subfolder is used to save marker definitions; all markers saved in *.MRK files of this folder are automatically loaded during a RxSpotlight session.

Buttons in Create Marker dialog box


	Create marker from selection	Places a selected object from the document workspace to <i>Create Marker</i> window
	Load marker from file	Opens *.MRK file and loads marker to <i>Create Marker</i> window
	Save	Saves a marker in *.MRK file
	Save As	Saves a new or changed marker in a new *.MRK file
	Pick Marker Origin	Allows users to specify the origin point to which a line end would be attached

Zoom buttons in the window bottom allow the details to be seen. The *Fit* button (with letter “f”) scales the marker to fit the *Create Marker* window.

Fill Shape symbols


Custom shapes can be created to fill closed objects. In RxSpotlight you several predefined shapes can be used, replaced, and new shapes created and saved for future use. All shape definitions are located in the FILLSHAPES subfolder of the RxSpotlight program folder as *.SHF files. They are automatically loaded at the start of each RxSpotlight session.

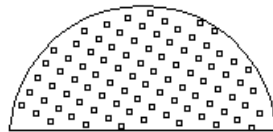
To fill a closed area with shapes

1. Select a closed object – circle, closed polygon, rectangle, etc.
2. Open the *Inspector* window ( button).
3. Select TRUE in *Filled*, then *ShapeFill* in *Hatch Type* and then select a *Hatch Shape*.

The selected object will be filled with shapes placed on the vertices of an invisible rectangular grid.

4. Specify *Hatch Step* and *Hatch Angle* to modify the size and orientation of this invisible rectangular grid.



Hatch Type	 ShapeFill
Hatch Shape	filledrect
Hatch Step	20.00 mm
Hatch Angle	80.0°






Result

The filling shape specification in the *Inspector* window

To create a fill shape symbol

1. Select one or several vector objects.
2. From the *Tools* menu select the *Create Fill Shape* command or press  button on the *Draw* toolbar.
3. The selected objects will appear in the *Create Shape* dialog box
4. Click  button to save the shape. The FILLSHAPES subfolder is used to save shape definitions; all shapes saved as *.SHF files of this folder are automatically loaded during a RxSpotlight session and their names appear in the *Hatch Shape* list.

Buttons in Create Shape dialog box

	Create a shape from a selection	Places selected object from the document workspace to the <i>Create Shape</i> window
	Load shape from file	Opens *.SHF file and loads a shape to the <i>Create Shape</i> window
	Save	Saves a shape as a *.SHF file



Save As

Saves existing or changed shape in a new *. SHF file

Zoom buttons in the window bottom allow the details to be seen. The *Fit* button (with letter “f”) scales a shape to fit the *Create Shape* window.


Editing vector objects

The operations described in this section can be applied only to vector and raster lines, arcs and circles, polylines, and polygons.

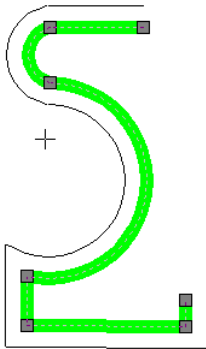
Offsetting

Offsetting creates a new RxSpotlight vector object similar to that which is specified.

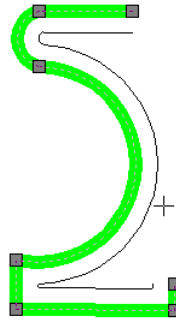
To offset an object (or objects)

1. Select object(s).
2. Choose *Correct>Offset* or press the  button on *Vector Correction* toolbar. Select one of the proposed positions for offset copy. Specify *Offset distance* in the *Inspector* window or click to confirm.

The lines are duplicated. Polylines, polygons, arcs, rectangles and circles are supplied with enlarged or reduced copies.



Offsetting outside creates a larger object.



Offsetting inside creates a smaller object, or nothing, if the *Offset distance* is too large.

Merging with converting vector types

Due to the poor quality of some raster objects, vector objects obtained from automatic vectorization sometimes need to be corrected. Such correction is needed when after recognizing such objects as lines, circles, arcs, and polylines, a number of separate vector fragments are obtained. For example, several line segments are obtained

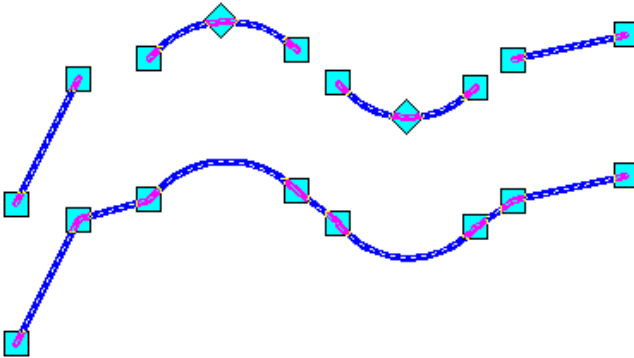
instead of a single continuous vector line, a raster circle was recognized as a number of arcs, a polyline as a number of arcs and segments, etc.

The commands described in this section allow users to merge selected vector fragments to a single object. The type of object can also be changed. For example, if a raster circle was incorrectly recognized as a polyline.

Though the merging commands are called *Merging vectors to...* and the descriptions of other commands in this section instruct how to edit vectors, these commands can also be applied to raster objects.


Merging Vectors to Polyline

This command will merge arbitrary vector fragments to a polyline.



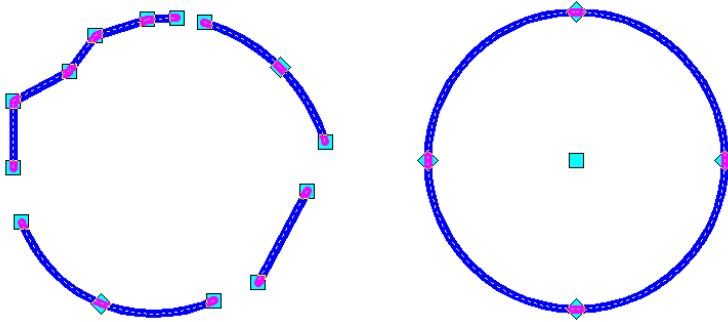
Vector objects in the upper part of the drawing were converted to a polyline

To Merge Vectors to Polyline

1. Select the vectors to merge to a polyline.
2. Choose *Merge Vectors to > Polyline* from the *Correct* menu or press the  button on the *Vector Correction* toolbar.


Merging Vectors to Circle

This command will merge arbitrary vector fragments to a circle.



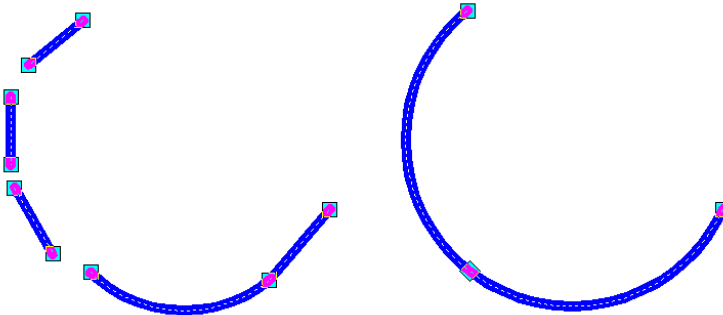
Vector objects in the left part of the drawing were converted to a circle

To Merge Vectors to Circle

1. Select the vectors to merge to a circle.
2. Choose *Merge Vectors to > Circle* from the *Correct* menu or press the  button on the *Vector Correction* toolbar.


Merging Vectors to Arc

This command will merge arbitrary vector fragments to an arc.



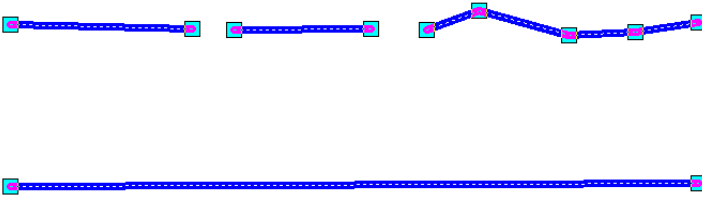
Vector objects on the left of the drawing were converted to an arc

To Merge Vectors to Arc

1. Select the vectors to merge to an arc.
2. Choose *Merge Vectors to > Arc* from the *Correct* menu or press the  button on the *Vector Correction* toolbar.


Merging Vectors to Line

This command will merge arbitrary vector fragments to a line.



Vector objects in the upper part of the drawing were converted to a line


To Merge Vectors to Line

1. Select the vectors to merge to a line.
2. Choose *Merge Vectors to > Line* from the *Correct* menu or press the  button on the *Vector Correction* toolbar.

Merging Vectors with auto defining of the resulting object type

RxSpotlight can automatically define the type of vector object obtained via merging. The set of selected fragments is analyzed and converted to the object that is the closest in geometry to the selected set.

To Merge Vectors Auto

1. Select the vectors to merge.
2. Choose *Merge Vectors to > Auto* from the *Correct* menu or press the  button on the *Vector Correction* toolbar.

Converting polyline to spline

The *Convert to Spline* command from the *Correct* menu converts a selected polyline to a spline; the polyline nodes are used as fit points. A spline can be also draw with the *Spline* command from the *Draw* menu.

The conversion of a closed polyline results in a closed spline.

A spline can be converted to a polyline using the *Merge Vectors to Polyline* command from the *Correct* menu or the *Explode* command from the *Modify* menu.

To convert a polyline to a spline

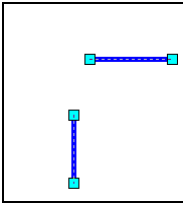
1. Select polyline(s) to convert.
2. Run the *Convert to Spline* command from the *Correct* menu.

The polyline properties that are typical of a spline will be inherited (for example, end markers, fill type and others) by the created spline.

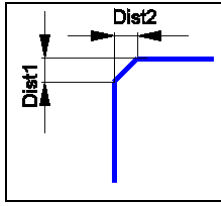
Creating chamfers

A chamfer is a line object that connects two nonparallel lines or polylines. The connected lines or polylines are trimmed or extended if necessary.

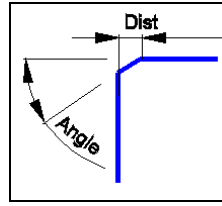
There are two methods to create a chamfer: by specifying two distances and by distance and angle.



Original objects




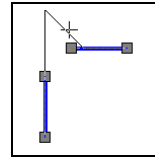
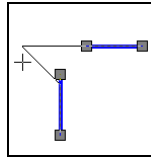
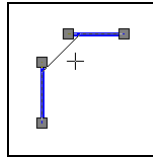
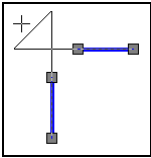
Chamfer by two distances



Chamfer by distance and angle

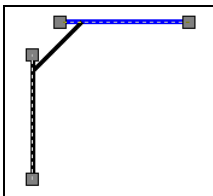
To create a chamfer:

1. Select two vector lines.
2. Choose *Correct > Create Chamfer* or press  button on the *Vector Correction* toolbar.
3. Choose chamfer creation method in the *Chamfer method* field of the *Inspector* window. Specify two distances or an angle and distance.
4. Using the mouse, select one of the chamfers.

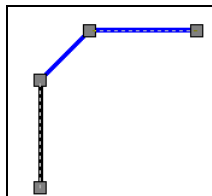


Following the mouse, RxSpotlight offers several positions for the chamfer

5. Set *Correct vectors* to FALSE if lines are not to be extended or trimmed; otherwise set TRUE.



Correct vectors is FALSE



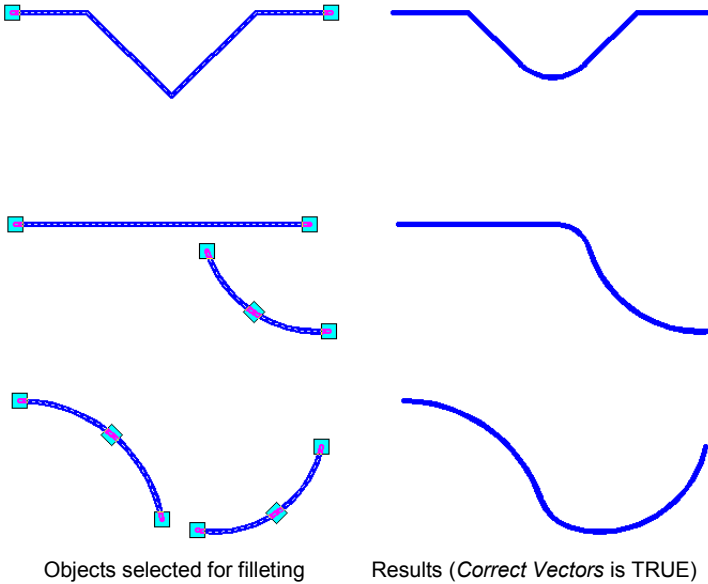
Correct vectors is TRUE

6. Click ESC to finish chamfer creation or choose Exit from the right button menu.


Creating fillets

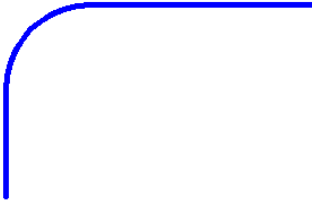
A fillet connects two objects with a smooth fillet arc of a specified radius. A fillet can be applied to lines, arcs, and circles. The radius of an arc that connects filleted object is called a fillet radius. The radius value of a fillet arc, when doubled, cannot be less

than the minimum distance between the two filleted objects. When filleting objects, specify a fillet radius and choose to trim or not to trim the filleted vectors.



To fillet Vectors

1. Select two or more vector objects to fillet.
2. Choose *Create Fillet* from the *Correct* menu or press the button  on the *Vector Correction* toolbar.
An auxiliary arc appears on the screen. Its radius is equal to the last fillet value applied.
3. Open the *Inspector* window to redefine the fillet radius and choose the mode to trim or not to trim filleted vectors.
Enter the fillet radius in the corresponding box of the *Inspector* toolbar.
In *Correct Vectors* set TRUE to trim the filleted vectors, or FALSE if the filleted vectors are to remain untrimmed.
4. Move the auxiliary arc to the pair of objects to be filled and choose the right position of the fillet.
5. Click to accept changes.



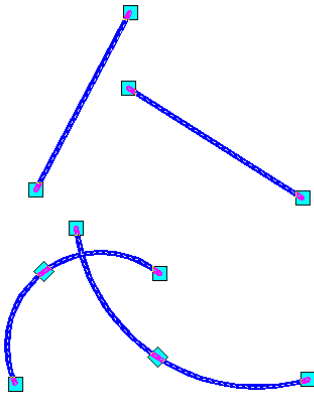
The two lines filleted with *Correct Vectors* set to TRUE



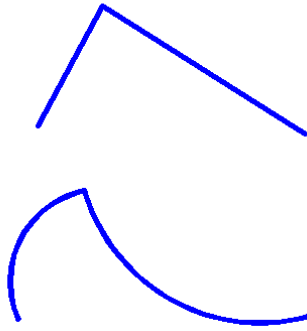
The two lines filleted with *Correct Vectors* set to FALSE

Correcting to intersection

This command is applied to correct vector objects which are supposed to be joined at an intersection by trimming or expanding accordingly. Correct to intersection can be used on a pair of lines, arcs, and circles as well as different combinations of these objects.




The objects selected for Correction to Intersection



Results

To correct to Intersection

1. Select one or more vector objects to correct to Intersection.
2. Choose *Correct To Intersection* from the *Correct* menu or press the  button on the *Vector Correction* toolbar.
3. If the object is expanded, then the screen displays an auxiliary line, which indicates the expected position of the vector object.
4. Move the cursor to the appropriate pair. The expected position of the objects is highlighted on the screen.
5. Click to accept changes.

Correcting by Edge


Edge is a temporary set of vector objects with a special function. The vector objects included in Edge are a contour, which can be used with the commands *Break/Expand/Trim* from the *Modify* menu. Use Edge to trim vector image parts that are outside the Edge, trim vector objects by the Edge, and also expand vector lines up to the Edge. Objects that compose an Edge are highlighted with specific highlighting; the number of objects that compose Edge can be seen in the *Inspector* window.

Only one Edge can be set in the document; if a new one is set, the previous is automatically ungrouped. The Edge contents are not saved when closing the document unlike the contents of a group or a block.

Tune the parameters of Edge display, as well as colour and width by highlighting **B** in the *Preferences* dialog box.

✉ For more information about Preferences see “**Tuning the application**” on page 389.

To set an Edge

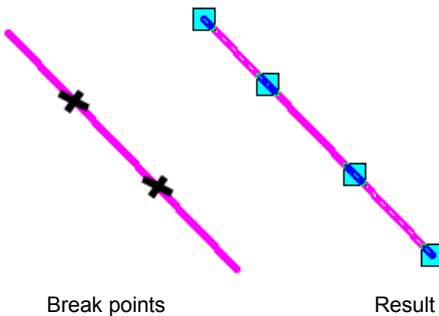
1. Select objects to compose an Edge that can be defined by one or more objects.
2. Choose *Group/Ungroup Edge* from the *Correct* menu or press the  button on the *Vector Correction* toolbar.


Breaking vectors

Vector objects, such as lines, arcs, circles, polylines and others can be broken into smaller parts using the *Break* command. It is possible to specify points on the vector object at which to break it, and also a break boundary by which the selected vector objects are supposed to break. Edge can be used as a break boundary.

To Break vectors

In the following example the raster line is broken into three segments. The break points are specified on the object.

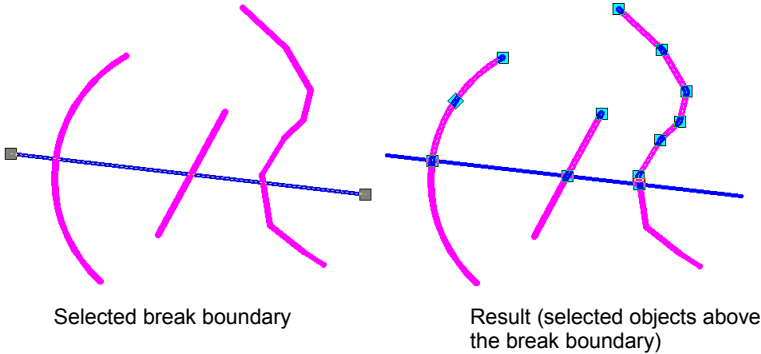



1. Choose *Break vectors* from the *Correct* menu or press the  button on the *Vector Correction* toolbar.

- Specify the points on the vector object at which to break it.

To Break vectors by break boundary

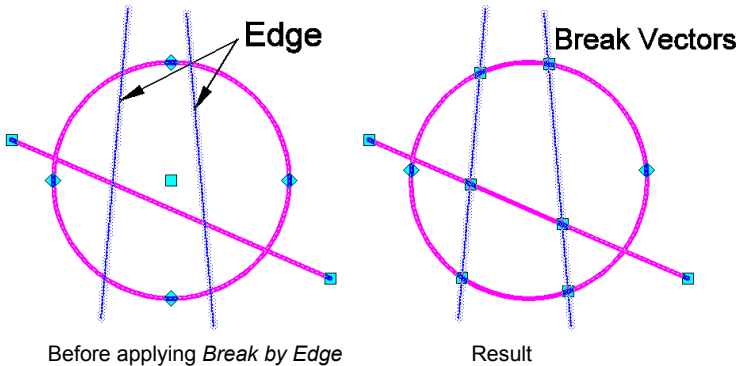
In the following example, first select a line, which will be a break boundary, then specify the objects to be broken. The boundary can be defined by one or more objects.



- Select the vector object or objects to break by boundary.
- Choose *Break vectors* from the *Correct* menu or press the  button on the *Vector Correction* toolbar.
The vector objects that were defined as the cutting edge will be highlighted.
- Specify one by one the vector objects to be broken.

To Break vectors by Edge


In the following example, first specify an Edge, and then select the objects to be broken by this Edge.



- Set an Edge.

For more information on setting of the Edge see page 269.

- Select vectors to break.

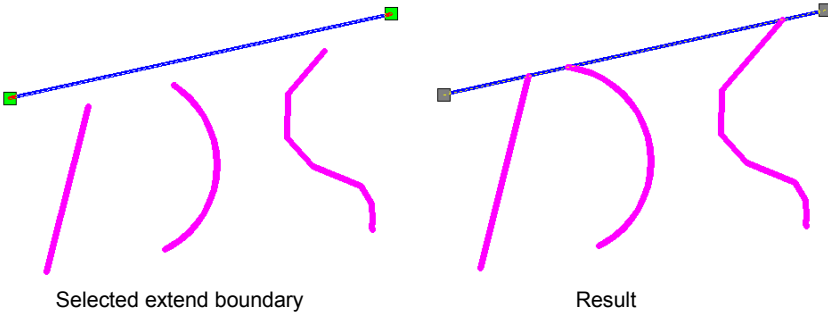
- Choose *Break vectors* from the *Correct* menu or press the  button on the *Vector Correction* toolbar.


Extending vectors

Vector objects can be extended so that they end precisely at the boundary defined by other objects. One or several selected objects can be used, and also Edge as a boundary.

To Extend vectors by boundary

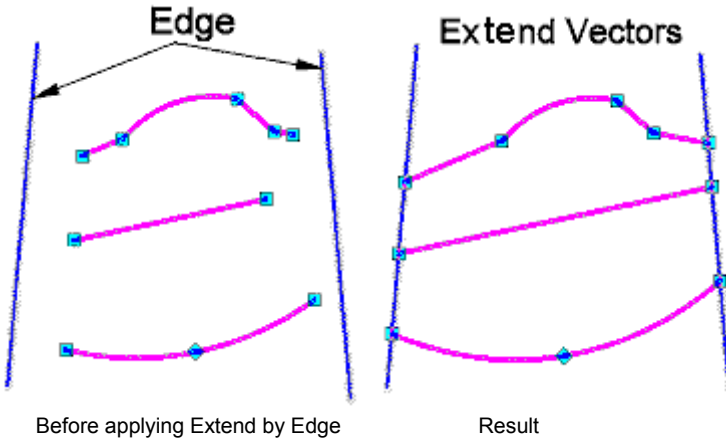
In the following example, first select a line that will be a boundary, and then specify the objects to be extended to the boundary.



- Select the vector object or objects to specify a boundary.
- Choose *Extend Vectors By Edge* from the *Correct* menu or press the  button on the *Vector Correction* toolbar.
- Select vector objects to be extended one by one.

To Extend vectors by Edge

In the following example first specify an Edge, and then select the objects to be extended to this Edge.




1. Set the Edge.

For more information on setting of the Edge see page 269.

2. Select the vectors to expand.

Note: this command can only be applied to non-closed vector objects.

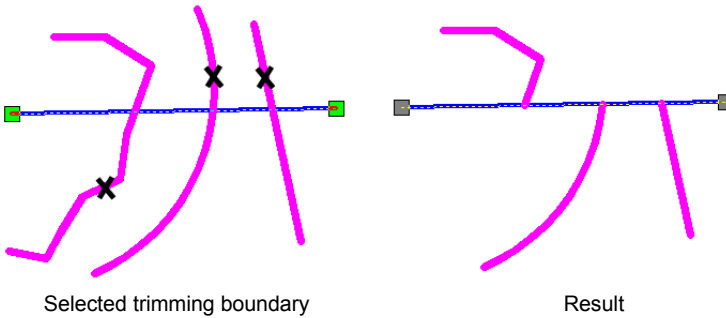
3. Choose *Expand vectors By Edge* from the *Correct* menu or press the  button on the *Vector Correction* toolbar.


Trimming vectors

An object can be trimmed precisely to the boundary defined by one or more objects. A trimming boundary can be composed of lines, arcs, circles, polylines, and others. If a trimming boundary has any width, then the objects to be trimmed are trimmed along the centreline of this boundary. An Edge can be used as a boundary.

To Trim vectors by boundary

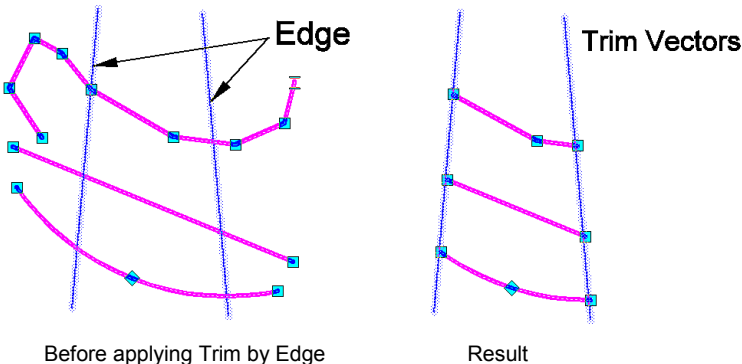
In the following example, first select a line that will be a trimming boundary, then specify one by one the objects to be trimmed.



1. Select a vector object to be used as a trimming boundary.
2. Choose *Trim Vectors By Edge* from the *Correct* menu or press the  button on the *Vector Correction* toolbar.
3. Specify a part of the vector object to be trimmed.

To Trim vectors by Edge

In the following example, first specify as Edge, then select the objects to be trimmed by this Edge. All parts of the selected vector objects located outside the Edge are trimmed.




1. Set an Edge.

For more information on setting of the Edge see page 269.

2. Select the vectors to trim.


❖ This command can only be applied to non-closed vector objects.

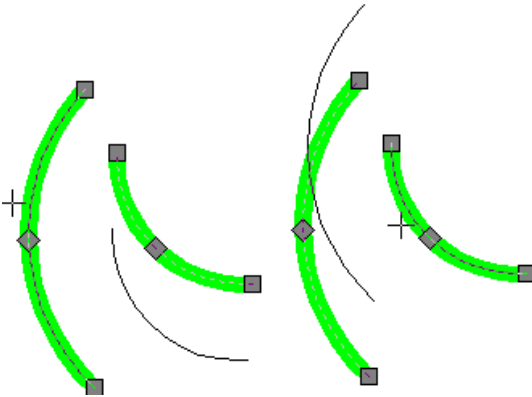
3. Choose *Trim vectors By Edge* from the *Correct* menu or press the  button on the *Vector Correction* toolbar.

Aligning angle and distance

This command can be very useful to align lines, arcs and circles. Lines are aligned by one of the lines so that the resulting lines are parallel; arcs and circles become concentric after alignment.

To align objects' angle and distances:

1. Select the objects to be aligned and choose *Correct > Align angle and distance* or press the  button on the *Vector Correction* toolbar.
2. Place the mouse cursor near the aligning object. RxSpotlight will suggest various positions for the aligned objects.
3. Set aligning options in the *Inspector* window (see description below).

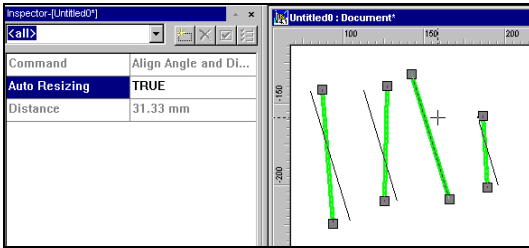


RxSpotlight suggests one of two possible positions for the created object (thin lines), depending on the position of the mouse pointer (cross). The resulting arcs are concentric.

4. Press ENTER to confirm aligning.

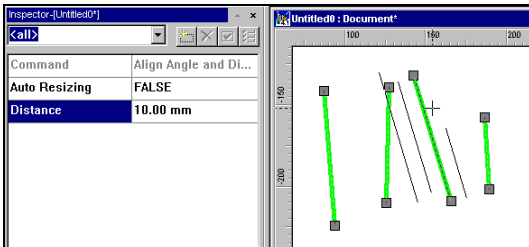
The command has two options that can be controlled in the *Inspector* window.

If *Auto resizing* is set to FALSE, then the distance between aligned lines or radiuses of aligned arcs and circles can be set in the *Distance* field. A zero value in the *Distance* field means that no resizing is applied – lines preserve their native positions and only angles are changed; circles and arcs preserve native radiuses. If *Auto resizing* is set to TRUE, then RxSpotlight aligns objects automatically, spreading them at even distances to each other across the selection.

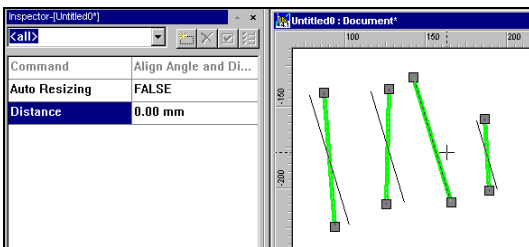


The pictures represent the suggested result of alignment of lines by the third one from left (note cross cursor near it).

The *Auto resizing* is TRUE and the *Distance* is calculated automatically.



The *Auto resizing* is FALSE and the *Distance* is set to a relatively small value.



Now the *Auto resizing* is FALSE and the *Distance* is set to 0.

The lines are only rotated around their centre points to align angles with the third line from the left.

When aligning circles and arcs with *Align Angle and Distance* the centres of aligned circles must fall inside the aligning circle.

The most common usage (but not the only one) of *Align Angle and Distance* correcting vector objects created during automatic vectorization. If the selection contains objects of different types, then RxSpotlight will do its best to perform aligning. If confused with the operation of these commands, then try simple examples first.

Vector auto correction

This procedure is intended for automatic correction of automatic and semi-automatic vectorization (tracing) results. It processes such vector objects as lines, arcs, and circles. After applying *Auto correction* it is also recommended to apply manual vector correction, if needed.


The results of *Auto correction* performance depends on the width of corrected vectors.

Autocorrection allows users:

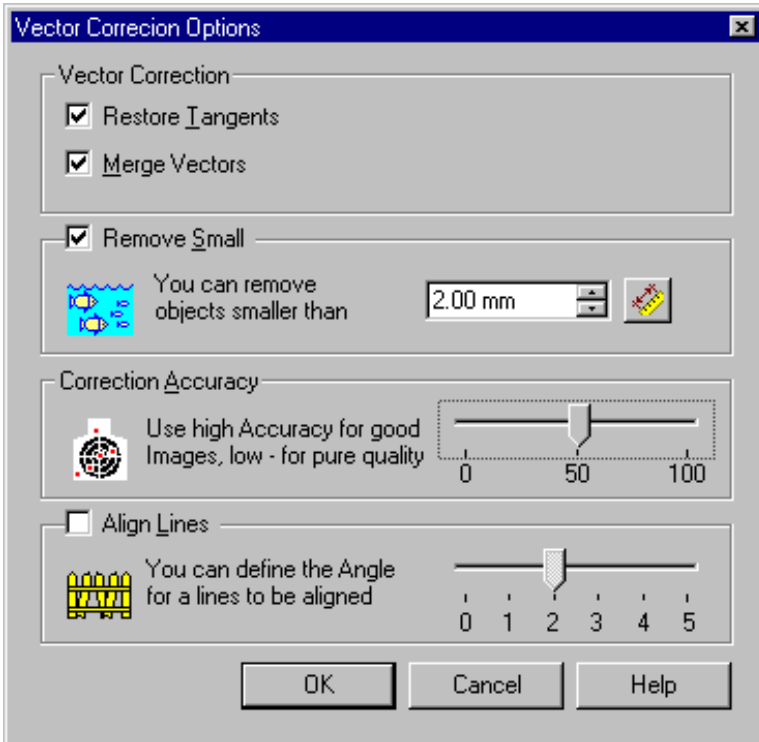
- To restore the contact of lines with arcs and circles
- To “stick together” vector fragments in entire objects

- To delete vector objects if their size is smaller than specified. A line size is defined by its length, a circle size – by diameter, an arc size – by its largest projection onto the X and Y-axis.
- To align lines to regular directions (angle 0°, 30°, 45°, 60°, 90°, etc.) if their deviations from the specified values do not exceed the specified value.

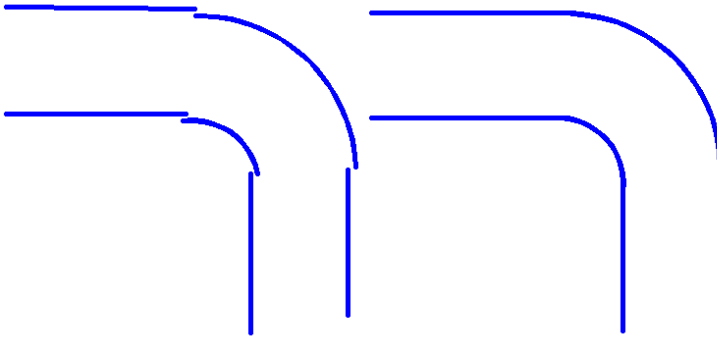
To tune the *Auto correction* parameters

1. Choose *Vector Correction Options* from the *Convert* menu or press the  button on the *Vector Correction* toolbar.

The following dialog appears:



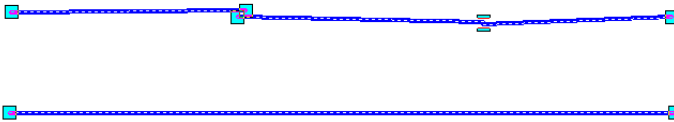
2. Turn on the *Restore Tangents* checkbox to restore the contact of lines with arcs.




Before applying *Restore Tangents*

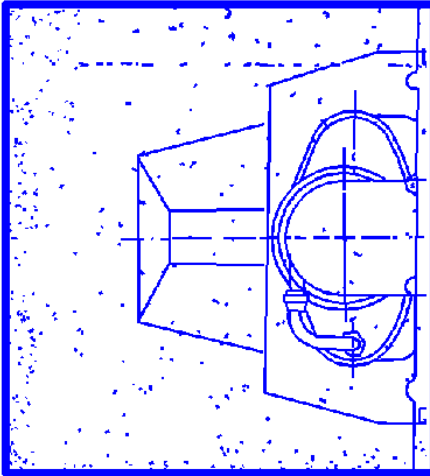
Result of the *Autocorrect* command

3. Turn on the *Merge Vectors* checkbox to “stick together” vector fragments into one object.

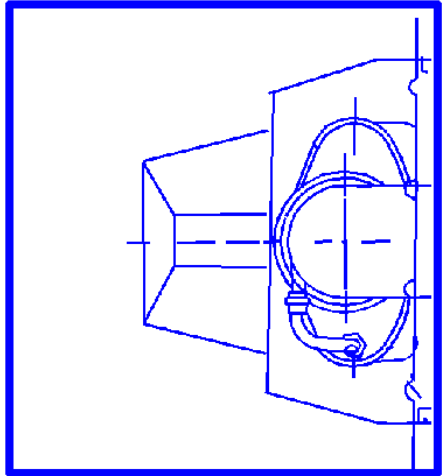


The lower figure shows the result of applying Merge for these three lines.


4. Turn on the *Remove Small* checkbox if automatic vectorization created some vector speckles – i.e. small vector objects that are not required.
 The size of a vector speckle is defined in one of following ways: for a line – by its length, for a circle – by its diameter, for an arc – by its largest projection onto the X and Y-axis.
 Specify the maximum size of speckle – all speckles with a size less or equal to this value will be removed.
 Enter the maximum value for vector speckle in *Remove Small*. The measurement tool can also be used. Click on  and specify two points on the document, which define the size of a vector speckle.



Before applying *Remove Small*

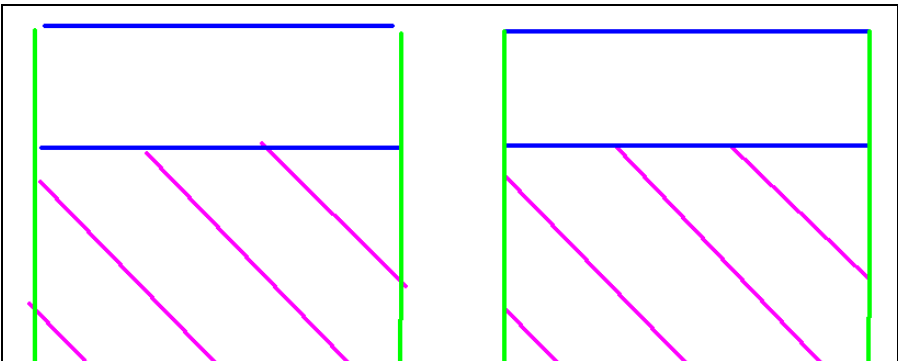


Result of the *Auto correct* command

5. Enter the required value of *Correction Accuracy* in the corresponding box. Use high *Accuracy* for images of good quality, low for images of poor quality.
6. Turn on the *Align Lines* checkbox to use the feature of line alignment to regular angles. Enter the deviation angle value in *Align Lines* – the command will align regular angles to those lines who's deviations from the regular directions are equal to or smaller than the specified angle.
7. Choose *Vector Autocorrect* from the *Convert* menu or press the  button on the *Vector Correction* toolbar.

Example of auto correction of vectorization results

In this example the *Autocorrection* command expands and trims selected vectors by correcting their intersections.



Polylines collecting

The *Collect Polylines* command is designed for assembling vector polylines obtained as a result of the trace or automatic vectorization. When checking the results it is best to use the raster image as a substrate.

Choose the *Collect Polylines* from the *Correct* menu to start this command

Click the first polyline.

While the cursor is moving, which polyline will be added to the current one, and the result, can be seen. Choose the next polyline by clicking on it. Click the next polyline. The program automatically pans to the end point of the resulting object.

Use right-button menu during command running:

<i>Back step</i>	Cancels the latest step.
<i>Cancel</i>	Cancels the command and current polyline creation.
<i>Continue</i>	Continues the command.
<i>End</i>	Finishes current polyline collecting.
<i>Close</i>	Closes the current polyline.
<i>Change Direction</i>	Changes the current collecting direction.
<i>Centralize View</i>	Pans an image to show the last added polyline nodes at the screen centre.

This command adds a new item into the *Inspector* window *Auto Properties*.

If the *Auto Properties* item is off (No), then the properties of the resulting polyline (such as its colour, thickness, markers) can be changed in the *Inspector* during the command execution. Otherwise the resulting polyline will inherit the current document properties.

Collect Polylines special modes

There are special modes for modifying the resulting object during the polyline assembling process:

Case 1: polyline 1 has a stray tail, and you need to attach it to polyline 2

Press CTRL and click a point on the current polyline 1 in which it must be broken. Polyline assembling will continue from this point.



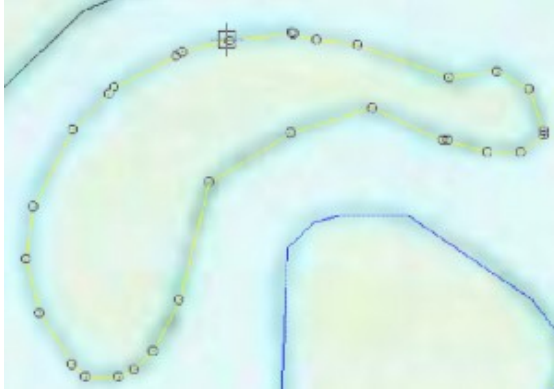
Case 2: polyline 2, which you want to append, has a stray head

Press CTRL and specify a point on polyline 2 to which it must be attached. It will be broken at this point and added to polyline 1.



Case 3: to close a current polyline

Press CTRL and click on one of the current polyline end points. The polyline will close and the command will be finished. The closed polylines are highlighted with round, instead of square, grips.

**Case 4: to draw a segment of a polyline manually**

Press SHIFT and draw as many segments as necessary.



Case 5: to add some vertices to a current polyline

Press CTRL+SHIFT and add as many vertices as necessary.




Elevations arranging

The *Arrange Elevation* command assigns the *Elevation* property to polylines with a specified step. It is used to assign elevation values for vectorized contour lines on topographical maps. When working with vector data in AutoCAD, the *Elevation* property for 2D-polylines is used as the Z-coordinate. Open the *3D View* window during arranging elevations to see all changes in 3D projection.

To perform the Arrange Elevation

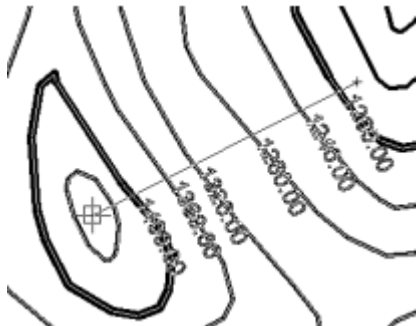
If polylines are selected before running the command, the command will be only applied to these objects.

Start the *Arrange Elevation* command: click the *Arrange Elevation* from the *Correct* menu or click the  button on the *Vector Correction* toolbar.

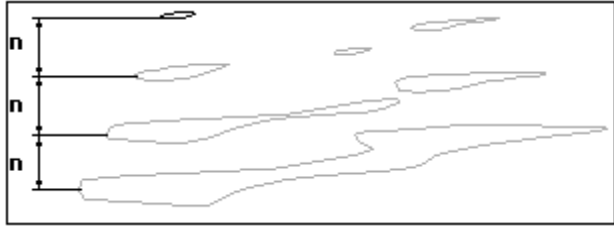
Set a *Begin Value* and a *Step* in *Inspector*. Elevations are assigned starting from the first object to the last one. If a step has a negative value, the elevation will go down from the start value.

Draw a rubber line so that it will intersect the polylines to be assigned elevations. Thus, the order of intersecting objects is important – the first object will be assigned the value entered in the *Begin Value* property. The other objects will be assigned the values depending on the order and the *Step* parameter.

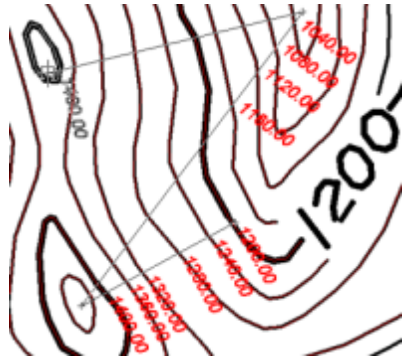
Dynamically calculated elevation values for every intersected polyline will be seen on the screen.



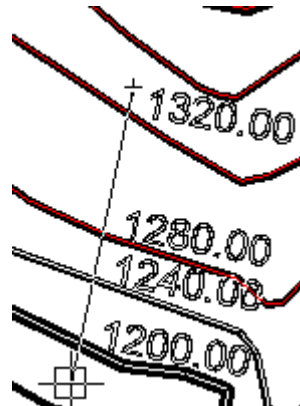
Calculate an elevation that will be assigned to an object according to this simple formula:
*Resulting value = Begin Value +/- order * Step.*
 For example, 1000 (starting value) + 100 (step) * 5 (order) = 1500



The *Begin Value* and the *Step* properties are needed only for the first polylines intersection step. The command automatically calculates the elevation of the newly specified polylines basing on the elevation of the polylines whose elevation value has been specified. These polylines are highlighted with a colour specified in the *Highlight Colour* property of the Inspector. There is no need to recalculate and re-enter *Begin Value* and *Step* for every new logical group of isolines – they are calculated automatically.



If the first polyline intersected with a rubber line has been processed, then the command uses its *Elevation* value as the *Begin Value*. If two or more polylines with assigned elevations have been intersected at the beginning, then the command automatically calculates the *Step* parameter too.



When working with Arrange Elevations only intersect polylines whose elevations are either increasing or decreasing, but not both together. Use two or more steps to process all polylines.



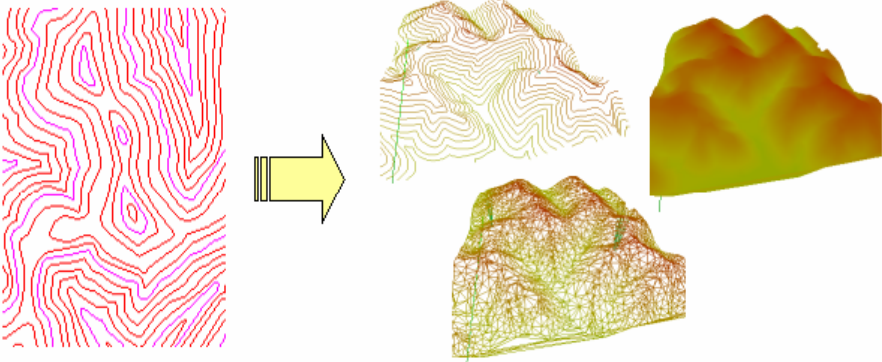
To distinguish polylines with assigned Elevation values from polylines with unassigned Elevation values this command uses the *Undefined Value* property of the Inspector. It is equal to zero by default. The *Undefined Value* specifies a single Elevation value which will mean an unassigned elevation. All other elevation values mean assigned elevations. For example:

Change the *Undefined Value* parameter specified as an unassigned elevation value to an assigned one. For example, the drawing has a ground (zero) elevation value is an assigned value. Then just set *Undefined Value* to any other (-30 for example).

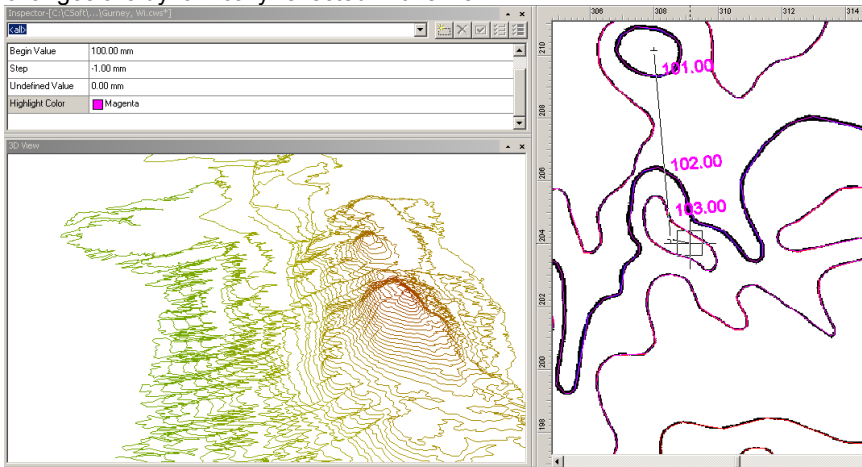
3D View

This window shows a drawing in 3D projection where the Z coordinates represent elevation values. Zoom, pan and rotate a drawing in this view using the mouse and/or buttons. It is useful for viewing vector topographic maps.

Various view projections and surface view styles can be specified.




Open the **3D View** window during *Arrange Elevation* to trace errors as all document changes are dynamically reflected in this view.




- ❖ The **3D view** window does not show polylines whose elevations are equal to the *Unsigned* elevation value during the *Arrange Elevation* command execution.

3D View buttons and controls:

Rotate

Use  buttons to rotate the window content. Rotate a 3D drawing using the mouse to drag the 3D drawing in any direction.


Zoom

Use  buttons to zoom in, out and zoom all. This can also be implemented by scrolling the mouse wheel.


Pan

Use the third (middle) mouse button for panning.


View

Use  button to change the view. *Isometric, Front, Backward, Right, Left, Top, or Bottom* can be set.

Perspective

Use  button to change 3D perspective. The perspective slider works like a zoom slider on a camera – it changes perspective and zoom distance simultaneously. To change zoom only use the zoom buttons. Switch on the *Ortho* checkbox to set orthogonal projection.

Surface Type

Use the  button to change 3D surface type. It can be represented by *Isolines, Triangles or Surface*.


To open 3D View window choose *Show 3D View* from the *View* menu.

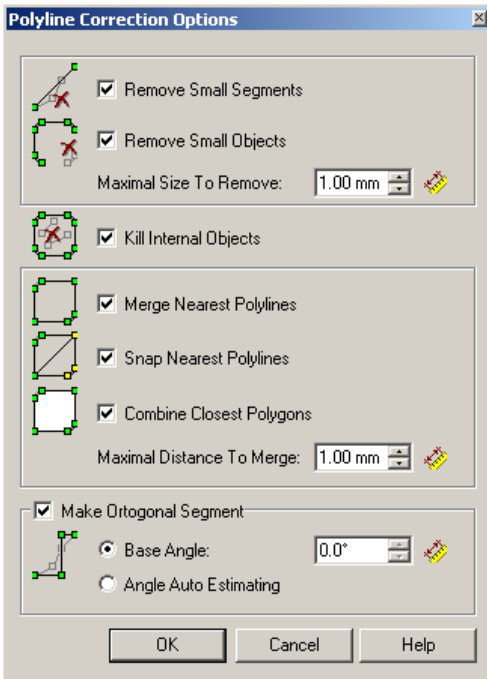
Automatic polylines correction

This command is designed to correct polylines mainly produced as a result of automatic vectorization or tracing. Depending on the settings, it can perform merging, removing or the combining of polylines. Other types of objects will also be automatically converted into polylines.

This command can be performed only while vector objects are selected.

Set up the command options in *Polyline Correction Options* dialog. To launch this

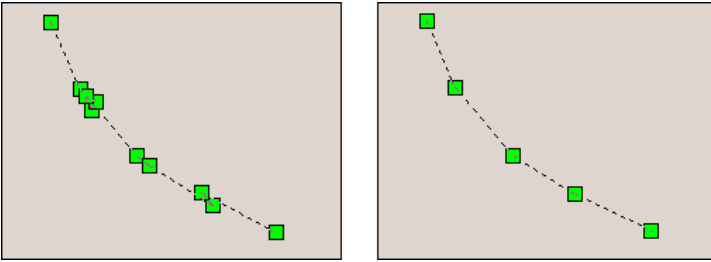
dialog choose *Polyline Correction Options* from the *Correct* menu or click the  button on the *VectorCorrection* toolbar.



Remove Small Segments

Consolidates polyline nodes connected with a segment which is smaller or equal to the parameter value shown in *Minimal Size to remove*. A larger value causes the more distant nodes to consolidate into one. This type of correction allows elimination of overlapped and surplus segments. To achieve the best result the Minimal Size need to be correctly set to the remove value. This can be measured this directly from the document.

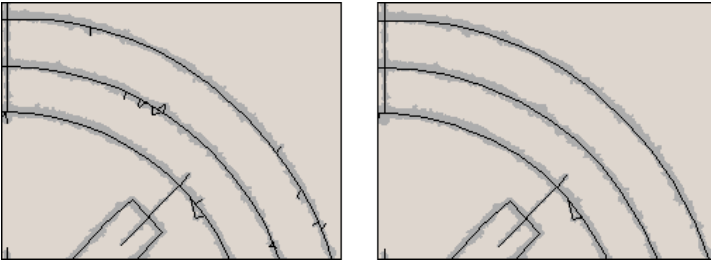
- ❖ Minimal size of the polyline segment produced as a result of automatic vectorization or tracing depends on the Precision parameter. The higher the Precision produces a smaller size of polyline segment and vice versa.



Remove Small Objects

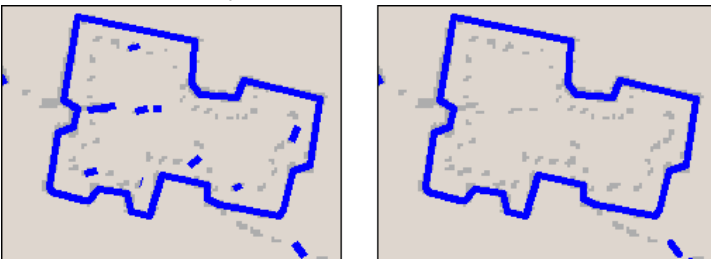
Removes Objects smaller than the set value.

This type of correction can be used for removal of small vector trash that has appeared as a result of automatic vectorization



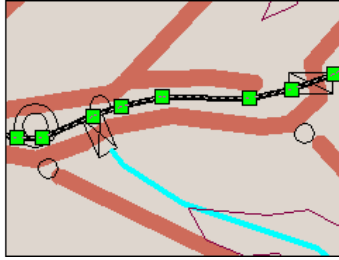
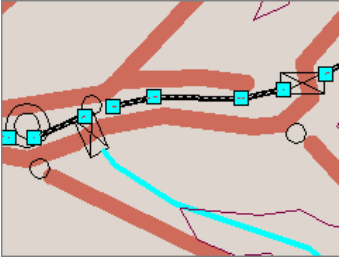
Kill Internal Objects

If this checkbox is set, then during the correction the objects located inside the uncrossed closed polylines will be deleted.



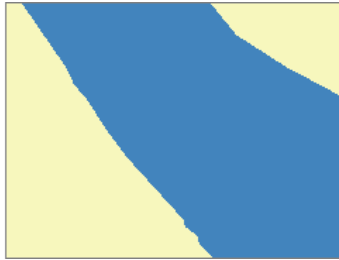
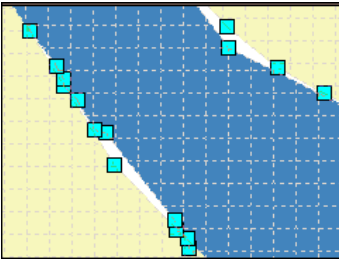
Merge Nearest Polylines

Merges the nearest polylines into one by adding new segments between the endpoints of polylines. Minimal Distance to merge can be set up using an appropriate parameter.



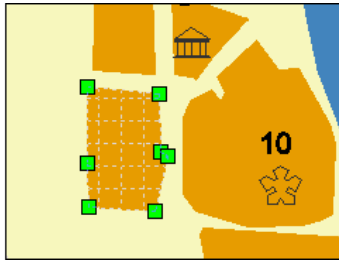
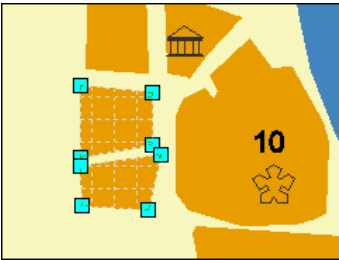
Snap Nearest Polylines

Snaps polylines located near each other. The size and location of one line changes when it is connected to another. This is different to the Combine Closest Polygons operation, where the 'combination' does not appear as the two become one.



Combine Closest Polygons

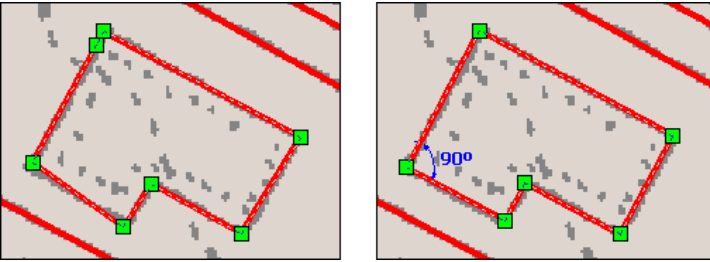
Combines closed polylines (polygons), located closer to each other than the maximum size parameter value, into one object.




Make Orthogonal Segment

This changes a polyline segment to be orthogonal to another segment.

Set the angle value directly in the 'base angle' parameter or allow the application to calculate the angle automatically.



To start polylines automatically corrections choose *Polylines Autocorrect* from the *Correct* menu or click the  button on the *VectorCorrection* toolbar.

To perform polylines corrections do the following:

1. Open the file with the vector objects needing to be corrected.
2. Estimate the correction and activate the required algorithms. Almost all of them require the setting up of the parameters, so do not forget to measure the values in the document using designated tools (ruler button). Setting up the parameters can be performed from the *Polyline Correction Options* dialog box.
3. Select the vector objects that need to be corrected.
4. Run the *Polylines Autocorrect* command.

Raster Drawing and Editing

Merge (Rasterize)

The merging operation adds *selected objects (selection)* to *destination* raster images. A *selection* can be composed of:

1. Raster images;
2. Raster selection;
3. Vector and hybrid objects to be rasterized with the *Merge* command.

Destination raster images – one or several images to which the *selection* will be added. The *Merge* command adds the *selection* to all visible images located on unlocked layers under the *selection*.

Data from the source images or raster selection with less colour depth can be merged onto destination images with greater colour depth, but not the other way around: monochrome onto greyscale and colour, greyscale onto colour (not on monochrome) colour onto colour only.

When merging colour vector images on a monochrome raster image; their rasterized representations take the foreground colour. When merging colour vector images on a colour raster image; their rasterized representations keep the colour of the original vector objects.

During the *Merge* operation only the part of the *selection* placed within the boundary of the destination images is transferred. The part of the *selection* placed outside the

boundary of the destination images is ignored. All the objects included in the *selection* disappear after the *Merge* is completed.


Choose the destination raster image in *Select Image For Merge* combo-box on



- or -


Turn off raster images visibility or place them on locked layers.

To merge data

1. Make the *selection*. Select the desired images, raster selections, and vector or raster objects.
2. Specify the destination raster in the combo-box on the *Modify* toolbar.
3. Choose *Merge (Rasterize)* from the *Modify* menu or press the  button on the *Modify* toolbar.

Merge a Copy (Rasterize)

Merging a Copy (i.e. duplication) works in a similar way to merging except it does not erase the source *selection* from the document.

To perform duplication, use the same procedure as when merging except the command is called *Merge a Copy* and the button looks like .

Paste, Paste Special and Paste Separate commands

Two commands from the *Edit* menu add options to the standard Windows Cut-Copy-Paste mechanism when handling raster fragments.

A selection set can be composed of fragments taken from different raster images. Note that RxSpotlight always retains information about which image was the source of each fragment.

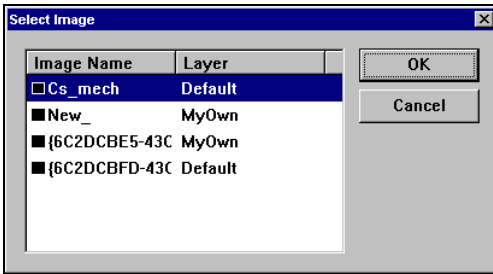
The *Edit > Paste* command is used to paste a copied selection set. This command preserves internal information of the raster fragments' source and every raster component of the selection set is pasted onto the image where it came from.

If the image from which a fragment had been copied was removed and later the *Paste* command was performed, then this fragment is converted to a separate embedded image that is placed on the active layer.

Paste Separate does not care about fragments' sources. It creates separate embedded images for every raster selection fragment and puts them on the active layer. Perform this command to create new images from a selection quickly.

☒ For more information on embedded images see page 54.

Paste Special merges a temporary image that unites all raster fragments of a selection set with the image that is chosen from the box (if there is only one image to paste the selection to, *Select Image* dialog does not show).



Select Image dialog that supports *Paste Special* command

This command is useful to cut or copy a fragment from one image and merge it with another.

Pixel Drawing and Floodfilling

By using pixel drawing tools, raster lines can be drawn and erased on monochrome, greyscale, and colour images.


When working with monochrome images, these tools allow users to draw with the foreground colour or erase with the background colour. When working with colour or greyscale images, a colour (or grey tone) can be selected to use for drawing.

Floodfilling tools work on both monochrome and colour images. They allow the filling of closed raster outlines with the raster object colour (foreground) and also to erase isolated raster objects by filling them with the raster background colour.


For more information on floodfilling on colour images see page 311.

- ❖ Note: Select the images to be processed with the above commands. Otherwise the commands will be applied to all raster images located under the cursor, if they are visible and reside on unlocked layers.

To draw on raster images


1. Choose the *Raster > Pencil* command from the *Draw* menu or press the  button on the *Draw* toolbar.
2. Open the *Inspector* to set *Pen Width* and colour. Type the width value in the corresponding box. Select the required colour from the list of *Pen Colour*.
3. The raster line will be displayed as follows: with foreground colour on monochrome images; with one of grey tones corresponding to the brightness of the selected colour on greyscale images; with the selected colour on colour images.

To erase on raster images


1. Choose the *Raster > Eraser* command from the *Draw* menu or press the  button on the *Draw* toolbar.
2. Open the *Inspector* to set *Pen Width* colour. Type the width value in the corresponding box. Select the required colour from the dropping down list of *Pen Colour*.

3. The raster line will be displayed as follows: with foreground colour on monochrome images; with one of grey tones corresponding to the brightness of the selected colour on greyscale images; with the selected colour on colour images.

To floodfill closed outlines

1. Choose the *Raster > Flood Fill* command from the *Draw* menu or press the  button on the *Draw* toolbar.
2. Specify a point within a closed outline on a monochrome raster image.

To erase by floodfilling

1. Choose the *Raster > Flood Erase* command from the *Draw* menu or press the  button on the *Draw* toolbar.
2. Specify any point in the isolated raster area to be erased.

Creating new image from vector and raster selection

Rasterization converts vector objects to raster objects, and the obtained raster is inserted into raster images.

There are two ways to rasterized data in RxSpotlight:

The first is to rasterized vectors by *Merge* or *Merge a Copy* commands from the *Modify* menu – see page 289.

The second is to make a new image using *New Raster from Selection* command from the *Draw* menu. This way is more powerful. A newly created image includes all the objects included in the *selection*.

The *selection* may include:

1. raster images;
2. raster selection;
3. vector objects.

To insert a new image from a selection

1. Create a set of objects to rasterize. If pre-selection is absent, this command applies to all data in the document.

-
- ❖ Selection can be performed during the *New Image from Selection* dialog is opened

2. Choose *New Image from Selection* command from the *Insert* menu or press the

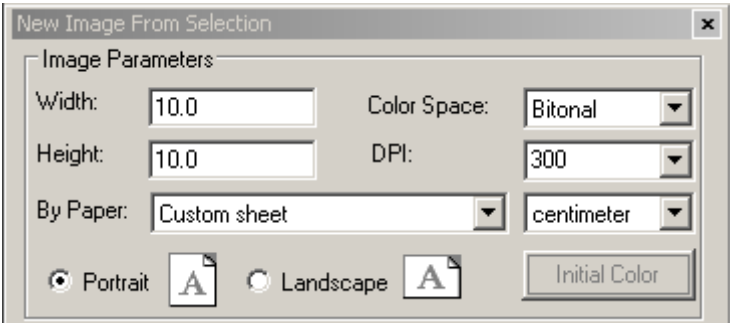


button on the *Draw* toolbar.

3. If source images are exist and have different colors or resolution, then properties of destination image have to be specified:

Color Space – choose destination image color space from the list;

DPI – select resolution;

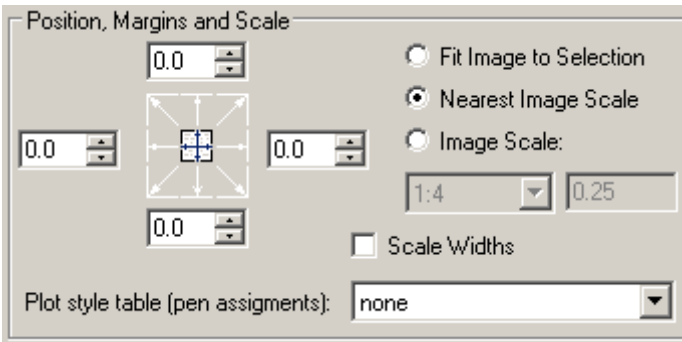


Width and Height – set a value for a new image or select a standard format in the **By Paper** field;

Initial color – define a background color for a color image;

Portrait or Landscape – select orientation of destination image.

4. Set the scale:



Fit Image to Selection – scales the image to fit the paper of specified format;

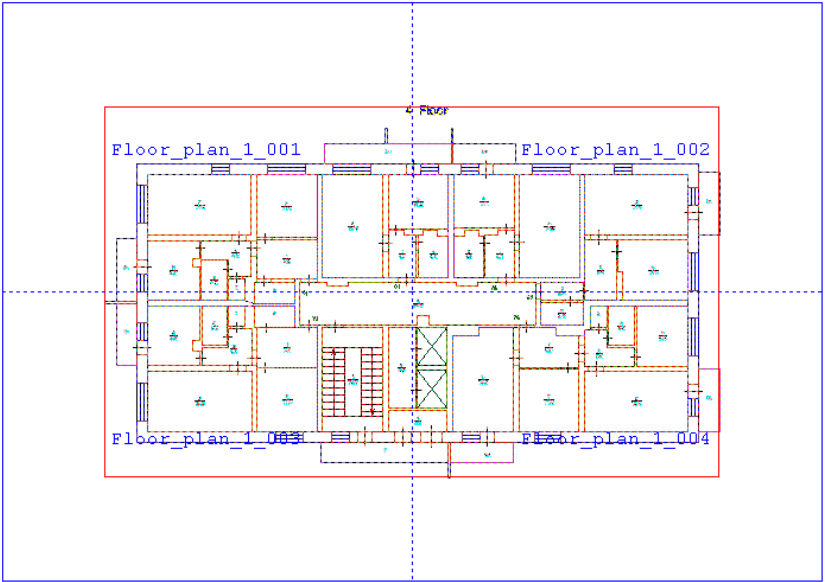
Nearest Image Scale – scales source selection to the greatest possible size that fits specified paper format;

Image Scale – enter scale index for destination image or select it from the list.





To place the image relative to format boundaries, enter margin value in the fields of **Position, Margins and Scale** section. The margin value can be more or equal to 0.

If the image is smaller than a page of the specified format, you can set alignment to a paper side. Click an arrow displaying required alignment type.

If the scale is set manually, rasterization can be processed on several papers.



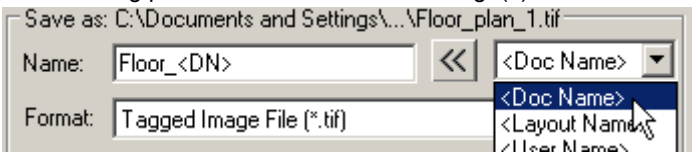
The results will be saved in separate files with adding page numbers to the tail of the file name.

-  4_plan_1_001.tif
-  4_plan_1_002.tif
-  4_plan_1_003.tif
-  4_plan_1_004.tif


Plot style table allows you to change a color and line width of objects on destination image.

For more information on *Plot style table* see description of the *Print Options* dialog (chapter “*Setting Printing Parameters*” on page 91).

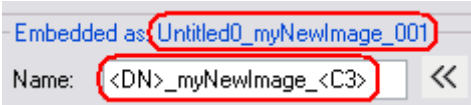
5. Set saving parameters for destination image(s):



Name – Set file name for destination raster image(s).

You can use macros to set mask for the raster image name. To insert macros in the *Name* field select an appropriate one from the drop-down list and click the  button. You can also type it manually. The decripted name is displayed in the caption

of the *Save As* section:



Macros are very useful for batch rasterization through scripts when several raster images should be created.

Format – set the way of storing the image:

- *Embedded Image* – store destination image in a document file.
- Otherwise destination image will be saved in a separate file(s) of a selected format.

Folder – set the folder to save the image. If *Current Document Folder* is selected, image(s) is saved in the folder of the current document. A drop-down box contains five previously specified folders.



Mode – define a way of saving and removing vector data after rasterization.


Insert Image – this checkbox inserts destination image, stored in a separate file, in current document. If *Embedded Image* file format is selected, this checkbox is blocked and switched on by default.

To process rasterization without changing current document, switch off this checkbox and choose *Keep Vectors after Rasterizing*.

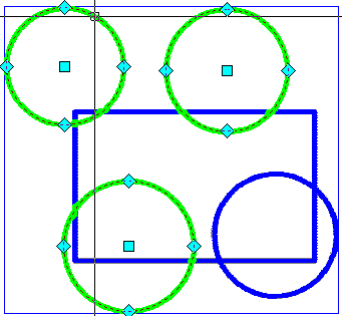
Press OK.





If a name for a new raster has not been specified, it will be *New_(N)*, where N – an index number.

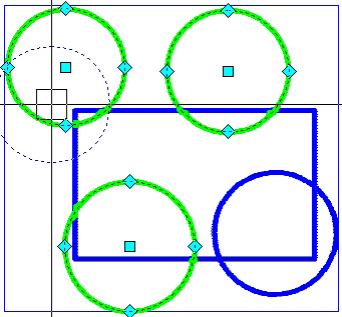
Disabling hybrid objects for selection

Selection of raster objects in RxSpotlight can yield two types of result: hybrid or pure raster. The type of selection can be switched by the  button on the *Select* toolbar.

When this button is not pressed, the raster objects selected are supplied with grips and can be treated as vector objects.

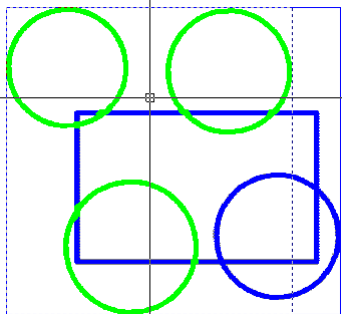






Buttons , ,  are pressed and  is not pressed. Three circles are clicked with the mouse. Raster objects are selected as hybrid.

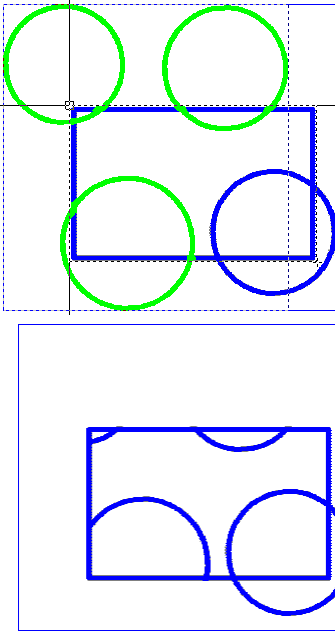



Use grips to resize or move them separately. When dragging any circle, the whole group of circles is moved.

When the *Disable hybrid objects for selection* button is pressed, the raster objects selected are pure rasters and more complicated operations can be used to change the selection set.



Buttons , ,  are pressed and also  button on *Select* toolbar is pressed. Three circles are added to selection set that is raster area. Pixels selected are highlighted with colour and the selection set is encompassed with a dashed rectangle.




Reconfigure the selected area by cutting it with other areas i.e. selecting the fragment in the centre with  button pressed (note that all pixels inside the dashed area drawn around rectangle are subtracted from the selection).

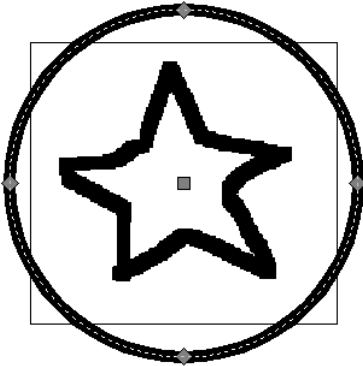
Pressing DEL removes the parts of three circles outside the rectangle.

When composing a selection set, you the mode of hybrid objects can be changed in add to selection raster and vector objects in any combination.

Switch drawing raster mode on/off (RDRAW button)

This mode controls rasterization of vector objects during drawing and is switched on by pressing the  button on *Main* toolbar or RDRAW button in the lower right corner of the RxSpotlight status-bar.

When this mode is on, any vector objects drawn are automatically converted to raster objects, i.e. this mode combines creation of vector objects (lines, arcs, circles, texts, dimensions) and immediate rasterization.



Vector object drawn over an image



Drawing when RDRAW is ON. Vector circle is drawn and immediately rasterized (note clipping by image boundary)

Edit raster text

This operation is used to modify a raster text directly in the raster image. During this operation users can recognize a raster text within a specified area, edit this text, and then either delete or keep the image beneath the original text.

A raster text can be inserted in the image as either a raster object or a text object (single-line text).

To edit a raster text

1. To enter a raster text, press the *RDRAW* button (raster drawing mode). Turn off this mode to obtain a text object.
2. From the *Draw* menu choose *Raster > Edit Raster Text*.

Command	Raster Text Inplace Edit
Text	
Erase Raster	Yes
Recognize Text	<Use OCR>
Base Point	129.15, 177.92 mm
Corner	110.83, 192.98 mm
Size	18.33, 15.07 mm
Angle	0.0°
Layer	Default
Color	Cyan
Elevation	0.00 mm
Text Style	Standard
Text Font	Arial
Text Height	5.00 mm
Text Width Factor	1.000000
Text Oblique	0.0°

3. In the *Inspector*, set values for the parameters *Recognize text* and *Erase raster*. Set values for the parameters in the fields *Layer*, *Colour*, *Font*, *Text*, *Height*.

Specify a rectangular area encompassing a text to edit in the image:

Specify a first (base) point for the area. The values for the parameters *Base Point* and *Corner* (the coordinates of a second point) can be set in the appropriate fields of the *Inspector*, and a text angle in the *Angle* field.



The arrow indicates a direction to enter a text

Specify a second point.

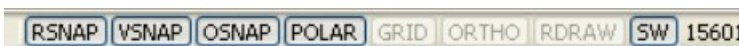
4. Use the *Text* field to edit a recognized raster text or enter a new one from the keyboard correcting the text parameters in the appropriate fields of the *Inspector*. Press ENTER. Depending on the value set in the *Delete* raster field, the original image beneath will be deleted or kept.

Snaps and Grids

Snap and grid settings help to create and align objects. Snap automatically finds a specific point on the object in the vicinity of the mouse cursor and allows selection without precise clicking. The grid is a visual guide which displays snappable points at user-specified intervals.

In RxSpotlight vector, raster and polar snaps and snappable points of a grid are available.

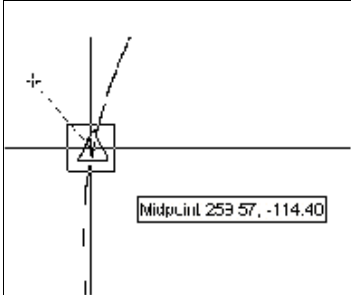
The buttons that control snapping are at the bottom of the RxSpotlight window on the status bar.



RSNAP controls snap to raster object snaps; **VSNAP** controls snap to vector object snaps; **POLAR** controls snap to predefined angle; **GRID** allows use of a grid. Snaps are active only when drawing or editing objects.

Vector and Polar snaps

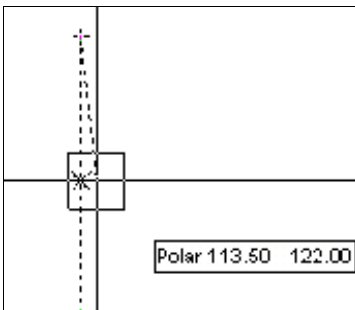
The simplest way to see how snaps and grid work is to try drawing vector objects on a blank document with VSNAP and/or POLAR and/or GRID buttons pressed.



RxSpotlight analyses the area enclosed in the *aperture box* or *snap pickbox* (square) and displays the appropriate snap.

The type of snap and its coordinates are shown in a tool tip.

Snaps of different types are shown with their specific markers.



The Polar snap offers the direction and the point on it to accept.

Snaps of different types can be switched on and off in the *Snap Setup* dialog (menu *Tools*). This dialog can be open from the cursor menu by right-clicking on the snap control buttons.

Sizes of *snap markers* and *aperture* are set in the *Preferences* dialog (see page 389).

To change sizes of *snap markers* and other snap settings

1. Press CTRL+ENTER or from the *Tools* menu choose *Preferences*.
2. Open *Snap Settings* section.

The size of the *aperture box*, sizes and colours of *snap markers* can be changed and also tool tips switched on and off.

Raster snap

Raster snap allows creating and editing objects, based on the geometry of other raster objects. For example, draw a line, the end point of which coincides with another raster line end point, or stretch an arc so that its end point is placed on a characteristic point of raster line.

Raster snap can only be performed on monochrome image. The raster snap operation looks the same as with vectors. When selecting points on the image with raster snap mode on, a square *raster snap pickbox* appears on the cursor cross. When placing this pickbox on the object, the program finds an appropriate point on

the object for the specified snap mode, and transfers the calculated coordinates to the current command. If there are several possible snap points, then the closest one to the point specified is chosen.

The program highlights the point to which the snap is supposed to be made with a colour marker. Holding the cursor over the object displays a tooltip with the current snap mode name at the point. For each snap type a special marker is used. If there is any problem with precise snapping, then zoom the image on the screen.

-
- ❖ Note that the snapping function only operates effectively in the neighbourhood of the rubberline end, hence if it fails to recognize a raster entity, it considers it as a part of a polyline and tries to snap to the endpoints and midpoints of “polyline segments”.

Snap on Demand

To snap to a specific point of raster or vector object, the snap cursor menu is used. To open the snap cursor menu, right-click with the CTRL pressed. Choose the snap type needed from the menu. To snap to the object, move the cursor to a position close to the required snap point. A highlight marker and tooltip will be seen. Click to accept the snap point.

Use the cursor menu to change snap modes and change the combination of snap buttons “on the fly” until ESC is pressed, or drawing/editing mode is exited, or the snap buttons are released.

Running Snaps

Both raster and vector snaps can be used simultaneously; both the points of vector objects and those of raster objects are snapped. The snap to raster has lower priority. First an attempt is made to snap to a point on a vector object, and then to a raster object.

✉ Snaps are also controlled by settings in *Command Setup* dialog, see page 376.

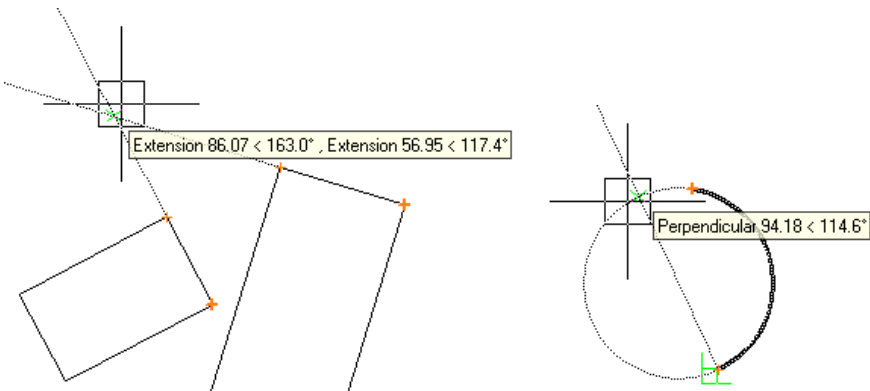
To switch on both raster and vector snaps, set the checkboxes in the *Tools > Snap Settings* dialog or press both corresponding buttons on the screen.

-
- ❖ Polar snap has a higher priority than vector and raster snaps.

Object Snap Tracking mode

Using Object Snap Tracking you can specify point position relative to position of object snap points and points which lies in specified directions.

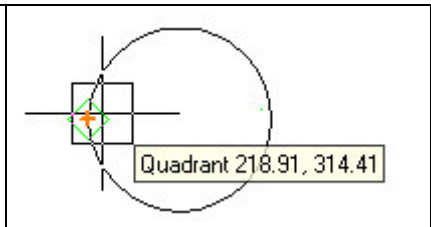
Working in this mode, firstly, you must specify temporary tracking points and secondarily, choose appropriate point, which lies on temporary alignment paths or its intersections that appear during cursor movement.



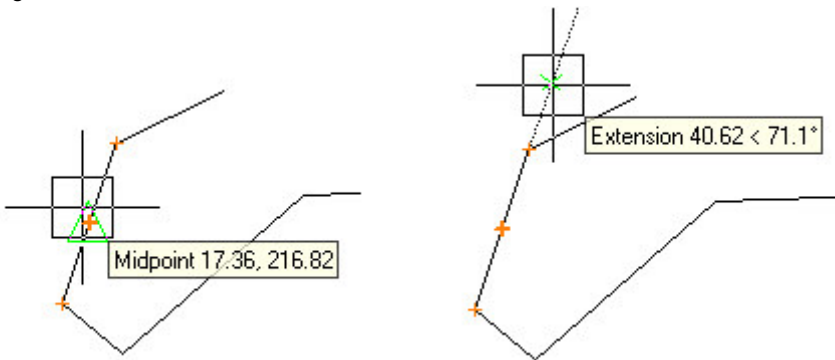
To use Object Snap Tracking mode

1. This mode is available while the *Snap to raster* or *Snap to vector* modes is ON, so switch ON *Object Track* mode simultaneously with any of object (raster or vector) snap modes.

2. Then you should acquire temporary tracking points. Acquired points are marked with thick sign **+**. To acquire tracking point move cursor to any snap point (i.e. perform snapping to any point). To remove acquired point move cursor to its location again.



Some tracking points are acquired simultaneously with subsidiary tracking points, which appear at endpoints of an object or objects segment. These points are marked with thin sign **+** and define possible tracking directions in extension of an object or its segment.

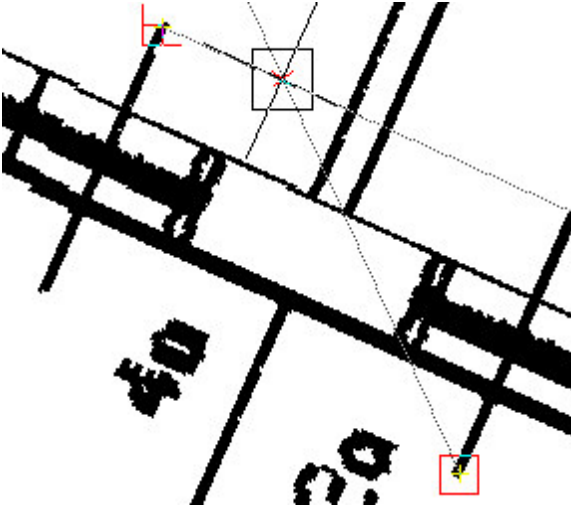


3. After tracking points has been acquired temporary alignment paths appear during cursor movement. Such a path displays as dotted line, which follows through acquired point in direction defined by types of object snap.

- ❖ The more object snap types are switched on in the *Snap Setup* dialog, the more types of temporary tracking points you can acquire and the more tracking paths are available.

4. Snap to any point on temporary alignment paths or to point of their intersection.

Points on raster object could also be acquired:



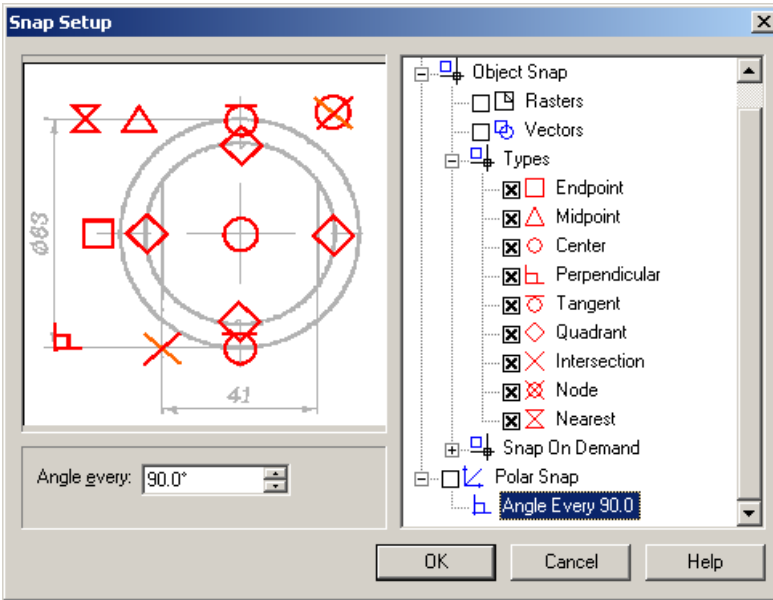
After panning or zooming a document all temporary tracking points disappear.

To acquire points manually

While the Object Snap Tracking mode is running, tracking points are acquired automatically during cursor movement that is not always suitable. To acquire points by pressing a SHIFT key only, switch on the *By Shift Key* checkbox in the *Object Tracking* section of the *Snap Setup* dialog.

Snap Modes

Snap modes can be viewed and changed in the *Snap Setup* dialog box (menu *Tools*). This dialog can be also opened from the cursor menu that appears when right-clicking on any of the snap buttons.

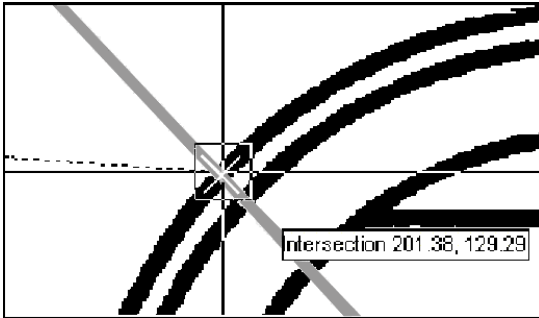


This table provides the names of raster snap modes, which can be used to snap to points of raster objects.

Name	Description
<i>Endpoint</i>	Snap to the objects endpoints (lines, arcs etc.).
<i>Midpoint</i>	Snap to the middle of objects (lines, arcs etc.).
<i>Centre</i>	Snap to the centre of an arc, circle.
<i>Quadrant</i>	Snap to the nearest quadrant (the point located under an angle 0, 90, 180 or 270 degrees from centre) of arc, circle.
<i>Nearest</i>	Snap to the point of the object located close to the cursor position.
<i>Intersection</i>	Snap to the intersections of objects (lines, circles, arcs etc.).
<i>Perpendicular</i>	Snap to the point of the object lying perpendicular to another object or to its imaginary extension.
<i>Tangent</i>	Snap to the point on an arc or circle belonging to the tangent of another object.

In some cases when using snap tools, many *Nearest* points are revealed (since they are the easiest type to find) and these frequently obscure other points. To see more point types (if any) just turn off *Nearest*.

The RxSpotlight snapping algorithms can find the *Intersection* between raster and vector lines as shown in the figure below.



The raster circle is intersected by a vector line. RxSpotlight finds the *Intersection* snap (thin cross).

Note that to run this feature both RSNAP and VSNAP must be pressed.

Setting Snap Accuracy

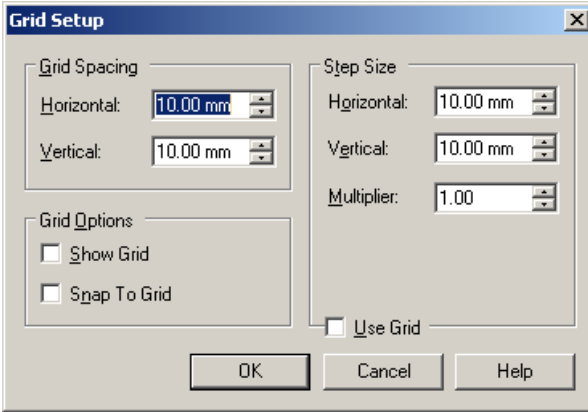
The raster snap operation is based on algorithms for raster objects recognition. The program calculates vector objects, approximating the specified raster lines and makes a snap to the characteristic points of these vector objects. That is why the operation of raster snap tools depends on the parameters which are set in the *Options* tab of the *Conversion Options* dialog box.

Raster snaps are only influenced by three parameters of the *Options* tab: *Max Width*, *Max Break* and *Approximation Accuracy*.

See the description of the *Options* tab of the *Conversion Options* dialog on page 122.

Grid Settings

When the GRID button is pressed, a new set of snapable points is introduced. Snapping to a grid has the highest priority over the other snaps. The grid activity and options are set in the *Grid Setup* dialog from the *Tools* menu.

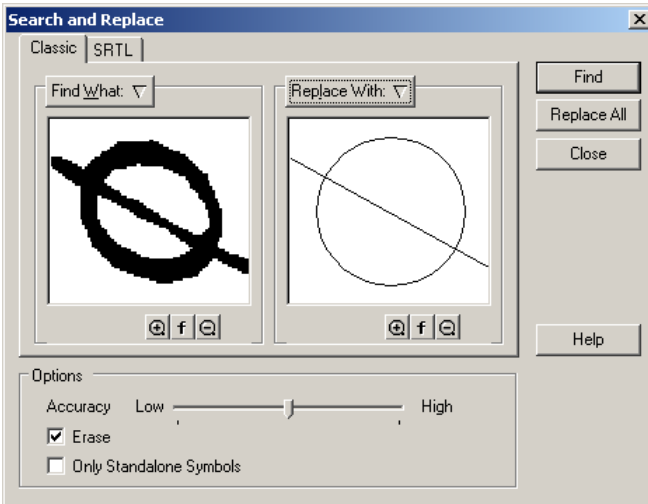


Name	Description
<i>Grid Spacing</i>	Grid cells size.
<i>Show Grid</i>	Shows the grid.
<i>Snap to Grid</i>	Turns on/off grid snapping mode, the same as pressing GRID button.

Searching and Replacing Raster and Vector Objects

The search and replace operation can find vector or raster (monochrome and colour) objects and replace them with any other vector or raster item. The operation can be applied to sets of vector objects.

The search and replace operation is performed using the following dialog box.



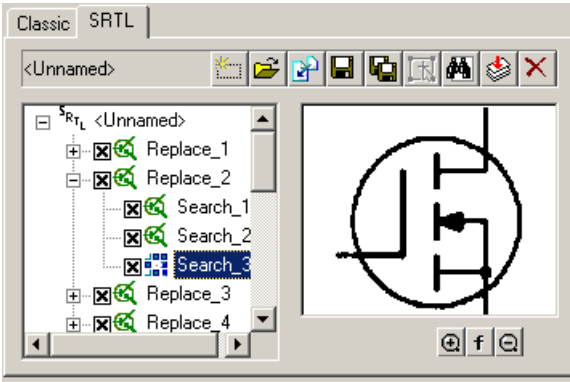
First it is necessary to specify, what templates should be found and with what they will be replaced. For searching and replacing templates of single type the *Classic* tab is used. If it is necessary to operate with a complicated set of different types, then the *SRTL* tab should be used.

To specify a single template switch to *Classic* tab. Place a raster selection or vector data in the *Find What* box – to define a sample for searching – and setup searching parameters. To replace found objects, also place the replacing vector or raster selection in the *Replace With* box.

Raster selections can be replaced with raster or vector samples. Vector selections can only be replaced with vector samples.


The command also allows sets of vector objects to be found, which in combination resemble the vector sample. Lines, arcs, circles, and polylines can be used as a sample sets. Vector objects to be found by this command must be composed of line segments, arcs, and circles only.

The *SRTL* tab allows to set and tune Symbol Recognition Template Library for current Search and Replace operation.



Work with *SRTL* tab is similar to work with *SRTL editor* tool and is described in chapter "**Tuning Symbol Recognition Template Library**" on page 198.

To specify single search and replace pattern

1. From the *Edit* menu choose the *Search and Replace* or click  button on *Edit* toolbar.
2. Go to the *Classic* tab.
3. Place a search sample in the *Find What* box:
 Select raster area on one of raster images or vector data in the drawing.
 Click the *Find What* button above the left dialog window.
 In the drop-down menu that appear choose the *Search raster* item for raster data placing, or the *Search selection* item for vector pattern placing.
4. Place a replace sample in the *Replace With* box:
 Select raster area on one of raster images or vector data in the drawing.
 Click the *Replace With* button above the right dialog window.
 In the drop-down menu that appears choose the *Search raster* item for raster data placing, or the *Search selection* item for vector pattern placing.

- ❖ To erase found patterns keep the *Replace With* checkbox clear and turn on the *Erase* checkbox.
- ❖ To clear data from *Find What* box and *Replace With* box click the button above the appropriate box and choose *Clear item* in drop-down menu that appears.

To define the search and replace parameters

1. Set the *Accuracy* parameter with the slider to the allowable level of difference between a searched for object with a found one.
2. Turn on the *Erase* option to erase the found objects in the process of replacing. The color or greyscale raster symbols are erased with the colour specified in *Background Color* property of the current raster image.
3. Turn on *Only Standalone Letters* to search for isolated raster objects only or vector symbols, which do not overlap other objects.

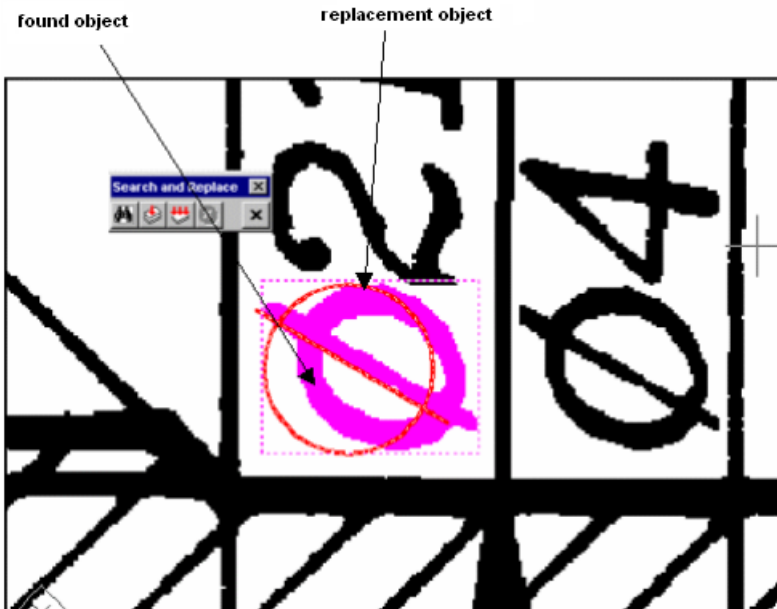
To search and replace raster and vector objects

1. If a raster selection is used as the basis for a search and there are several available (visible, placed on unlocked layers) raster images in the drawing, then select for the search operation the appropriate raster image with standard selection methods.
2. Click the *Replace All* button to start the automatic search and replace procedure for the raster images found
or
Click the *Find* button; the program will start the first character searching procedure.
The Search and Replace toolbar is displayed.



Using its buttons, the user can control search and replace.

3. When the program finds an object, it centres that found object in display screen. This object is highlighted with a color and dotted frame. If a replacement object is specified, it is redrawn over the found object. The base points of the found and replacement objects coincide.



4. To not make the proposed replacement, simply click the *Find Next* button and the found object will be skipped.



Find Next

Click this button and the found item will be skipped.



Replace

If the replacement sample has been specified, it will be inserted. Depending on the *Erase* checkbox setting, the found item can be either erased or left intact. After replacement, the program continues searching for the next item.



Replace All

Continues the operation in automatic mode.



Cancel Search

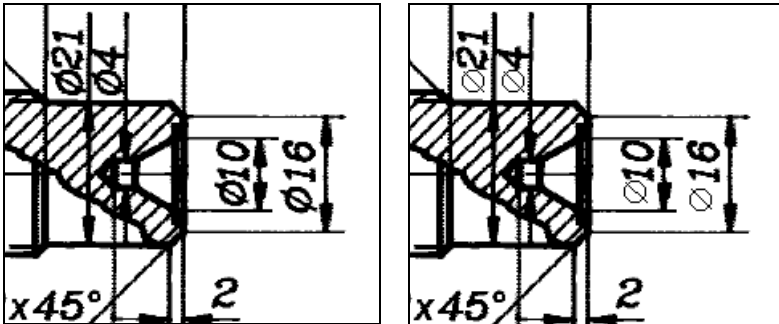
Cancels the current search-replace operation.



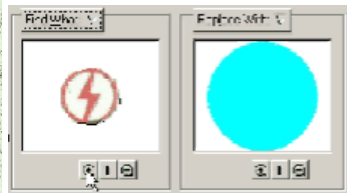
Close

Stops the search-replace procedure.

5. If the program finds the next object, then the user can perform any operation described in step 4. When no more objects can be found, the procedure is completed.



Document fragment before and after replacement procedure.



Finding raster objects on an RGB map and placing a semitransparent vector circle on them.

Color processing

General notes

Monochrome images also referred to as black-and-white or bitonal use one bit to represent each pixel color (black or white). *Greyscale images*, also referred to as grey-level, consist of different grey tone pixels. Grey levels vary from 0 (black) to 255 (white). Thus, one byte is sufficient to store information on each pixel color in greyscale images.

Depending on the color information number of bits a *color image* can require 4, 8, 16, 24 or 32 bits per pixel to represent a color. Colors can be made by mixing of three basic colour components in different proportions. These components are known as the primary colors: red, green and blue (*RGB model*). Each component has 256 levels (from 0 to 255). The RGB color image is an image that requires three bytes (24 bits per pixel) to store color information of each pixel; one byte (256 brightnesses) is required for each of the primary colours.

The *HSV model* is based on color perception by the human eye. In the HSV model all colors are described in terms of three basic characteristics:

- *Hue* is the wavelength of light reflected from or transmitted through an object. More commonly, hue is identified by the name of the color, such as red, orange, or green. Hue is measured as a location on the standard color wheel and expressed as a specific angle between 0° and 360°.
- *Saturation* is an analogue of the intensity or purity of a color. Saturation represents the amount of grey in relation to the hue and is measured as a percentage from 0 percent (grey) to 100 percent (fully saturated).
- *Value* (or *brightness*) is the relative lightness or darkness of the color and is usually measured as a percentage from 0 percent (black) to 100 percent (white).

Note that scaling an image implies the distortion of colour since the colours of dots on the image can be mixed in one pixel (scale less than 1:1) or, in the opposite case, several pixels on the screen represent one dot (scale greater than 1:1). Hence for the most precise color match on the screen, set the scale to 1:1 (one dot on the image corresponds to 1 pixel on the screen).

Color editing

Color Flood Fill

Use the *Draw > Raster > Color Flood Fill* command to fill areas on color images with the selected color. This operation can be tuned to clean the floodfilled area by eliminating the speckles and small areas of close colors.

To fill the area with autodetection of color

1. Choose *Draw > Raster > Color Flood Fill*.
2. Set *Autodetect color* to TRUE in the *Inspector* toolbar.
3. Click on a pixel of the filling color.

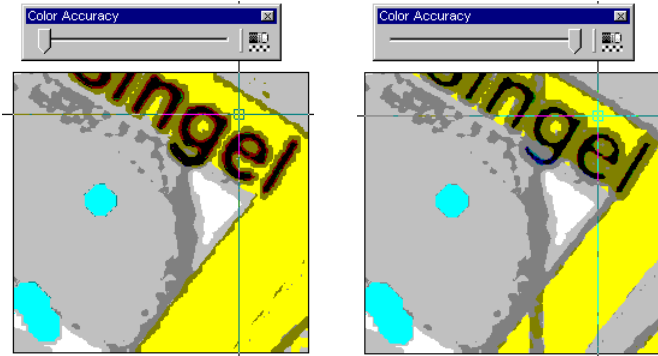
To fill the area with selected color

1. Choose *Draw > Raster > Color Flood Fill*.
2. Set *Autodetect color* to FALSE in the *Inspector* toolbar and select *Fill color*.
3. Click on the pixel where floodfilling is to begin.

The performance of the color floodfilling operation is controlled by settings of the slider in the *Color Accuracy* toolbar.

The leftmost position of the *Color accuracy* slider (0%) corresponds to floodfilling areas with a range of colors close to chosen one, thus eliminating speckles and small areas (and maybe useful details) of close colors; the rightmost (100%) corresponds to the narrowest range of colors close to chosen one and leaves many details untouched.

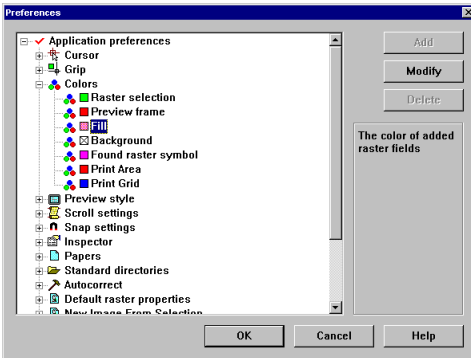
On the pictures below results of color filling of the same area with opposite values of *Color accuracy* can be seen. Note that 0% of accuracy yields more readable text (left), while 100% of accuracy preserves vertical lines.



Colour Accuracy is low.

Colour Accuracy is high

The other option is the default color of filling areas, which can be set in the *Colors* section of the *Preferences* dialog.



Colors treated as *close* in the above text are “close” in terms of current *color model* but may not seem “close” in human perception.

Color Correction and Color Filtration

The color filtration and color correction tools can be used to prepare an image for further, more complicated operations, such as binarization, layering, raster editing and vectorization. The color filters are also used for image enhancing after operations that move image objects or change the resolution, such as scaling, aligning, rotation, calibration or four-point correction.

Selecting Images for Color Correction and Filtration

The color filtration and color correction tools can be applied to a group of color raster images. The colour filter commands work on images that have a clipping boundary. Restrict a filtration area for any image using this feature by specifying its clipping boundary.

For information on the use of clipping boundary see page 130.

The colour filters are not applicable to greyscale (grey-level) images. Nevertheless these can be applied to such images after having converted them to colour. Use the *Convert to RGB* command from the *Image* menu.

Conversion to RGB, greyscale and 8-bit indexed

Every image in RxSpotlight can be converted to greyscale, RGB (24 bits per colour) and 8-bit indexed image.

Conversion operations can be applied to several images of an appropriate type at once. So, if several images are inserted in the current drawing and they are available (visible, allocated on unlocked layers), select a group of raster images before running this operation.

By converting monochrome images to greyscale or RGB it is possible to apply colour filters to the image (Blur, Unsharp and Median).

Conversation colour image to 8-bit indexed is the tool facilitating colour management.

-
- ❖ This operation is not applicable for images with a clipping boundary.

To convert an image to RGB

Select images to be processed. Choose *Convert to RGB* from the *Image* menu.

To convert an image to Greyscale

Select images to be processed. Choose *Convert to Greyscale* from the *Image* menu.

Converting to 8-bit indexed

This command supplies the user with a way of reducing the file size of an image by changing its colour depth (number of bits that store colour information) from 24 bits per pixel to 8 bits per pixel. This is also a way to tune colours precisely.

When applying this command to an RGB colour image, the number of colours used reduces to 256 (or less). Further reduce this number by deleting selected colour or colours or by merging several colours into one.

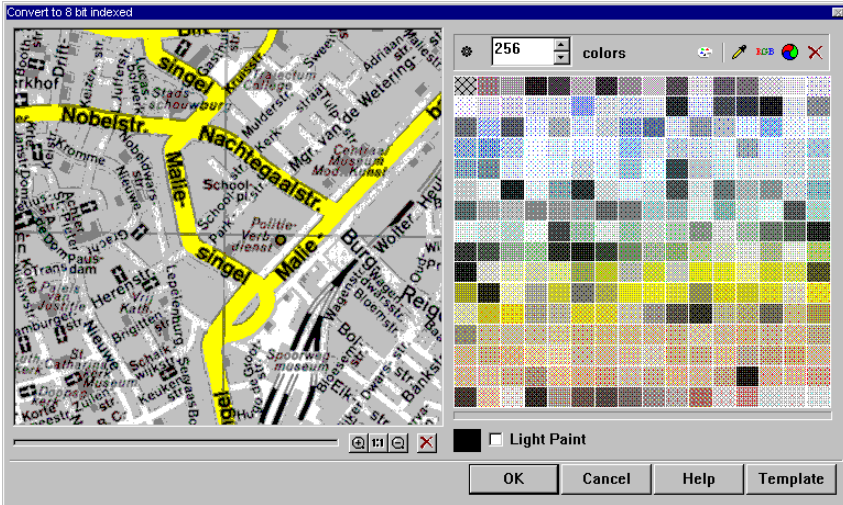
Selected colours can also be replaced and add them to the palette.

Note that colour filtering (blurring, Unsharp mask and medianning) can be applied only to colour images. Hence it would be a good idea to apply colour filters to a RGB image before converting it to an image of indexed colours.

Choosing the *Image > Convert to > Convert to 8-bit indexed* produces a dialog box with tools for manipulating with palette and the individual colours and preview window.

To convert an image to 8-bit

Select the images to be processed. Choose *Convert to 8-bit indexed* from the *Image* menu.



The buttons and controls in *Convert to 8-bit indexed* dialog window

Colour samples table

Contains the samples of colours of the current palette, i.e. the palette that will be applied by pressing OK.



Colour counter

This control is used to show the number of colours in the current palette. This number can be enlarged or reduced.



Set auto palette button

Pressing this button forces RxSpotlight to automatically create the palette. RXSPOTLIGHT determines the set of colours that most truly represents the image and places them into the colour samples table. Their number is reflected in the colour counter spinbox.



Reset palette button

Restores the native palette of the image.



Preview and *Light paint*

The *Preview window* is supplied with its usual set of buttons described on page 34. The *Light paint* is the additional tool consisting of colour selector and *Light paint* checkbox.

The *Light paint* tool lets the user see where the pixels of selected colour reside in the *Preview window*.

To preview pixels of selected colour

1. Select colour sample (samples).
2. Click on the coloured box near the *Light paint* checkbox and choose an appropriate colour in the colour selection dialog. Press *OK*.
3. Check the *Light paint* box.

For better previewing select a colour for light painting contrasting to those in the colour samples table.

4. Pan the image in the preview window and see the pixels and areas of colour selected on step 3.



Eyedropper

This tool is used to obtain a colour by clicking on the pixel in the *Preview window* or in document window.



RGB button

Opens a dialog of colour selection, lets new colour to be chosen and changes the colour selected in the colour samples table with the new one. The image is repainted with the new palette.



Merger button

Merges the colours selected in the colour samples table to the mean colour. The image is repainted with the new palette.




Delete button

Deletes the colours selected in the colour samples table from the palette. The image is repainted with the new palette.

Template

This button provides options to save and load colour and palette information to and from template files. See more information on template files on page 40.

To create a palette automatically

Press *Set auto palette* button .

- or -

Reduce the number of colours in the *Colour counter* spinbox.


The palette will be automatically recalculated and the image repainted to reflect changes.


To reset a palette

Press *Reset palette* button .



The palette will be recalculated to best fit the number of colours set in the *Colour counter* spinbox.

To delete colour from a palette


1. Select colour(s) to be deleted in the colour samples table by clicking on them with SHIFT pressed.
2. Press delete button . Watch as the image is repainted.

The number of colours can also be reduced by setting the number of colours in *Colour counter* spinbox and pressing the  button.

To add colour to a palette or replace existing one

1. Click on the colour sample to be replaced or on a box in the colour samples table that is not occupied.
 2. Press RGB button  and choose a new colour in the colour selection dialog.
- or -
- Pick the colour from the image with the eyedropper tool .

To merge colours

1. Select colours to be merged in the colour samples table by clicking on them with SHIFT pressed.
2. Press merge colours button . Watch as the image is repainted.

Modifying image brightness, contrast, hue, and saturation

The brightness, contrast, hue, and saturation can be adjusted for a single or several colour and greyscale images. For each image a clipping boundary can be defined. In this case first define a clipping boundary where the operation is to be applied.


Brightness sets the relative colour lightness or darkness. It is usually measured in percent ranging from 0% (black) to 100% (white).

Modifying contrast enables the image brightness range to be increased or reduced. An image with the same brightness value has zero contrast value. If the contrast value increases, then it causes an increase of the brightness range, i.e. darkening dark colors and lightening light ones. Image contrast is measured in percent ranging from 0% (fully grey) to 100%. Color hue usually means a colour, and saturation means colour purity. There is the ability to fully modify an image colour.

Hue is a light wavelength reflected from or transmitted through an object. Usually hue is identified by the name of a color, such as red, orange, or green. Each hue has a specific position in the standard colour wheel and is characterized by a specific angle between -180° and $+180^\circ$.

Saturation is a degree of color purity. Saturation defines the ratio of grey and the specific hue and is measured as a percentage from 0 percent (grey) to 100 percent (fully saturated).

To modify an image brightness, contrast, hue and saturation

1. Select the image to be processed.
2. Start the operation by one of the following methods: click the  button on the *Image* toolbar or choose *Brightness/Contrast* from the *Image* menu.

The following dialog box is displayed:



3. Use the appropriate boxes or slides to modify the value of the following parameters: *Brightness*, *Contrast*, *Hue*, and *Saturation*. The preview window displays the effect of modifying parameters.
4. Click *Apply* to run the operation.

Correction by Histogram


This operation is applied for precise adjustment of the image brightness, hue, and contrast. The tool of correction by histogram requires the specification of two threshold brightness levels – the brightest and darkest pixels, and image gamma that defines the position of the middle brightness value relative to the current threshold values.

The gamma defines a ratio of the brightness range length between the average and the brightest value to the length of brightness range between the dark threshold and the average value. As a result, the pixels with a brightness value below the dark threshold gain zero brightness value; the pixels with a brightness value above the brightest one gain maximum brightness value (255), and the brightness values of the pixels between the darkest and the middle values as well as between the middle and the brightest ones are relocated evenly in conformance with their range lengths determined by image gamma.

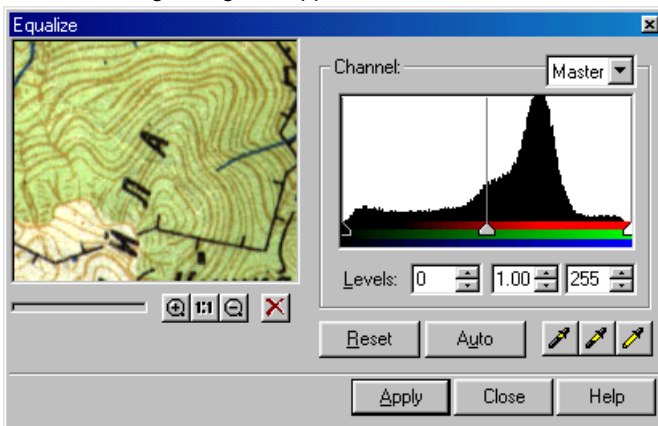
An increase in gamma value causes the range for brightness value in the dark range to reduce, and therefore it increases the contrast, at the same time reducing the contrast in the light hue area, and vice versa.

The command enables users to redistribute both image pixels average brightness and brightness by separate colour pixel components (Red, Green, and Blue). It enables image pixel colour to be corrected, for example, to turn a pink background to pure white.

To correct an image by histogram




1. Select an image to be processed.
2. Click the  button on the Image toolbar or choose *Equalize* from the *Image* menu.

The following dialog box appears:



This dialog box represents the image histogram, displaying the averaged number of pixels, corresponding to each brightness value. The left part of histogram corresponds to low brightness value, and the right one corresponds to high

brightness value (the lightest tones). The sliders in the bottom part of histogram indicate threshold values: the left black one is for the darkest value, the grey middle one is for the middle value, and the right white one is for the brightest pixel. The *Levels* box provides the numerical expression of current threshold values. One of four histograms can be selected: *Master* displays summary pixel brightness distribution, Red, Green, and Blue display distribution of the corresponding pixels colour components. Use the *Master* histogram slides to proportionally modify the threshold value for all components at once. The histogram sliders Red, Green, and Blue modify brightness threshold values separately for the corresponding colour component.

The eyedroppers are used to select threshold values and gamma for an image. When selecting a colour sample with the  (or ) eyedropper, it defines the threshold value for the darkest (or the lightest) for all components equal to the corresponding components values of the selected colour. When selecting a colour sample with the  eyedropper, it defines the position of the middle tone, and hence defines the image gamma.

3. Select a histogram corresponding to the colour component to be corrected.
4. Specify the brightness value for the darkest and the brightest pixels, and for the image gamma. Use *Levels* or eyedroppers. Use histogram slides for precise adjustment.

The preview window displays part of the image. Use the preview management tools to adjust optimal correction parameters.

Use the *Auto* button to automatically specify the light and dark threshold values so that the brightness values of each colour component not found in the image are cut off. Automatic correction tries to increase image contrast as much as possible, slightly modifying brightness values.

Suppose we want to make the background tone of a map image pure white. To do so, select a background sample with the white eyedropper. The white triangle in the *Master* histogram moves to the position corresponding to the selected colour brightness. All the pixels with a brightness value above the defined one become white. Then suppose we want to turn outlines, which are not pure black after scanning, black. Select a colour outline sample with the black eyedropper, all pixels with a brightness value below the defined one become black.

The brightness value of the remaining pixels will be proportionally redistributed within the new tone range. As a result, the image contrast increases. Move the grey slider (modifying gamma value) to redistribute the contrast between the light and dark image parts.

5. Click *Apply* to run the operation.

This operation can be applied several times, consistently modifying an image pixel brightness distribution.

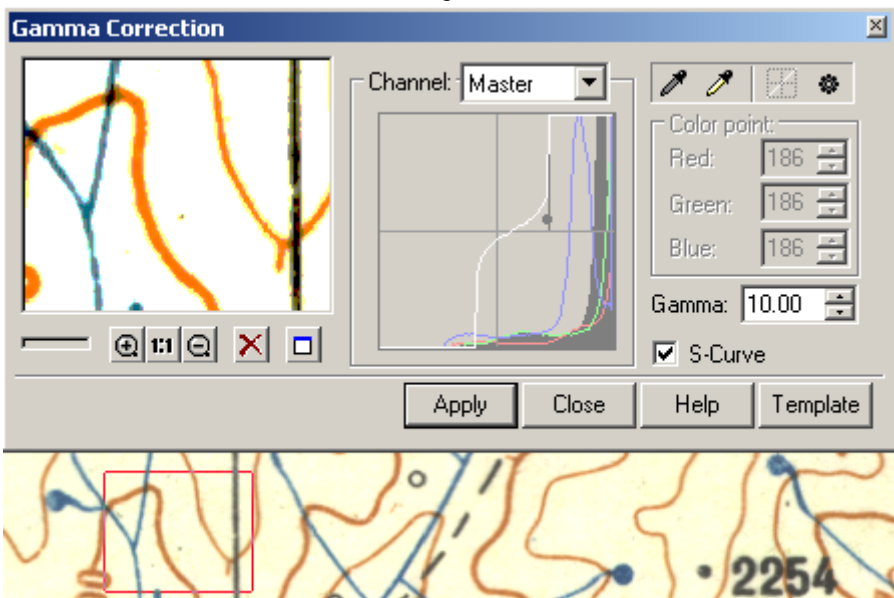
Gamma Correction

This tool is used to enhance the overall quality of an image by changing its so-called “color profile” - i.e. it applies an “algorithm” to change the distribution of brightness.

Every image has its brightest point (a “white” point) and its darkest point (a “black” point). The points having intermediate values of colour intensity are usually distributed unevenly, forming a curve of an arbitrary shape. The Gamma value defines the slope of the curve halfway between the black and white. Using the Gamma Correction tool, the points that fall within in a specified range of brightness can be made either brighter or darker. The brightness of Red, Blue or Green colours can also be changed.

To change colour profile


Choose *Gamma Correction* from the *Image* menu.



The *Gamma Correction* dialog is displayed. Do the following:


- Specify white and black points using the relevant eyedropper tools;
- Choose *Master* or specify a colour in the *Channel* list;
- Create Gamma curve automatically or adjust it manually;
- See the results in the preview window. Press *Apply*.


Specifying black and white points

Use the  buttons to pick the black or white point values directly from the image. Select an appropriate tool and draw an area on the screen.

The *Color point* section of the *Gamma Correction* dialog allows for precise adjustment of colour values. If any values are set different from (0,0,0) for a black point and/or

(255,255,255) for a white point, then the points located outside this range will not be affected by the Gamma correction procedure.

The *Auto Set* button  calculates the black and white point values automatically for every colour channel. The histogram in the middle of the dialog window reflects colour brightness distribution. The curve for every channel can be changed separately.

Click  to reset the gamma curve.

Changing the gamma curve


There are three interrelated methods of changing the shape of the Master gamma curve and the curves for individual channels.

1. Select or clear the *S-Curve* checkbox. S-curve is a form of a gamma curve that is always symmetrical around the central point of a distribution range. This implies that when adding brightness to dark areas we automatically darken bright areas to the same extent creating a more balanced brightness for the human eye. If the *S-Curve* checkbox is off, then a gamma curve can be created by shifting the overall balance of brightness in the resulting image.
2. Enter a value in the *Gamma* box. This changes the curve slope.
3. Drag the *Master* curve or the curves for individual channels in the histogram window.

When *Master* is selected in the *Channel* list, all the curves are shown (at first you see them as a single white curve since the curves for colour channels overlay).

When placing the mouse pointer over the curve a bold point will be seen that can be dragged to change the shape of the curve. While keeping the mouse pointer over the curve, the real distribution of colour brightness on the image can be seen.

To change the shape of the curves for the Red, Blue or Green channels, select the corresponding colour name from the *Channel* list.

For some images the Master curve Red, Blue or Green components can also be split by pressing the *Auto Set* button .

Modifying a Color Palette

The editing operations allow the color palette to be calculated automatically or modified based on the user-defined colours.













Manage the colours in the image using the *Color Classifier* dialog of the *Image* menu. The following operations are available:

- Reducing the palette by deleting the selected colour or colours or by merging several colours into one;
- Changing selected colours;
- Adding new colour(s) to the palette; and
- Saving the palette for further use when processing a set of similar colour images.


To edit a palette

Choose *Image Classifier* from the *Image* menu.

The buttons and controls in the *Image Classifier* dialog

<i>Colour samples table</i>	This table contains colour samples of the current palette.
 <i>Colour counter</i>	This control is used to show the number of colours in the current palette (from 2 to 256).
 <i>Set auto palette</i>	Pressing this button forces the program to automatically determine a set of colours that represents the image most closely.
 <i>Reset palette</i>	This button is used to recalculate the palette based on the number of colours set in the <i>Colour Counter</i> .
 <i>View Selection</i>	When this checkbox is checked, the points of selected colours are highlighted with a specified colour in the image.
 <i>Choose colour from the image</i>	This tool is used to choose a colour by clicking on a pixel in the document window. The colour of a selected pixel will be highlighted in the <i>Colour samples table</i> .
 <i>Select colours from the image</i>	This tool is used to select colours by drawing a polygon around an area in the document window. Press ENTER or right-click to close the polygon.
 <i>Choose colour from dialog</i>	Opens the <i>Colour Selection</i> dialog which allows the replacement of the currently selected colour with a new one.
 <i>Merge colours</i>	Merges colours selected from the colour samples table to the mean colour.
 <i>Delete colours</i>	Deletes colours selected in the colour samples table from the palette
 <i>Load LUT</i>	Loads the current palette from a LUT-file (Look-Up Table).
 <i>Save LUT</i>	Saves the current palette in a LUT-file (Look-Up Table).
 <i>Template</i>	Use this button to save and load colour palette information to and from a template file.

To calculate a palette automatically

Press the button .


The palette will be recalculated automatically, and the image will be regenerated to reflect the changes. The colour samples will appear in the *Colour Sample table*, and the number of colours will appear in the *Colour Counter*.

To create a new palette

Set a number of colour in the *Colour Counter*

- or -

edit the palette in the *Colour Sample table*.


Press the button 

Observe the changes in the Preview window. When the best result are achieved press *OK*.


To select colour(s)

Pick a colour in the *Colour Sample table*; hold SHIFT for continuous selection;


- or -

press the button ; pick a point in the image; the selected colour will be selected in the *Colour Samples table*;

- or -


press the button ; draw a polygon around the desired area in the image. The colours within the polygon will be selected in the *Colour Samples table*.

Observe selected colours in the image using the *View Selection tool*.

Select the checkbox  *View selection*; a colour located next to the checkbox is used as a highlight colour. Pressing on this colour invokes the dialog for highlight colour selection.

To delete a colour from a palette

Select colour(s) to delete.


Press the button .

Reduce the number of colours by setting the number in the *Colour counter* and

pressing the  button.


To add or replace a colour in the palette

To replace a colour, click on the colour sample to replace, or to add a colour select an unoccupied space in the colour table.

Press the RGB button  in the *Colour Correction* dialog and choose a new colour to add or replace an existing colour with.

To merge colours

Select colours to merge from the *Colour Samples table* with the SHIFT key pressed or pick them in the image using the tool .

Press the button .

Blur Filter


This filter produces image blur effect, giving the impression that the image is slightly "out of focus". Blur filtration reduces image clearness, but makes image areas with

texture fills more even. This procedure can have a positive effect on further binarization or image colour separation.

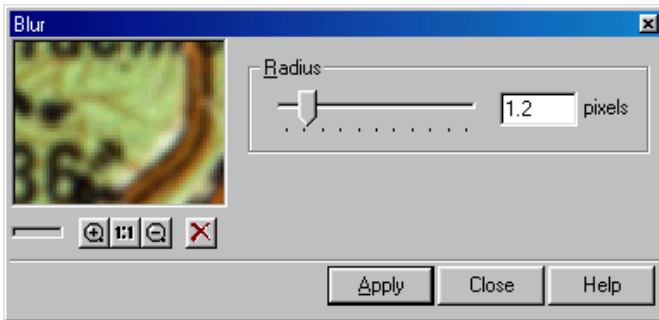
To calculate a pixel's new color the program replaces its color value by the spatial average. The averaging of pixels in the area around the pixel is done with the weighting function being a two-dimensional Gaussian distribution with its centre at the current pixel..

Radius is the only filter parameter. Increasing its value produces a stronger blur effect.

To blur an image

1. Select an image to process.
2. Click  on the *Filter* toolbar or choose *Blur* from the *Filters* menu.

The following dialog box is displayed:



3. Type values from 0.1 to 10.0 in the *Radius* box to specify the image blur level. Increasing its value produces a stronger blur effect.
4. Choose *Apply* to run filtration.

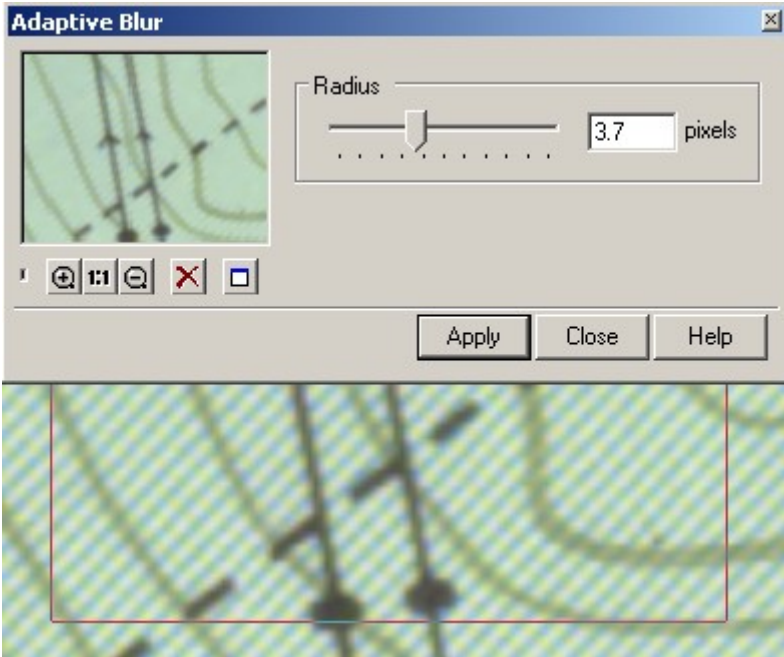
On the one hand, blurring with a large *Radius* yields a coarse image and removes details. On the other hand, setting a small *Radius* applies the minimum blur effect of the filter application. To better control the result of blurring, apply this filter with a small *Radius* value several times, using the *Apply* button of the dialog box.

Adaptive Blur

This tool is designed for blurring none uniform colour areas inside the colour transition boundaries in the image. It works on greyscale and colour images.

The blurring gives the impression that an image is slightly «out of focus».

The *Adaptive Blur* filter, in contrast to the *Blur* filter, tries to recognize the colour transition boundaries in the image and leave them unchanged, without smoothing.



The setting of the radius value determines the depth (in pixels) of the filter effect on the colour area.

To implement the Adaptive Blur


1. Start the command *Adaptive Blur* from the *Filters* menu.
2. Type values from 0.1 to 10.0 in the *Radius* to specify the image adaptive blurring degree. The bigger the radius, the stronger the blurring effect.
3. Click Apply.

Unsharp Mask Filter

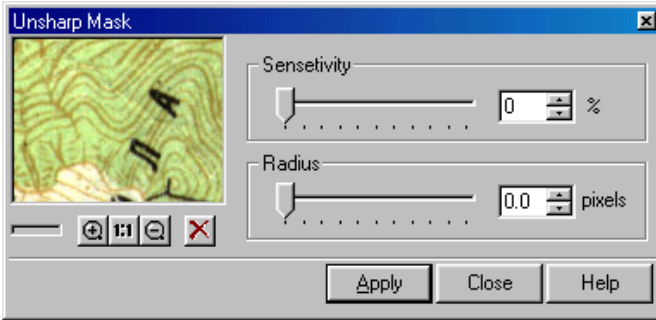
This filter looks for colour transition boundaries in the image and improves their sharpness.

The filter modifies pixel contrast on colour transition boundaries, producing an overall increase of image sharpness. This filter can be used for correction of images that became blurred after interpolation, for example, after such operations as scale, resolution modification or calibration.

To increase outline sharpness

1. Select an image to process on the screen and start the operation using one of the following methods:
2. Click the  button on the *Filter* toolbar or choose *Unsharp Mask* from the *Filters* menu.

The following dialog box is displayed:




3. Enter a value in the *Sensitivity* box or use the appropriate slider to specify the desired effect of the filter application in percent from 0 to 100. The effect of the filter application becomes stronger as this value is increased.
4. Enter the *Radius* value.
The higher the *Radius* value specified, the more pixels surrounding the colour transition boundary will be processed. Low radius values only increase the sharpness on the boundaries.
To adjust optimal parameter value for the entire image, first try out some settings on a typical area in the preview window.
5. Choose *Apply* to run filtration.

Median Filter

Median filtration reduces an image noise, by analyzing all pixels within the specified radius and giving the central pixel the averaged value of the reviewed pixel characteristics. As a result, the extremes of pixel colour and brightness are depressed and the image looks slightly blurred.

To perform median filtration

1. Select an image to process.
2. Click  on the *Filter* toolbar or choose *Median* from the *Filters* menu

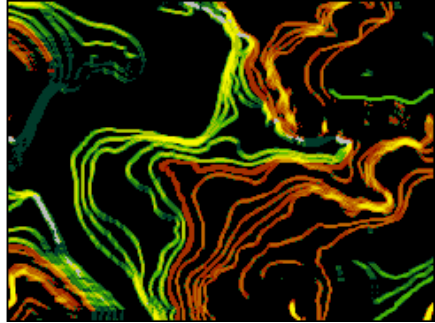
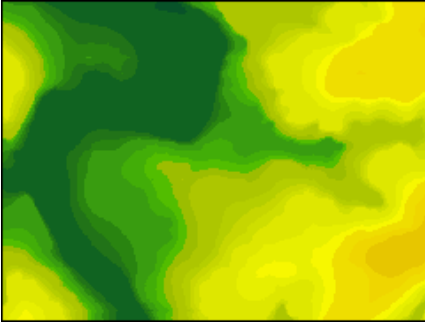
The following dialog box is displayed:




3. Specify the *Radius* value from 1 to 5. This value determines in pixels the area within which the filter is to review colour values.
4. Choose *Apply* to run filtration.

Find raster borders

The *Segmentation* filter finds and highlights the borders on colour raster image. The bigger the difference, the brighter the border segmentation.



Increasing the *Radius* parameter causes more places to be treated as area borders. To launch the *Segmentation* dialog choose *Filters* from the *Image* menu and then *Segmentation*. Or click the  button on the *Filters* toolbar.

To perform segmentation do following:

1. Open a colour raster image.
2. Run the *Segmentation* command.
3. Tune it with the *Radius* slider until satisfied with the result in the preview window. Click the OK button

Binarization and Colour Separation

This section describes the procedures of converting colour and greyscale images to monochrome raster images (raster layers).

The original image is a raster file, obtained after colour or greyscale scanning. *Binarization* creates monochrome raster images, containing black-and-white representations of colour objects. For example, from one image of a scanned map it is possible to extract and place objects of different colours (e.g. isolines, roads, rivers, and other objects) to separate monochrome layers.

Another method to obtain a monochrome image from a colour one is *colour separation*. RxSpotlight can convert a colour image to a set of monochrome raster layers. This method guarantees that the black-and-white (or monochrome) representation of each pixel of the original image will be placed on a certain layer.


Vectorization or tracing can further convert the resulting monochrome images to vectors. Vectorization of a layered raster image is considerably more effective than vectorization of a raster obtained by scanning of colour originals.

Running Binarization


Binarization creates a new monochrome image of a specified colour, which is placed on the specified layer. Using the specific criterion the program defines which pixels of the original (colour or greyscale) image should become black (foreground pixels), and which ones should become white (background pixels), and then generates a monochrome image and places it on a new raster layer. The criterion for division of pixels into two sets is defined by the selected *binarization method* and its parameters (threshold values or a set of colour range). The selection of pixels is ruled by the settings, specified in the *Binarization* dialog box. A new monochrome image is named <Original image name>_N; N is an integer.

This operation can be applied to several images at once. If no images are selected, then the command will be applied to all images (that are visible and located on unlocked layers). If several images are selected, then the command will be applied to those that are visible and located on unlocked layers.

Binarization is applicable for images with clipping boundary. Using this feature, users can restrict the binarization area on any image.

 For information on clipping boundary application see page 130.

To binarize an image

1. Choose the images to process (visible, on unlocked layers). Otherwise, the command will be applied to all appropriate images.
2. Click the  button on the *Image* toolbar or choose *Binarization* from the *Image* menu.
3. In the dialog window (see picture and description on page 331) select a method and adjust its parameters.
4. Click *Apply*.

Binarization creates a monochrome image from a colour raster image.

Binarization methods

To convert colour and greyscale images to monochrome ones, various conversion algorithms are used, which are called *binarization methods*. It is recommended to choose a conversion method appropriate to the image type.

Threshold by Grey

Threshold by Grey converts colour pixels with a brightness values above the specified level to background dots, and pixels below this level to image dots.

This method may be used for converting both colour and greyscale images. When converting a greyscale image, RxSpotlight uses its grey levels. When converting a colour image, the grey levels are defined by the brightness value of colour dot.

Threshold by RGB

When using *Threshold by RGB*, define three threshold levels for the Red, Green, and Blue components. RxSpotlight converts colour dots with Red, Green and Blue values

below the appropriate threshold levels to black dots (image dots) of the monochrome image.

Range by Grey

Range by Grey allows conversion of colour pixels, with any brightness value, to image dots. Using this method, first specify a number of basic levels of grey. These levels are used as midpoints for *ranges*. For each of the specified levels, define a *range half-length*. A range half-length is a number of grey levels below and above the specified grey level.

Range by Grey converts pixels that have grey values within all specified ranges to foreground dots. Other pixels are converted to background dots.

This method may also be used for converting colour and greyscale images. Grey levels for colour dots are calculated as described in *Threshold by Grey*.

Range by RGB

This method can convert colour pixels of the specified *RGB ranges* to image dots.

To specify an RGB range, first select a *central range colour*. The Red, Green, and Blue components of this colour define the position of the RGB range central point. For each of the colour components (R, G, and B) specify the appropriate *range half-lengths*. The range half-length for R, G, or B component is a number of R, G, or B levels below and above the selected R, G, or B level. For example, if the R level of the selected colour is equal to 50 and its range half-length for R component is equal to 10, then the RGB range includes colours with the R components from 40 to 60.

Range by HSV


This method allows the conversion of pixels of analogous colours to image dots. Analogous colours are closely related colours in the human perception of colour, e.g. red - orange, dark green - light green, etc.

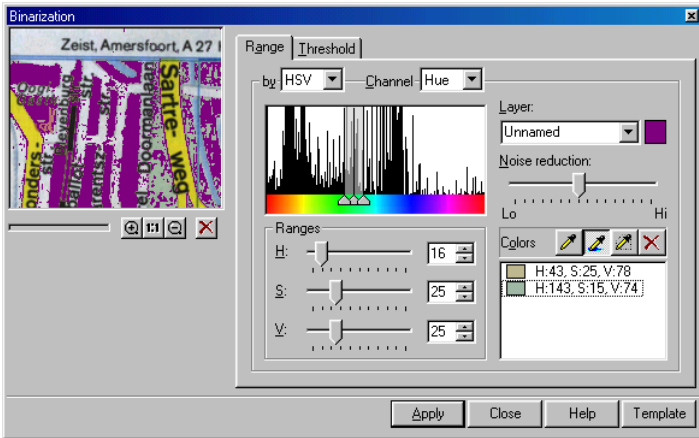
To convert an image using *Range by HSV*, specify one or more HSV ranges. The HSV range is defined by a selected colour and H, S, V *range half-lengths*. The HSV range is similar in design to the RGB range described above. Note that *Hue* is expressed as an angle between 0° and 360°, *Saturation* and *Value* are measured as a percentage from 0 to 100.

-
- ❖ Using this method for converting greyscale images provides a low-quality result.

Binarization dialog box

To open the Binarization dialog box

Choose *Binarization* from the *Image* menu or click the  button on the *Image* toolbar.



The *Binarization* dialog with the *Range* tab open

The controls and buttons described below are the same of the *Threshold* and *Ranges* tabs of the *Binarization* dialog box.

Preview window

This window dynamically displays the binarization results of an image part. Note that if a colour sample in the image is chosen with an eyedropper, the preview window marks the position of a selected pixel with a cross. This only happens if colour selection is performed in the preview area, the position of which is shown with a coloured frame (red by default) on the image.

 For more information on Preview window and *Preview Area* toolbar see page 34.

Noise Reduction

This slide sets the sensitivity of the binarization tool to small details in the image. If the maximum level of noise reduction is set, then the quantity of raster noise and holes in the obtained monochrome raster objects is reduced. However, the high level of noise reduction decreases the binarization quality of small and thin details, such as texts, thin lines, etc, since small details can be taken for noise. If a low level of noise reduction is applied, then the quality of small detail binarization improves, but the quantity of raster noise increases.

By

Depending on the chosen tab, this list allows users to select a binarization method. For example, if the *Range* tab is chosen, the choice is *Range by Grey*, *Range by RGB* or *Range by HSV*.

Channel

A *colour information channel* type can be chosen from this list. The term *colour information channels* stands for the information on the colour components of the image pixels by a certain colour representation model.

The number of available channels depends on the image type. Every colour image has five channels: *Red* to store information on the red colour, *Green* to store information on the green colour, *Blue* to store information on the blue colour, *Hue* to store information on hue, and *Grey* to store information on the grey colour components (brightness) for each colour. For greyscale images the *Grey* channel is used only.

Channel histogram window

The histogram of the selected channel is displayed in the *Channel* list. Histogram is a graphic representation of a colour component value distribution by image pixels, defined by a selected channel. A component value is measured along the histogram horizontal axis (low values are on the left, high values are on the right). Along the vertical axis are placed a normalized number of pixels with the specified colour component value. Thus, the histogram extremes correspond to the most frequent component values, and the minimums correspond to the least frequent values.

Depending on a selected binarization method, either one or three triangular sliders can appear in the bottom histogram part. These sliders allow the adjustment parameters of the current binarization method, i.e. to specify range parameters and threshold level value.

Layer

Allows the specification of a layer name, on which a monochrome image will be placed after binarization, and a raster image colour.

Apply

Starts the binarization procedure.

Template

Used to store and load all the parameters for all binarization methods.

Dialog box tabs

There are two tabs in the *Binarization* dialog box: *Range* and *Threshold*. The first one is used to specify the binarization range methods parameters; the second is used to specify threshold methods parameters.

Range tab

This is applied to tune the following range methods: *Range by Grey*, *Range by RGB* or *Range by HSV*.

Colours

This list shows information on *central colours* of specified ranges and allows to selection of a range for correction and deletion. The left part of the list shows a sample of a selected colour (or grey tone), and the right part shows colour component values in the current colour model (grey level for greyscale images). To select a range, click its appropriate colour in the *Colours* list.

Above there are three buttons with eyedropper pictograms, these allow the creation of new ranges.



Colour selection allows the creation of a new range by selecting a colour in the image.

RxSpotlight creates a new range, using the colour of the specified pixel as the range central colour.



Averaged colour selection allows the creation of a new range by choosing an averaged colour in the area around the pixel clicked.

RxSpotlight calculates the average colour value in the area of the specified pixel and creates a new range, using the calculated colour as the *range central colour*. The half-lengths of the created range are automatically adjusted to take close colours, found in the specified pixel area.



Area averaged colour selection allows the creation of a new image by calculating the averaged colour of an arbitrary area in the image.

Click the button and specify vertices of a polygonal area or drag the cursor, outlining the boundary of the image polygonal area. Complete the selection of the area with a double-click. RxSpotlight calculates the average colour value in the specified area and creates a new range, using the calculated colour as the *range central colour*. The half-lengths of the created range are automatically adjusted to close colours, found in the specified pixel area.

Ranges

Use this box to change the half-lengths of a range, selected from the *Colours* list. The type, name and a number of sliders and boxes depend on the current conversion method. For example, when choosing *Range by HSV*, the following sliders and boxes to modify the range half-lengths are displayed: hue – H, saturation – S and brightness – V.

When *Range by Grey* is chosen, there is only one slider and one box to enter the half-length of brightness range.

Sliders of channel histograms

This tab has three triangular sliders on the histogram channels corresponding to the selected binarization method. These sliders allow changes to the central colour components (grey central level) and the half-length of the range selected from the *Colours* list.

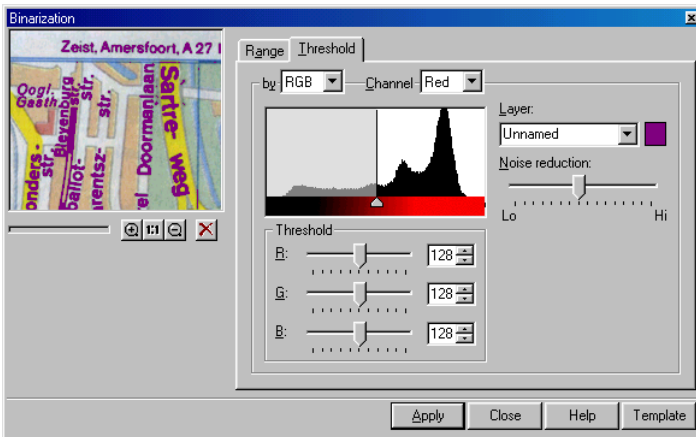
When *Range by HSV* is chosen, the sliders at the channel *Hue* histogram appear, the selection of *Range by RGB* causes the appearance of sliders at the *Red*, *Green* and *Blue* histograms. When *Range by Grey* is chosen, the sliders appear at the histogram of the *Grey* channel.

Threshold tab

This is used for binarization with *Threshold by Grey* or *Threshold by RGB*.

Threshold

This command displays the specified algorithmic threshold values of the current method of threshold binarization. To modify a value, move the corresponding slider.



Threshold tab of the *Binarization* dialog

Sliders of channel histograms

One triangular slider appears on the channels histogram corresponding to a certain binarization method. This slider allows the modification of the threshold value of a colour component or grey level.

When *Threshold by HSV* is chosen, the sliders appear at the *Red*, *Green* and *Blue* histograms. When *Range by Grey* is chosen, the slider only appears at the histogram of the *Grey* channel.

Tuning Binarization

To fine-tune the binarization procedure, choose an appropriate method. The selected method type defines a customizing method. For each of two threshold methods specify one or three threshold values at the histogram. Also specify a set of ranges of the corresponding types that contain the extracted colours.

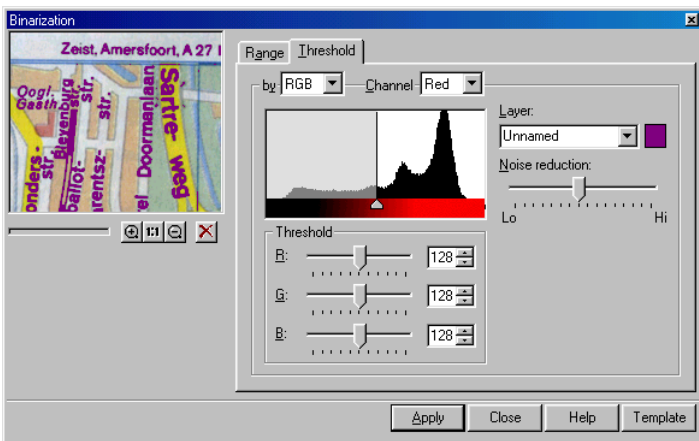
For information on binarization methods see "Binarization methods" on page 329.

For any method specify a layer to place an image, obtained after binarization.

To tune threshold binarization

1. Choose the *Threshold* tab from the *Binarization* dialog box.
2. From the *By* list choose an appropriate method.
3. Tune the threshold values for the selected method.

When tuning, use the preview window of the *Binarization* dialog box to observe the results of parameters' modification. Note that an image preview at the scale 1:1 provides the most reliable results. For more information on preview tools see page 34.



Binarization dialog with *Threshold by Grey*

If the *Threshold by Grey* method is selected, then choose *Grey* in the *Channel* list to see the grey level histogram. Specify a threshold value with triangular or G sliders.

If the *Threshold by RGB* method is selected, then adjust the R, G, B threshold values. For this purpose the sliders on histograms of *Red*, *Green*, and *Blue* channels can be used.

4. Use the *Noise Reduction* slider to adjust noise reduction and improve binarization quality.

By default this parameter is specified as an average value. If binarizing large filled areas, then decrease this parameter value (close to *Lo* mark) to reduce the quantity of raster speckles and non-filled holes when binarizing objects.

When trying to get a monochrome layer containing images of small or thin objects (texts, characters, isolines, or grid), increase this parameter value to prevent these small objects, caused by noise reduction, from being thinned and distorted. This will increase the noise level of the obtained object.

5. Define a monochrome image colour and a name of the layer to place the binarization results on.

Enter a name in *Layer*. To define a colour, click on a colour pattern and choose a colour from the box, click *OK*.

To tune the binarization using the range method

1. From the *Binarization* dialog box, choose *Range*.
2. From the *By* list, choose a required type of range method.

Set the parameters of the chosen method.

When tuning use the preview window of the *Binarization* dialog box to observe the result of changing parameters. Note that the most reliable results are obtained on viewing the image at a scale of 1:1. For more information on preview tools see page 34.

3. Specify a set of ranges capturing the colours (grey levels) of the colour image objects to be moved to a separate monochrome level.


To do so, create a required number of ranges, using the eyedropper buttons and control the result of adding each range in the preview window. If the range addition results with unwanted image pixels being captured, then try to modify the range parameters using the *Ranges* box or the channel histogram sliders. If an acceptable result cannot obtain for a range, then delete it using the *Remove Colours* button.

-
- ❖ Note that during selection of a colour pattern on the image with the eyedropper, when selecting a colour in the image preview area, the position of the chosen pixel is marked with a cross in the preview window. It enables a pixel lacking colour to be chosen.

To add a range

Click  or  buttons and point on the image a pixel to binarize.

- or -


Click  button and choose an area on the object to binarize.

An element related to the created range appears in the *Colours* list.

To change the created range parameters

Use sliders and boxes of *Ranges*, or channel histogram sliders.

To delete a range

Click an element corresponding to the range to be deleted in the *Colours* list, press the *Remove Colour*  button.

Binarization example

In this example we create two monochrome images, containing isolines and rivers of a colour map image, which is in the MAP.TIF file, found in the SAMPLES subfolder of the program root folder. In the end of this example we shall save one of the obtained layers to a separate file.




✉ When performing the instructions below control the binarization procedure through the zoom buttons, preview window and with the buttons on the *Preview Area* toolbar: , , and . For more information on preview tools see page 34.

Image loading

1. Choose *Open* from the *File* menu.
2. In the displayed dialog open the SAMPLES folder and open the MAP.TIF file.

Binarization

Open the *Binarization* dialog box.



Click *Binarization* on the *Image* toolbar or choose *Binarization* from the *Image* menu.

When the dialog opens, the preview window displays the central part of the image at a scale of 1:1.

The position of the preview area is indicated with a red frame in the image.



Change the position of the preview area using the *Preview Area* buttons. (The *Preview Area* toolbar is shown automatically after the *Binarization* dialog box is opened).

Unless parameters of *Binarization* not specified, the original image is displayed in the preview window. This window will automatically display the results of tuning the parameters. Moving the preview area, shows the binarization results of any image part.

Binarize isolines that are brown in the original image.

1. Name a layer and image colour for the binarization results to be placed on.
Enter "Isolines" in the *Layer* box, click the colour sample, and from the dialog box select an appropriate colour - brown for example. Click *OK*.
2. Choose the *Range by HSV* binarization method.
Choose the *Range* tab, then choose *HSV* from the *By* list.
The *Channel* list will automatically shift to the *Hue* channel, and the window will display the colour hue histogram.
To perform binarization with *Range by HSV*, specify a set of colour ranges. Image pixels within these ranges will form objects on the resulting monochrome layer.

The ranges are created by selecting a pixel or an area on the image using the eyedropper buttons, located in *Colours*. The selected pixel colour (averaged area colour) becomes the range central colour, and the range sizes are adjusted so that close colours are captured.

The program defines range sizes either by default or by automatically analyzing the area around the specified pixel. The range sizes can be manually adjusted the in the *Binarization* dialog box.

3. Create a range using the middle eyedropper button, which automatically adjusts the created range sizes.



To make colour selection and tuning parameters easier, zoom the preview area, using the *Synchronize View to 1:1* button on the *Preview Area* toolbar.



In *Colours* click the button and indicate a point in the middle of the isoline.

In the *Colours* list there is a colour sample, corresponding to the created range. The created range parameters are shown in *Ranges*. These parameters are range half-lengths – deviation by H (hue), S (saturation), and V (brightness) from the range central colour. The image pixels, which colour characteristics get into the specified limits, will be transferred to a monochrome layer.



If a mistake is made when selecting a colour, then delete the created range, clicking the *Remove Colour* button in *Colours* and repeat the colour selection procedure.

The preview window displays the results of the preview area binarization. If some of isoline dots are not binarized, then create one or more ranges, specifying the isoline pixels that do not get into the available ranges.



For precise pixel picking use the eyedropper button. When colour selecting with the use of this button, the selected pixel colour is not averaged.

When selecting a colour in the preview area, the preview window indicates the selected pixel position with a cross. It enables selection of a pixel lacking a colour.

After making sure that all the pixels of the isolines in the current view area are enclosed in the defined ranges, review the binarization results of other image parts.

If during a preview an image fragment has unsatisfactory binarization, then, try to improve the binarization quality by adding a range containing the missing colours.

4. When satisfied with the previewed binarization result, start the procedure by clicking the *Apply* button.

During binarization the screen displays a dialog box where the progress of the task being performed is shown in percent. Click the *Cancel* button present there to interrupt the task.

As a result of binarization a new layer named “Isolines” is created where the MAP(1) monochrome image is located.



If not satisfied with the binarization result, then use the *Undo* command to cancel it.

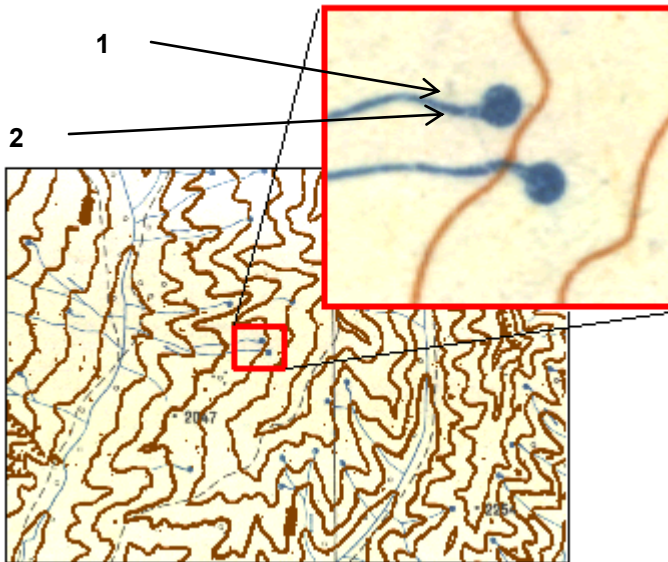
Binarize the rivers that are light and dark blue in the original image.

Firstly delete the ranges used for isolines binarization. For this purpose right-click on the *Colours* list, and choose *Remove All* from the cursor menu.

1. Specify a layer name where the binarization result should be placed and an image colour.

Enter "Rivers" in the *Layer* box, click the colour sample and select an appropriate colour from the box, blue, for example. Click *OK*.

2. Using the  button, place the preview area in the central part of the image is shown in the figure below. Click the button  in the *Colours* box and specify a point in the middle of the top circle (1 in the figure below). Then specify a point on the circle edge (2 in the figure below).



The preview area position in the image


4. When satisfied with the binarization results, repeat the procedure described above.

As a result of binarization a new layer named "Rivers" is CREATED, where the monochrome image MAP(2) is placed.

5. Close the *Binarization* dialog box by clicking the *Close* button.

Save the image from the "Rivers" layer to a separate file.

1. Open the *Images* dialog box.

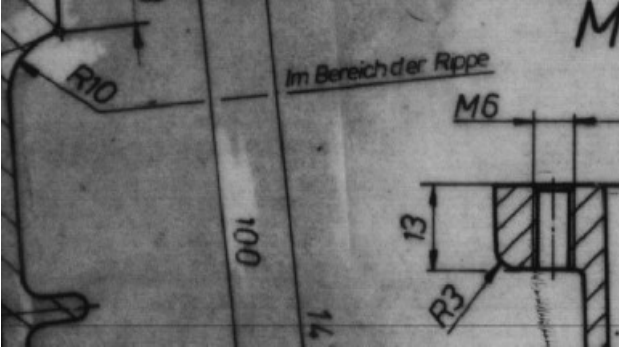
Choose *Images* from the *Tools* menu or click  on the *Properties* toolbar.

2. Choose Map(2) from the list of images.
3. Click the *Save* or *Save as* button.

❖  For information on the *Images* dialog box see page 52.

Adaptive Binarization

This command is designed for correcting raster images that have been acquired by scanning blueprint and sepias in Greyscale mode.



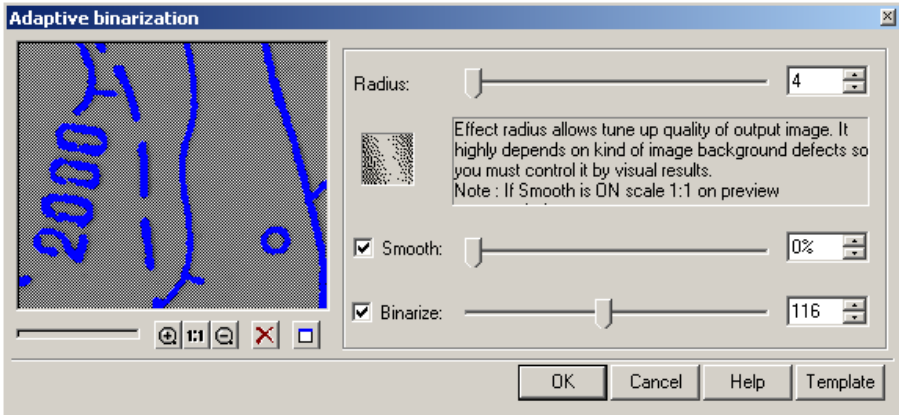
This command enhances those images by improving the binarization in order to make the images readable. Because binarizing images on which the background has a different brightness and the noise and speckles are spread unevenly produces poor results, the Adaptive Binarization tool combines binarization with cleaning of the image. The program estimates the level of noise in the area being processed and does its best to extract the useful data.



The command is applicable only to greyscale images.

To run Adaptive Binarization

Choose *Adaptive Binarization* from the *Image* menu.



All the parameters of this dialog are set using the sliders or by typing appropriate values in corresponding fields.

1. Set the *Radius* value –the radius within which the program will be analysing the level of noise to be cleaned. The greater this value, the more pixels surrounding the colour transition boundary will be analyzed.
2. Select the *Smooth* checkbox. Using smoothing with the *Binarize* checkbox set to off produces a cleaner image with the background evened and line objects revealed.
3. Set the *Binarize* checkbox to create a monochrome image.
4. Click *Ok* after achieving satisfactory results in the preview window.

Color Separation

A real map or colour diagram is usually made up of a small number of colours. However, as a result of scanning a paper original we can get a colour raster image having tens or even hundreds of thousand of colours.

Two similar procedures are described in this section that make possible to separate colour image dots in non-overlapping sets, i.e. categories. These procedures are used to extract the colours the original image was created with. The objects of the same type are usually marked with the same colour; therefore we are able to separate the necessary image objects.

Each category is based on a set of basic colours. A set of basic colours that belong to all categories defines the separation of the original image dots in non-overlapping basic subsets.

To distribute colours into subsets RxSpotlight performs the following procedure. The colour difference between each dot of a colour image and all specified basic colours is calculated. This dot is put in a subset of basic colour that has the minimum colour difference from the colour of this dot in the RGB area. Thus, all the original image dots are split to basic subsets, related to the specified basic colours.

The dots belonging to basic subsets, which correspond to colours of one category, form this category.

For example, consider an image with a blue line passing across yellow and white background. Actually, this line consists of blue and green dots. Thus to classify the image dots correctly, we need to define three categories: the first one with yellow basic colour where all dots of yellow background will be put, the second one with white basic colour where all dots of white background will be put, and the third one with green and blue basic colours where all dots of blue line will be put.

On layering, the program places the dots of each category in a separate monochrome image. The original colour image is not changed.

As a result of this procedure the program assigns the same colour to the dots belonging to the same category. It causes colour reduction in the original image.

Separation to several monochrome layers

The first step to specify separation parameters is to define a set of object categories in the original image. For example, a category set may be the following: background, isolines, roads, railways, buildings, vegetation, rivers, etc. Up to 255 categories can be specified. Each category has two properties: name and symbolic colour.

A symbolic colour is used to display dots, belonging to a certain category, in the preview window during the adjusting of separation parameters. It is also assigned to the monochrome layer to which the dots of this category are transferred. A symbolic colour does not need to correlate with the colour of extracted objects.

To enable the program to extract the points, belonging to different categories, at least one basic colour needs to be specified for each category. As described above, the dots with the colour close to the category basic colours are placed into the appropriate category. The number and set of basic colours are defined manually when tuning the procedure.

Image layering is performed with the *Colour Separation* dialog box.

Running color separation


When performing the separation procedure, the program creates a separate monochrome image for each category and places the object points, belonging to this category on this image. The new layers are created in the document, on which new raster images are placed. The layer's names are the same as the categories names. Images colours are defined according to the symbolic colours of appropriate categories. New monochrome images get the names <Original image name>N, where N is an integer.

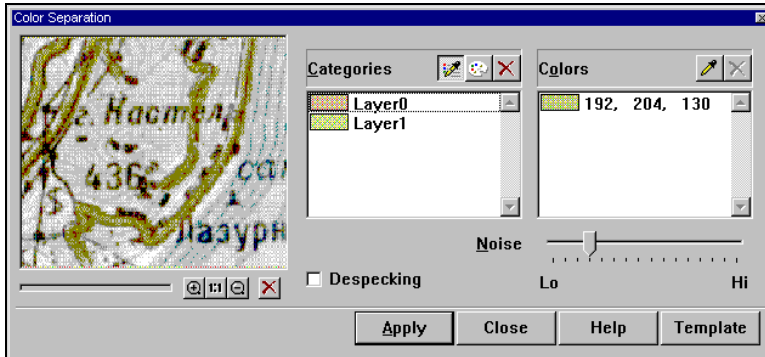
Several color raster images can be separated into layers at once. If no images are selected, then the command will be applied to all images (that are visible and located on unlocked layers). If several images are selected, then the command will be applied to those that are visible and located on unlocked layers.



Layering can be applied to images with clipping boundary. Using this feature, the layered area in any image can be restricted by specifying its clipping boundary.

☒ For information on clipping boundary refer to page 130.

To tune and run Colour Separation

1. Select images to process.
2. Click the  button on the *Image* toolbar or choose *Colour Separation* from the *Image* menu.



-  Create a category set, using the *Create Category* button as described below in this section.
-  To modify a category definition or delete a category created by mistake use the *Delete* or *Modify* buttons in *Categories*.

Use the preview tools of the color separation dialog box to view the results of modifying parameters. Note that an image review at a scale of 1:1 provides the most reliable results.

☒ For more information on preview tools see page 34.

3. If not satisfied with separation results, then try one of these methods:
 - Modify the category basic colours or add new basic ones, using the buttons of *Colours*. Note that a sufficient number of basic colours, describing each category should be specified. Colour samples both in the middle and closer to the object boundary should be selected.
 - or -
 - Use the *Noise Reduction* slider and *Despeckle* option to redistribute dots by categories.


- ❖ Deleting and modifying definition and a set of category basic colours are irreversible operations. So, if the option of returning to the current dialog box parameters adjustment is wanted, save the current adjustment to a template using the *Template* button before starting to change parameters or category set. The adjustment saved in the template can be restored later.

4. When satisfied with the quality of separation, click the *Apply* button.

Tuning color separation

Specify category attributes and basic colours in *Categories and Colors* of the *Color Separation* dialog box. *Categories* contain a list of specified categories, and buttons that allow creating, modifying, and deleting category definitions. *Colors* displays a list of basic colors of a category selected from the *Categories* list box and buttons that allow the basic colors of a selected category to be added or deleted.

To add a new category

1. Click  – *Create category* button in *Categories*.
2. Specify with the eyedropper tool the object in the image, the dots of which should fall in the created category.
The *Layer Name* and *Color* dialog box will be displayed.
A category's symbolic color and name can be specified. By default the box specifies the color corresponding to the specified pixel color and the category name "LayerN", where N is an automatically generated number.
To modify these default parameters, enter the category name to *Name* and select a color from the palette.
3. Click OK.
In the *Categories* list a new category appears, and in the *Colors* list the colour pointed to in the pixel image is shown.
If a mistake is made when specifying a category, then delete its definition or modify its symbolic color and name.

To delete a category definition



1. Select a category from the list of *Categories*.
2. Click *Delete*.

To modify a category symbolic colour and name



1. Select a category from the *Categories* list.
2. Click the *Edit Category* button on *Categories*.
The *Layer Name and Color* dialog box will be displayed.
3. Enter a new category name in *Name* and/or select a symbolic color from the palette.
4. Click OK.

Note that the category set of basic colors is not changed when its definition is modified.

To add a category basic color

1. Select the required category from the *Categories* list.
The current set of the selected category basic colours will appear in *Colors*.



2. Click the button with eyedropper on *Colors* and specify a point on the image.

The indicated point colour will be added to *Colors*.

If a mistake is made when selecting the basic color, then delete it. The mistake in color selection is detected by examining the separation results that are shown in the preview window.

To delete a category basic colour

1. Select the required category from the list of *Categories*.
2. Select a required basic colour from the list of *Colors*.



3. Click *Delete* in *Colors*.

To adjust separation sensitivity to small objects

Use the *Noise Reduction* slider and *Despeckle* option.

Setting *Despeckle* on eliminates the influence of noise and small objects on the colour analyzing procedures.

The *Noise Reduction* slider allows the redistribution of pixels by categories by modifying the sensitivity of separation to small objects. This parameter modifies the degree of colour averaging when calculating pixel colour. If the averaging value is high, then small-sized droplets of unwanted colours (speckles) in large image objects will be classified as pixels of the categories to which relatively large objects belong. Due to high averaging value, the categories, containing small objects are distorted because the object edge dots are classified as objects of other categories. If averaging value is low, then the opposite effect is observed - the quality of small objects increases, the quantity of noise rises.


By default the slider is set to an average value. If categories containing large filled areas are the most important, then reduce the value of this parameter (move to *Low*) to reduce raster speckles and holes in these category objects.

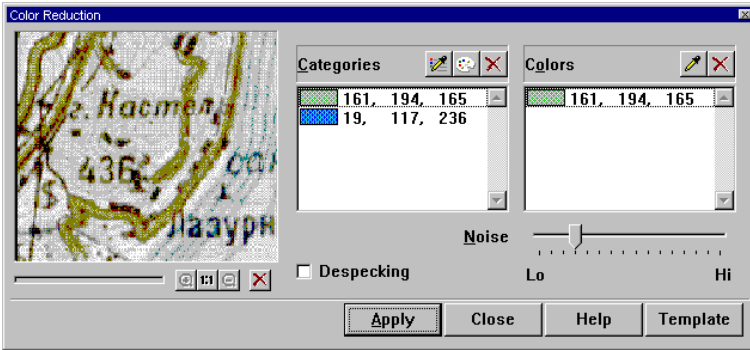
If to get monochrome layers containing of small or thin objects, such as texts, characters, level lines or grids, then increase the value of this parameter, to prevent the small object shapes from being thinned and distorted by noise reduction. Of course, this increases the noise level on all layers.

Color Reduction

This procedure is similar to that of color separation, described in the previous section. The only difference is that we do not have to specify categories names, since color reduction does not create of additional layers.

To open the Color Reduction dialog box

Click the  button on the *Image* toolbar or choose *Color Reduction* from the *Image* menu.



The *Colour Reduction* dialog box

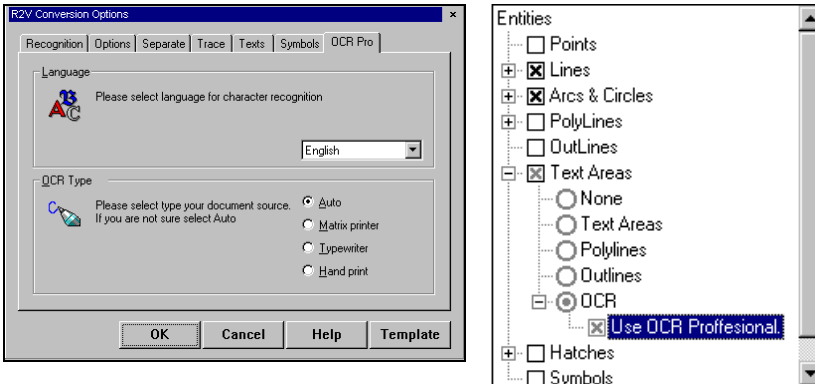
The adjusting procedure is performed the same way as the color separation procedure. Functions of this dialog box dialog controls are the same as those of the color separation dialog controls described on page 340.

Details

OCR Professional Support

Besides the standard tools used for RxSpotlight text recognition, the additional OCR module from ABBY Software can be installed; this module is intended to recognize texts on raster images. The OCR Professional option is best used to extract large amounts of text from drawings.

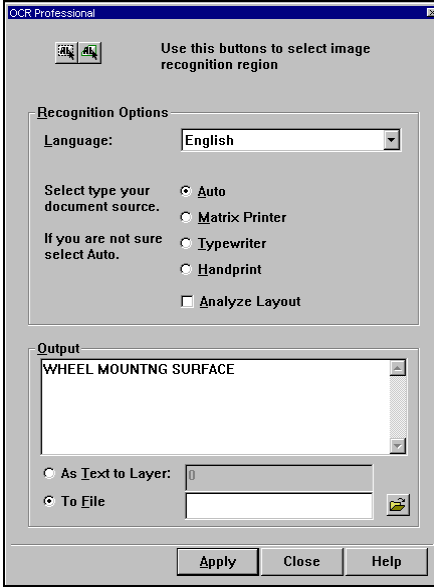
After installation the *OCR Pro* tab is added to the *Conversion options* dialog, and *Use OCR Professional* appears in the *Recognition* tab in the list of text recognition options.




New tab *OCR Pro*


Changes in *Recognition* tab

Choosing the *Convert > Fine OCR* command opens the following dialog window.



Options *Auto*, *Matrix Printer*, *Typewriter* and *Handprint* represent different algorithms of text recognition.

Turning on *Analyze Layout* adds the ability to recognize text strings that are not oriented horizontally. Buttons 

and  are used to select raster areas that contain text in a window or polygon boundary respectively. The recognized text is shown in *Output* where it can be edited and saved or placed on a specified layer.

Option *As Text to Layer* places the recognized text to a specified layer, and *To File* – to a specified file.

The information on OCR Professional module can be found in the documentation of ABBY Software.

Work automation and custom user's command creation

There are several ways to automate work with RxSpotlight and/or create user's custom commands. Each of them requires some programming knowledge and skills. Let's start from the simplest.

Autocorrect command

When starting this command a set of commands is applied to the raster image(s) in the current document.

For example, suppose a user wants to rotate all raster images by 90 degrees and remove holes, and then deskew the image in auto mode. These three commands (Autocorrect command setting) can be activated; the three operations are executed by one click on *Autocorrect*. The list of commands is defined and commands turned on (or off) with the *Autocorrection* section of the *Preferences* dialog.

The commands used with autocorrection which are executed with no parameters mainly refer to processing the whole raster image. The following commands are available: monochrome filters - *Remove Speckles*, *Remove Holes*, processing raster commands - *Deskew*, *Crop*, *Fit to paper*, *Rotate 90CCW*, *Rotate 180*, *Rotate 90 CW*, and also *Equalize* for auto correcting of colour image brightness.

☒ For more information on the *Autocorrect* command see description on page 134.

RxSpotlight Script

A RxSpotlight script lists RxSpotlight commands in specified order. It is written to a text file (with CSF extension).

When executing such script, RxSpotlight opens raster images included in the script, applies the commands to them and saves the changes made.

A special visual tool *Script Studio* is designed for creating, tuning and starting scripts. To launch RxSpotlight script, use the *Run Script* command or create a custom user command button or menu item.

✉ For detailed information about custom command buttons see page 381.

The script can be started from the Windows command line, i.e. use Windows batch file to start RxSpotlight and execute script. If starting from the command line, then the program window might not be displayed (hidden mode).

Scanning commands used in scripts can work with devices designed for auto-supply of scanned originals (reproscan devices).

There is no need to attend the RxSpotlight script execution - the computer can process data on its own, which saves operator time.

RxSpotlight Batch

RxSpotlight batch operates with several RxSpotlight scripts applied in sequence to a specified group of raster images. Batch is convenient to apply RxSpotlight scripts to a great number of raster images, located in different folders.

A RxSpotlight batch file is composed with the *Batch Studio* command.

Using the batch mode allows users to avoid changing paths in prepared scripts and create scripts with image processing commands only (without Open, Insert).

RxSpotlight Open Architecture (WIOA)

RxSpotlight has an open architecture (WIOA), which is used to create custom user commands using Java Script and Visual Basic Script languages.

WIOA creates scripts for more flexible tasks than those of RxSpotlight scripts (which are more oriented to batch processing of raster images). WIOA provides a powerful mechanism for customizing RxSpotlight, creating custom commands and close integration with other applications which are accessible through ActiveX (for example with Microsoft Office applications). Programming in JScript and VBScript requires a fundamental understanding of ActiveX Automation.

The *Active Script Studio* tool is used to create, edit and start WIOA scripts. To launch a WIOA script, use the *Run Script* command or create a custom user command button or menu item.

DDE

The DDE-interface of RxSpotlight represents the server and allows other applications to use its functions. With DDE it is possible to interact with 16-bit applications which can't support OLE Automation.

RxSpotlight script

A RxSpotlight script is a text file with one command on each line.

A script file can be created for standard processing of a loaded image and this file used to handle a number of images. To do so, create a script file containing the sequence of commands that load an image, invoke the standard processing scenario, and then save the resulting image or document for every image.

RxSpotlight script files can be created in RxSpotlight using the dialog window *Tools > Script Studio*. It is the easiest way to create scripts – there is no need to know the syntax of a RxSpotlight script to create it when using *Script Studio*.

Script files can be created externally using a text editor (such as Microsoft Windows Notepad) or a word processor (such as Microsoft Word) that can save the file in ASCII format. The file extension must be .SCF.

RxSpotlight also creates a log file for each script execution that contains the script execution date and all error messages that occur. The log filename is defined in the script file otherwise the default log filename that is set in RxSpotlight *Preferences* dialog is used. If a script file contains syntax errors, then it will not be executed and the description of errors will be written into the log file.

RxSpotlight script launching

There are four ways to run a RxSpotlight script.

- 1) It can be done from RxSpotlight using *Run Script* command in the *Tools* menu.
- 2) Also a script can be started from the command line using a special program call. A program call consists of three parts separated with space symbols.

Syntax:

```
RxSpotlight_executable_file { -K | -C } [ -L ] RxSpotlight_script_file
```

Parameters:

RxSpotlight_executable_file - The name of the RxSpotlight executable file (WI7.EXE by default). The second part is a special parameter:

- K – Starting the application and executing the RxSpotlight script.
- C – Indicates that the application must execute the script file in background mode (the application window is not displayed while the script is executing).
- L – Defines the log file.

RxSpotlight_script_file - The path to and the name of the script file that is to be executed.

Example:

```
WI7.EXE -C -L /Script/ColourRaster.csf
```

- 3) A script can also be started directly from the *Script Studio* dialog.
- 4) The last way to is to unite several scripts in the batch in the *Tools > Batch studio* dialog and apply it to selected images.

Script examples

RxSpotlight script examples can be found in the SCRIPTS subfolder of the RxSpotlight program folder.

Syntax of RxSpotlight script

RxSpotlight script files consist of one or more lines, each of which is either a comment or a command. Any line that begins with a semicolon (;) is considered a comment, and RxSpotlight ignores it while processing the script file.

The command in the script contains the command name and, if necessary, one or more parameters. All command names start with the slash symbol (“/”). Command or parameter names are entered in either upper or lower case. Command or parameter names are separated with the standard separators – space symbols, tab symbols, etc.

If a script command parameter has any value, then it is entered after the parameter’s name separated by a colon. For example:

```
/ROTATE ANGLE:30
```

If a command has only one parameter, then its name can be omitted. In such a case the command name is followed by a colon, after which goes a parameter value. Applying this rule the example above may look as follows:

```
/ROTATE:30
```

Note that a command name, a colon and a parameter value must not be separated by any separator symbol.

All references to names (names of files or layers) must be enclosed in double quotes. For example, to open the image MYHOUSE.TIF from a script, use the following syntax:

```
/OPEN:"myhouse.tif"
```

Some numerical parameters may be specified in different units. For example, an image height can be either in millimetres or in inches. These units are set in the *Script* item of the *Preferences* dialog box. Type “mm” (millimetres) or “inch” (inches) for linear units and “deg” (decimal degrees) or “rad” (radians) for angle units.

The batch commands described below are divided into groups based on their functionality, such as file processing commands, filtration commands, etc.

File selection wildcards

The wildcard symbols * and ? can be used in Open, Export, InsertImage, SaveImageAs, and SaveAs commands to open a group of files, process them one by one in a loop and save changes.

If using wildcards, then it is recommended to use the Close command to stop processing the list.

In this example we open all TIF files in the SAMPLES folder, process and save them in the NEWSAMPLES folder in BMP format:

```
...
; Batch operators
...
/OPEN: "SAMPLES\*.TIF"
;opens TIF files from the SAMPLES folder
```

```
...  
;Batch operators processing TIFs  
...  
/SaveAs FNAME: "NEWSAMPLES\*. *" FTYPE: "BMP"  
; saves the BMP file in the NEWSAMPLES folder  
...  
/CLOSE  
; Closes the loop
```

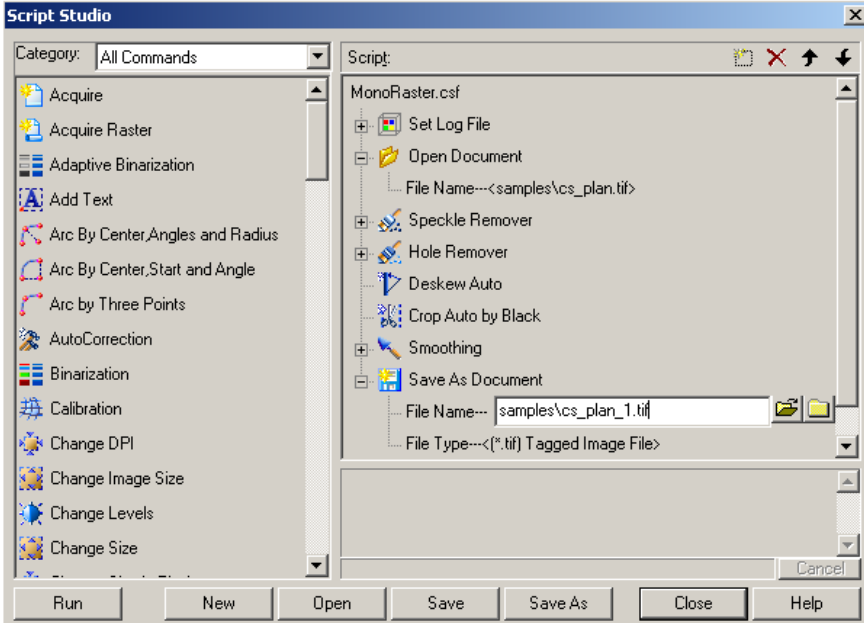
The RxSpotlight batch processor treats them according to following rules (the same as in DOS environment):

1. Asterisk stands for any number of characters.
2. Question sign stands for a single character.
For example, the following command syntax is valid:
`/OPEN: "SAMPLES*.TIF"`
as is the next example:
`/OPEN: "..\R?F.TIF"` – it would open REF.TIF, RIF.TIF, RRF.TIF and so on (but not RREF.TIF) in the upper folder.
as is the next example:
`/OPEN: "REF.* "` – it would open REF.TIF, REF.CWS, RRF.BMP and so on
3. If opening a number of files using wildcards, then save them using wildcard techniques:
For example, if opening REF1.TIF, REF2.CWS, and RRF3.BMP files with the command:
`/OPEN: "REF*.*; *.BMP"`
process them in a batch and close with the help of
`/SAVEAS: "..*. * " FTYPE: "CWS"`
the upper folder will contain REF1.CWS, REF2.CWS, and RRF3.CWS files.
4. Use the ";" symbol in the <filename> parameter of the Open command.
Example:
`/OPEN: "REF*.*; DETAILS.BMP; MYHOUSE*.TIF"`
This list of files will contain all files who's names begin with "REF", DETAILS.BMP file, and MYHOUSE1.TIF, MYHOUSE2.TIF, MYHOUSE2.TIF, etc.
5. Every item of the list is processed in a loop until the Close command is executed or the next Open occurs. The Close command is a valid way to close the list and dismiss the list of processed files.

To get more information on using wildcards, see *command line reference* in the operational system manual. Do not use this feature until conversant with command line manipulation.

Script Studio

RxSpotlight has a Visual Editor to create RxSpotlight scripts quickly and conveniently.




The left hand side of its dialog contains a list of all available commands. The current script window is located to the right.

Compose script by dragging commands from the list to the script window. With the up and down arrows control the order of execution of commands can be changed.

After a script is started, view the occurred errors in the report field.

Script commands can come with parameters. Most commands have similar parameters to those of RxSpotlight commands; the other commands have the parameter – command template name (TEMPL), which contains a set of parameters needed to execute the command.

To create a RxSpotlight script

1. Choose *Tools > Script Studio*. The script editing and running dialog window opens.
2. Using standard drag and drop techniques; populate the *Script* window in the dialog with the desired operations from the list in the left hand side. Press the key with the first letter of command name to speed up this process. To work with a list of commands, use the *Category* list in which commands are grouped by menu items (File, Edit..)
3. Set the command execution order by dragging them or using the  buttons. To set order precisely by dragging, hold the command over the other until a strip appears either under or over the command - this strip displays the

- expected command position – choose the desired position and release the mouse button.
- 4. Set the commands parameters (if needed). Those commands which require setting parameters for execution are marked with a cross to the left of their names. Some commands can be used in automatic mode or without setting parameters (e.g., *Speckle remover*).
- 5. Save the created script using the *Save* button.

To check created script


When starting a script from the *Script Studio* dialog, view the process of the script execution (i.e. view occurred errors and progress).

```
>> ----- SaveImageAs E:\dists\batch\processed\m
(ERRORR)>> File (or media) is write-protected. (Ok)
(ERRORR)>> ----- SaveImageAs
E:\dists\batch\processed\mechpage_pr.tif (Ok)
```







To write the results of the commands execution to a text file, use command *Set log file*.


If the file name and path are omitted, then the program uses the name specified in the section *Script > Default Log File* of *Preferences* dialog.

To change RxSpotlight script

Change a prepared script using the *Script Studio* dialog or manually using a text editor. Batch Studio avoids the need to modify file paths and names in the prepared script. To delete a command from script, use the  button or the DELETE key on the keyboard.

Dialog buttons and controls

Button	Description
	Makes a copy of the selected command.
	Deletes the selected command.
	Moves the selected command up in the script. (It will be executed earlier.)
	Moves the selected command down in the script. (It will be executed later.)
  Speckle Remover	Clicking on the plus sign reveals the command's options

Button	Description
	By clicking on “+” the command options tree is opened. Clicking on the command options values enters editing mode and appropriate values or options can be entered.
<i>Run</i>	Launch a RxSpotlight script and watch the program’s progress messages in the lower right section of the dialog. Press <i>Cancel</i> to stop execution of the script.
<i>New</i>	Clears the <i>Script</i> window and begins the new script.
<i>Open</i>	Opens saved script.
<i>Save/Save As</i>	Saves a script.

RxSpotlight script commands (Reference)

Exit

Closes application

Format:

/Exit

SetLogFile

Creates a log file with the script execution date and all error messages that occurred during executing.

Format:

/SetLogFile[FNAME]:”<filename>”

Example:

/SetLogFile:”C:\RXSPOTLIGHT5\MyScript.log”

File processing commands

Open

Opens an existing document.

Format:

/Open[FNAME]:”<filename>”

Example:

/Open:"C:\RXSPOTLIGHT5\Samples\map.tif"

New

This creates a new document.

Format:

/New

Close

This closes the current document.

Format:

/Close

Save

This saves the current document to a file. If the current document cannot be saved in the current file, then this command will be ignored. This might happen, for example, when trying to save several images or vector objects in image format.

Format:

/Save

SaveAs

This saves the current document to a new file. It can be saved in Colour Workspace format (CWS) or AutoCAD file format (DXF, DWG).

Format:

/SaveAs[FNAME]:"<filename>" FTYPE:"<ext>"

Example:

/SaveAs FNAME:"C:\RXSPOTLIGHT5\Samples\test.cws" FTYPE:"cws"

Export

This exports current document in as a Colour Workspace file (CWS) or AutoCAD file (DXF, DWG).

Format:

/EXPORT[FNAME]:"<filename>" FTYPE:"<ext>"

Example:

/EXPORT:"C:\RXSPOTLIGHT5\Samples\MyWorspace.cws" FTYPE:"cws"

InsertImage

This inserts an image from a file into the existing document.

Format:

/InsertImage[FNAME]:"<filename>"

Example:

/Insert:"C:\RXSPOTLIGHT5\Samples\map.tif"

SavelmageAs

This saves an image in a new image format.

Format:

```
/SavelmageAs[ INAME]:"<imagename>" FNAME:"<filename>" FTYPE:"<ext>"
```

Example:

```
/SavelmageAs:"electr" FNAME:"C:\RXSPOTLIGHT5\Samples\test.tif" FTYPE:"tif"
```

Print

This prints the specified area of the current document to the selected printer with the scale specified.

Format:

```
/PRINT [FIT | SCALE: <scale>] [LEFT:<offset> TOP: <offset> RIGHT: <offset>  
BOTTOM: <offset>] [NUMCOP:<copies>] [PNAME:"<printer name>"]
```

Description of Parameters:

FIT and SCALE

This specifies the print scale. With both parameters omitted, the command prints the image without scaling so that 1 image millimetre (or inch) represents 1 millimetre (or inch) on the paper.

FIT

This scales the print so that the portion of the document to be printed is made as large as possible for the specified paper size.

SCALE

Multiplies the print dimensions to the specified scale factor. For example, /PRINT SCALE:0.5 reduces the image by half before printing it.

LEFT, TOP, RIGHT, and BOTTOM

This defines the portion of the document to be printed. Each of these parameters defines the offset of the print area boundary. If the parameter value is positive, then the margin will be added to the appropriate boundary side. If it is negative, then the stripe of the defined width will be cut from the print area boundary. If some of these parameters are omitted, then the offsets will be equal to 0.

NUMCOP

This specifies the number of copies to print. If it is omitted, then the command prints one copy.

PNAME

This specifies the name of a printer. If it is omitted, then the command sends the output to the default Windows printer. The printer name should be typed as it appears in the Printer Name list box of the Print dialog.

Example:

```
/PRINT SCALE:2.5 LEFT:17.5 BOTTOM:10 NUMCOP:2
```

Acquire

Acquires the image using the specified TWAIN source, creates a new document consisting of one raster image, and places the result of acquiring on this image.

Format:

```
/Acquire DPI:<dpi_value> BPP:<bpp_value> [GREYSCALE] [SOURCE:"<source name>"]
```

Description of Parameters:

DPI

This specifies the scanner resolution in dots per inch.

BPP

This defines the number of colours to be used as colour depth in bits per pixel. Colour depth determines the number of bits used for colour representation when an image is being scanned. It may take the following values: 1, 4, 8, 16, and 24. For example, BPP: 1 value defines the bitonal scanning and BPP:24 value defines the TrueColour (RGB) scanning.

GREYSCALE

This forces the program into greyscale scanning mode. If this parameter is set, then define BPP = 8, or else the greyscale parameter will be ignored.

SOURCE

This specifies the name of the TWAIN source that will be used for acquiring the image. If it is omitted, then the program uses the default source.

Example:

```
/Acquire DPI:150 BPP:24
```

AcquireRaster

The image is acquired using the specified TWAIN source, creates a new raster image in the existing document, and places the result of acquiring on this image.

Format:

```
/AcquireRaster [RN:"<raster_name>"] DPI:<dpi_value> BPP:<bpp_value> [GREYSCALE] [SOURCE:"<source name>"]
```

Description of Parameters:

RN

This specifies the name of the raster that is used for the results of scanning.

DPI, BPP, GREYSCALE, SOURCE are described above in "Acquire"

Example:

```
/AcquireRaster DPI:300 BPP:8 GREYSCALE
```

Entire Image Processing Commands

MirrorX

This flips the images about the X axis.

Format:

/MirrorX

MirrorY

This flips the images about the Y axis.

Format:

/MirrorY

Rotate90_CCW

This rotates the images 90 degrees counter clockwise about its centre point.

Format:

/Rotate90_CCW

Rotate180

This rotates the images 180 degrees about its centre point.

Format:

/Rotate180

Rotate90_CW

This rotates the images 90 degrees clockwise about its centre point.

Format:

/Rotate90_CW

Rotate

This rotates the images by a user-defined angle about its centre point.

Format:

/Rotate[ANGLE]:<angle>

Example:

/Rotate:45

AutoCrop

Automatically detects margins for the specified raster image and removes them.

Format:

/AutoCrop [[ERN]:"<raster name>"]

Description of Parameters:

ERN – name of the raster for margins detecting. It may be omitted if the document consists of one raster image.

Example:

/AutoCrop:"map"

Auto correct

Applies a sequence of operations specified in the *Autocorrect* item of the *Preferences* dialog box to the raster image.

Format:

```
/AutoCorrect[[ ERN]:"<raster name>"]
```

Description of Parameters:

ERN – name of the raster for automatic estimation and detection. It may be omitted if the document consists of one raster image.

Example:

```
/AutoCorrect:"cs_cam"
```

Deskew

Automatically estimates the raster image deviations from the horizontal and vertical and rotates the image about its centre point to align it vertically or horizontally.

Format:

```
/AutoDeskew[[ ERN]:"<raster name>"]
```

Description of Parameters:

ERN – name of the raster for automatic deskew angle estimation. It may be omitted if the document consists of one raster image.

Example:

```
/AutoDeskew:"vp_city"
```

Entire Image Processing Commands (resample family)

ChangeDPI

Scales the image dimensions in pixels by changing its resolution in dot-per-inch. The image dimensions in millimetres or inches will not be changed.

Format

```
/ChangeDPI[ DPI]:<dpi_value>
```

Example:

```
; The current image resolution is 150 dpi and it has dimensions  
; 1500x1500 pixels or 10x10 inches
```

```
/ChangeDPI:300
```

```
; The image resolution is 300 dpi and it has dimensions  
; 3000x3000 pixels or 10x10 inches
```

SetDPI

Scales the image dimensions in millimetres or inches by setting the new resolution value in dot-per-inch. The image dimensions in pixels will not be changed.

Format:

```
/SetDPI[ DPI]:<dpi_value>
```

Example:

```
; The current image resolution is 150 dpi and it has dimensions of  
; 1500X1500 pixels or 10X10 inches
```

```
/SetDPI:300
```


; The image resolution is 300 dpi and its dimensions in pixels don't
 ; scale (1500x1500 pixels)
 ; but its dimensions in inches are now equal to 5x5 inches

Resize

Scales the image so that its height (or width) in current linear units becomes equal to the specified value. If the RESAMPLE parameter is present, then the command scales the image dimensions in pixels. If it is omitted, then the command scales the image by changing the new resolution value.

Format:

```
/Resize WIDTH:<distance>| HEIGHT:<distance> [RESAMPLE]
```

Description of Parameters:

WIDTH and HEIGHT

Specify the new width or height for the image.

RESAMPLE

Defines whether the image dimensions in pixels will be changed or not.

Example:

; Scale the image by changing its dimensions in /SetLinearUnits:

```
/Resize WIDTH:84 RESAMPLE
```

Scale

Scales the image. If the RESAMPLE parameter is present, then the command scales the image dimensions in pixels. If it is omitted, then the command scales the image by changing the resolution value.

Format:

```
/Scale[ SCFACT]:<scale factor> [RESAMPLE]
```

Description of Parameters:

SCFACT – scale factor.

Example:

; Enlarge the image twice by changing its dimensions in current
 ; linear units; (millimetres or inches) dimensions in pixels will not
 ; be changed. It means that the image
 ; DPI value will be decreased by half.

```
/Scale:2
```

ChangeSizeInPixels

Scales the image so that its height (or width) in pixels becomes equal to the specified value.

Format:

```
/ChangeSizeInPixels PWIDTH:<distance in pixels> | PHEIGHT:<distance in pixels>
```

Example:

; Scale the image by changing its dimensions in pixels so that
; the image height will be equal 1200 pixels

/ChangeSizeInPixels PHEIGHT:1200

Entire Image Processing Commands (image size family)

ChangelmageSize

Takes the original image and places it unchanged on a new image of the specified dimensions with the specified alignment.

Format:

```
/ChangelmageSize WIDTH:<distance> HEIGHT:<distance> [ALIGN:"<align_type>"]  
[LEFT:<offset>] [TOP:<offset>] [RIGHT:<offset>] [BOTTOM:<offset>]
```

Description of Parameters:

WIDTH

Width of the new image in the current linear units.

HEIGHT

Height of the new image in the current linear units.

ALIGN

Defines the type of alignment and specifies the available sequence of the LEFT, TOP, RIGHT, BOTTOM additional parameters. It may take the following values: LeftTop, Top, RightTop, Left, Centre, Right, LeftBottom, Bottom, or RightBottom. If this parameter value is Centre, then the original image centre point is always placed to the centre point of the new image and LEFT, TOP, RIGHT, BOTTOM are ignored. If one of the Top, Left, Right, Bottom values is used, then the image is aligned so that the centre point of the appropriate original image side is placed to the centre of the new image side. In such a case only one of the additional parameters is available. For example, if Top is used, the TOP parameter is available. When you use LeftTop, RightTop, LeftBottom, or RightBottom, the two appropriate additional parameters are available. For example, the LeftTop value indicates that the TOP and LEFT parameters are available and the RIGHT and BOTTOM parameters will be ignored.

LEFT, RIGHT

This defines the offset of the left or right original image side relative to the appropriate side of the new image. Only one of these parameters can be used at one time.

TOP, BOTTOM

This defines the offset of the top or bottom original image side in relation to the appropriate side of the new image. Only one of these parameters can be used at one time.

Example:

```
/ChangelmageSize WIDTH:85.27 HEIGHT:61 ALIGN:"LeftTop" LEFT:-20.3 TOP:12.4
```

FitToClosestPaper

This finds the standard paper format closest to the original image format and places the original image on a new image with the specified alignment.

The list of standard paper formats may be changed using the Papers item of the Preferences dialog box.

Format:

```
/FitToClosestPaper [ALIGN:"<align_type>"] [LEFT:<offset>] [TOP:<offset>]
[RIGHT:<offset>] [BOTTOM:<offset>]
```

Description of Parameters:

ALIGN, LEFT, RIGHT, TOP, BOTTOM are described above in “ChangeImageSize” command description.

Example:

```
/FitToClosestPaper WIDTH:120 HEIGHT:80.5 ALIGN:"Bottom" BOTTOM:10
```

FitToPaper

Takes the original image and places it unchanged on a new image of the specified standard size with the specified alignment.

The list of standard paper formats may be changed using the Papers item of the Preferences dialog box.

Format:

```
/FitToPaper [PN]:"<paper name>" [O:<orient_type>]
[ALIGN:"<align_type>"] [LEFT:<offset>] [TOP:<offset>] [RIGHT:<offset>]
[BOTTOM:<offset>]
```

Description of Parameters:

PN – Name of the standard paper format.

O – Orientation type (must have a numeric value):

1 - portrait orientation,

2 – landscape orientation.

ALIGN, LEFT, RIGHT, TOP, BOTTOM are described above in “ChangeImageSize”.

Example:

```
/FitToPaper PN:"ISO A2" O:2 ALIGN:"RightTop" RIGHT:20 TOP:10
```

ChangeMargins

Changes image size by adding or cutting specified margins.

Format:

```
/ChangeMargins [LEFT:<marg>] [TOP:<marg>] [RIGHT:<marg>] [BOTTOM:<marg>]
```

Description of Parameters:

LEFT, TOP, RIGHT, and BOTTOM

Each of these parameters defines the margin value for the appropriate image side. If the parameter value is positive, then the margin will be added to the appropriate image side. If it is negative, then the strip of the defined width will be cut from the image. If some of these parameters are omitted, the appropriate margin values for these will be set to 0.

Example:

/ChangeMargins LEFT:12.5 RIGHT:20 BOTTOM:12.5

Tools

Calibrate

This calibrates the image using the current calibration parameters or parameters defined by the specified template. If the template file is not stored in the default template directory, then a path must be defined for it.

Format:

```
/Calibrate[[ TEMPL]:"<template file>"]
```

Example:

```
/Calibrate:"My_calibration.tpl"
```

Binarize

This binarizes the image using the current binarization parameters or parameters defined by the specified template. If the template file is not stored in the default template directory, then a path must be defined for it.

Format:

```
/Binarize[[ TEMPL]:"<template file>"]
```

Example:

```
/Binarize:"map-rivers.tpl"
```

Colour Reduction

Performs colour reduction in the image using the current parameters or parameters defined by the specified template. If the template file is not stored in the default template directory, then a path must be defined for it.

Format:

```
/ReduceColours[[ TEMPL]:"<template file>"]
```

Example:

;Template file is not situated in default template directory:

```
/ReduceColours TEMPL:"C:\MyTPLs\My_ColourReduction.tpl"
```

Colour Separation

Performs colour separation of the image using the current parameters or parameters defined by the specified template. If the template file is not stored in the default template directory, then a path must be defined for it.

Format:

```
/SeparateByColours[[TEMPL]:"<template name>"]
```

Example:

```
/SeparateByColours:"map.tpl"
```

Separate By Size

Finds raster objects of the given size on the specified monochrome images and then moves the found objects onto a new layer.

Format:

```
/SeparateBySize RNS:"<raster_name1>"+["<raster_name2>"+...]
```

```
OLN:"<layer_name>" MIN:<dim> MAX:<dim>
```

Description of Parameters:

RNS – Names of monochrome raster images to find raster objects on

OLN –Name of new layer to place raster objects on

MIN, MAX – minimum and maximum sizes of objects to find.

Example:

```
; Moves raster objects that are more than 2 mm and less then
```

```
;3.5 mm from the "Texts" and "Symbols" images of one layer to "Small Symbols" layer.
```

```
/SeparateBySize RNS:"Texts"+"Simbols" OLN:"Small Symbols" MIN:2 MAX:3.5
```

Colour Correction Tools

Convert to 24 bit

Converts monochrome, greyscale, and 8 and 16 bit colour images to RGB colour images (24 bpp).

Format:

```
/ConvertToTrueColour
```

Equalize

Automatically redistributes the brightness values of the pixels in the images.

Format:

```
/AutoEqualize
```

Brightness/Contrast

This changes brightness, contrast, hue, and saturation values of the pixels in the images.

Format:

```
/ChangeLevels [B:<brightness>] [C:<contrast>] [H:<hue>] [S:<saturation>]
```

B – The change of the brightness value from –100 to +100

C - The change of the contrast value from –100 to +100

H - The change of the hue value from –180 to +180

S - The change of the saturation value from –100 to +100

Example:

```
/ChangeLevels B: 10 C:-10
```

Colour Filters

☒ Colour filters are described from page 324.

Blur

Format:

/Blur[RAD]:<radius>

RAD – The change of the blur radius from 0.0 to 10.0 pixels

Example:

/Blur:3.7

Median

Format:

/Median[RAD]:<radius>

RAD – The change of the median radius from 0 to 5 pixels

Example:

/Median:3

UnSharpMask

Format:

/UnSharpMask SENS:<sens_value> RAD:<radius>

SENS – The change of the sensitiveness value from 0% to 100%

RAD – The change of the unsharp radius from 0.0 to 10.0 pixels

Example:

/UnSharpMask SENS:35 RAD:6

Mono Filters

☒ Monochrome filters are described from page 149.

Invert

Format:

/Invert[[RNS]:"<raster_name1>"+<raster_name2>"+...]]

RNS – Names of monochrome raster images to invert.

Example:

/Invert RNS:"cs_cam"+"vp_city"

Contour4

Format:

/Contour4[[RNS]:"<raster_name1>"+<raster_name2>"+...]]

RNS – Names of monochrome raster images to create 4-coupling contours on.

Example:

```
/Contour4:"cs_mech"
```

Contour8

Format:

```
/Contour8[[ RNS]:"<raster_name1>"+["<raster_name2>"+...]]
```

RNS – Names of monochrome raster images to create 8-coupling contours on.

Example:

```
/Contour8 RNS:"cs_map"
```

RemoveSpeckles

Format:

```
/RemoveSpeckles[ RNS:"<raster_name1>"+["<raster_name2>"+...] [E I MIN:<dim>  
MAX:<dim>]
```

Description of Parameters:

RNS – Names of monochrome raster images to remove speckles from.

E – Estimates dimension of speckles to remove them automatically.

MIN, MAX – Minimal and maximal sizes of speckles to remove in default units.

Example:

```
/RemoveSpeckles RNS:"cs_plan" MIN:0.5 MAX:11.58
```

RemoveHoles

Format:

```
/RemoveHoles[ RNS:"<raster_name1>"+["<raster_name2>"+...] [E I MIN:<dim>  
MAX:<dim>]
```

Description of Parameters:

RNS – Names of monochrome raster images to remove holes from.

E – Estimates dimension of holes to remove them automatically.

MIN, MAX – Minimal and maximal sizes of holes to remove in default units.

Example:

```
/RemoveHoles MIN:0.5 MAX:6.32
```

Smooth

Format:

```
/Smooth[ RNS:"<raster_name1>"+["<raster_name2>"+...] M:<degree> T:<threshold>
```

Description of Parameters:

RNS – Names of monochrome raster images to smooth.

M – Medianing degree from 0% to 100%.

T – Smoothing threshold from 0 to 255

Example:

/Smooth RNS:"cs_plan" M:50 T:120

Thin

Format:

/Thin[RNS:"<raster_name1>"+"<raster_name2>"+...] [S I NP:<num>]

Description of Parameters:

RNS – Names of monochrome raster images to thinning.

S – Thin images up to skeleton.

NP – Number of thinning filter passes from 1 to 100.

Example:

/Thin NP:5

Thick

Format:

/Thick [RNS:"<raster_name1>"+"<raster_name2>"+...] [DIR:<direction>] [NP:<num>]

Description of Parameters:

RNS – Names of monochrome raster images to thicken.

DIR – Thickening direction:

0 – horizontal thickening,

1 – vertical thickening.

If the DIR parameter is omitted, then the thickening filter uses default directions.

NP – Number of thickening filter passes from 1 to 100.

If the NP parameter is omitted, then thickening filter uses one pass as default.

Example:

/Thick RNS:"cs_cam" DIR:0 NP:3

RxSpotlight Batch

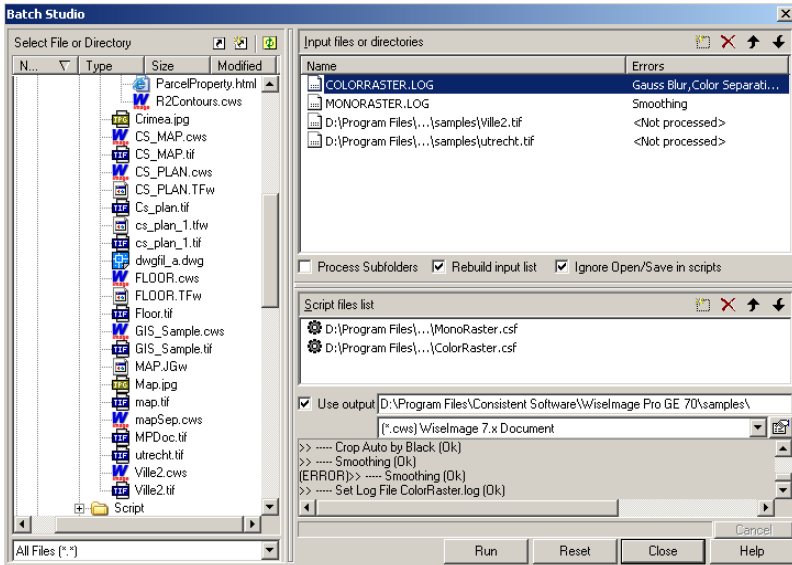
Prepared RxSpotlight scripts can be used for composing RxSpotlight batch-scenarios. The batch scenario makes it possible to apply unattended a sequence of operations to a number of images. Batch mode is convenient for using RxSpotlight scripts to process a large number of raster images located in different folders. It avoids changing paths in prepared scripts, i.e. creating scripts with handling image commands only, without *Open*, *Insert*, *Save* commands.

Batch Studio

RxSpotlight batches are created and started using the *Batch Studio*.

To create a batch, specify input images, RxSpotlight script file(s) which contain a processing scenario, and output images. Save the processed images to the same or different files, different file formats can also be selected for the destination files. More than one script may be applied to selected images in the batch.

1. Choose *Tools > Batch Studio*. The script tuning dialog window opens.



2. The *Select File or Directory* tree shows existing files and folders; use *format list* to show appropriate files.
3. To specify images to be processed, select the input files or the entire folder and move them to *Input files or directories* using the standard mouse-dragging technique. Multiple files can be selected with the CTRL key pressed or, with a window by drawing a frame over the files to select.
4. Select one or more RxSpotlight script files and place them to the *Script Files list*. It specifies the *processing scenario* when running batch. Clicking on a script list item it opens the *Script Studio* dialog described above; allowing the *processing scenario* contents to be checked or edited.
5. Switch on the *Process Subfolders* checkbox to include all subfolders of the specified directories in the batch to be processed.
6. Switch on the *Rebuild input list* checkbox to see the list of unprocessed files and files processed with errors instead of the *Input files/directories* list after batch processing.
7. Switch on the *Ignore Open/Save in scripts* checkbox to ignore all Open, Insert and Save commands in scripts during batch processing.
8. Press *Run* to launch the batch. The input files are processed with the scripts from *Scripts...* and the results are put into the *Output...* folder. The error or progress messages are shown in the lower right of the dialog. Press *Cancel* to stop executing the batch. To save the images in different folder and format select the output folder and file type. If this is omitted, then the images will be saved with their current names.

Batch execution errors

Some errors may occur during the automatic processing a group of raster images.

If the *Rebuild input list* checkbox is turned on, then the names of the files which caused mistakes during batch processing and also unprocessed files and directories will be left in the *Files or folders to process* field. The names of the commands, which were executed with errors, are logged in the *Name* field (see the picture). By double-clicking on the image name the image can be opened in the program in order to, for example, process this raster manually.

Batch execution report

An entire step-by-step report on batch execution can be seen by viewing the messages that appear in the report output field.

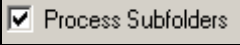
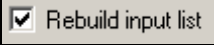
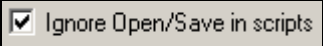









A full report (DEFAULT.LOG) can be found in the folder where the program is installed. The report file name is set in the *Scripts > Default Log File* item of the *Preferences* dialog.

Dialog buttons and controls

The buttons and controls in *Batch Studio* dialog have the following meaning:

Control/Button	Description
<i>Select File or Directory</i>	
	Opens a list of the directory shortcuts (to see the list place the mouse pointer on this icon and wait a bit)
	Add selected directory to the directory shortcuts list
	Refresh the folder tree
	Folder tree files filter
<i>Input files or directories</i>	
	Creates a new file name or folder
	Removes the selected item
	Moves the selected item up
	Moves the selected item down

Control/Button	Description
	Switch on the <i>Process Subfolders</i> checkbox to include all subfolders of specified directories to batch processing.
	Switch on the <i>Rebuild input list</i> checkbox to see the list of unprocessed files and files processed with errors instead of the <i>Input files/directories</i> list after batch processing.
	Switch on the <i>Ignore Open/Save in scripts</i> checkbox to ignore all Open, Insert and Save commands in scripts during batch processing.
<i>Script files list</i>	
	Create a new item
	Remove the selected item
	Move the selected item up
	Move the selected item down
	Switch on the <i>Use output</i> checkbox and specify the place for redirecting processed files.
	Selects the format of output files. Click the  button to edit chosen format properties.
<i>Dialog buttons</i>	
<i>Reset</i>	Clear all batch content.
<i>Run</i>	Launch batch processing and watch the output results in the lower right section of dialog. Press the <i>Cancel</i> button to stop execution of the batch.
<i>Close</i>	Close the dialog and keep all settings of <i>Batch Studio</i> .

RxSpotlight Open Architecture

RxSpotlight has an open architecture for creating custom user commands using Java Script and Visual Basic Script languages. Use WIOA to create scripts to execute much more flexible tasks than those of RxSpotlight scripts (which are more oriented to batch processing raster images).

☒ To install or update Microsoft Scripting Runtime Component and to get information on Java Script and VBScript languages' syntax and the runtime components description refer to <http://www.msdn.microsoft.com/scripting> or to Microsoft Developer Network (MSDN) documentation.

☒ For information about the RxSpotlight Object Model refer to *RxSpotlight Open Architecture* reference. The *RxSpotlight Script Toolkit* demonstrates WIOA capabilities.

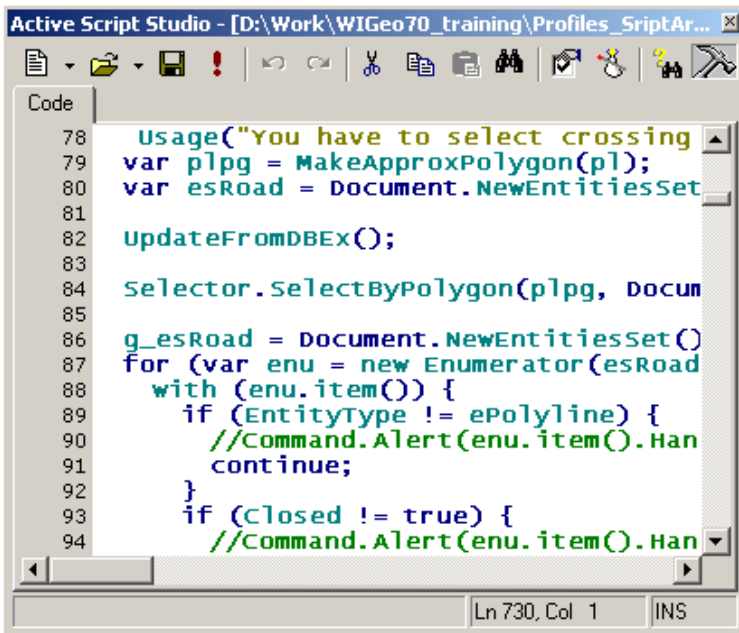
Active Script Studio.

The built-in code editor can be used for creating custom script commands. There is also a visual HTML-form editor designed for integration of user's forms and commands in the code.

☒ For information about creating custom user buttons and assigning scripts see page 381.

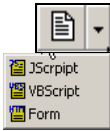
To create a custom user command

Choose *Tools > Active Script Studio*. This command invokes a dialog where command files can be created, edited, saved and run.



The buttons in the *Active Script Studio* dialog execute the following functions:

Button	Function
--------	----------



Clear the pane to create new Java Script, VBScript or HTML-form



Open a script file



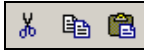
Save a current script file (with the SHIFT key pressed – save with a different name)



Run a script



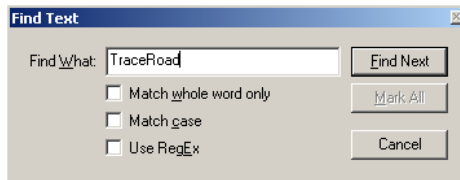
Undo / Redo



Cut / Copy / Paste



Search for text



Setting parameters to create Java Script, VBScript or HTML-form



Creates a master of the dialog



Reference for RxSpotlight Open Architecture

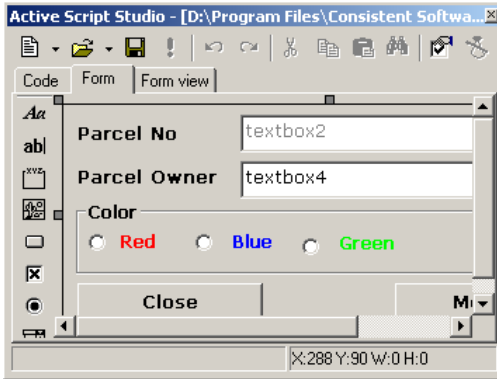


Drag this icon onto any toolbar or menu to create custom user command invocation button. For additional information about creating custom command buttons see page 381.
















In the editing mode of the HTML-form the *Master ActiveX* has three tabs.





- The *Code* tab contains the initial text of HTML-form.

- The *Form* tab – visual form editor.



The tools for form creation and editing:

	Insert Label
	Insert Text box
	Insert Frame
	Insert Image
	Insert Button
	Insert Checkbox
	Insert radio button
	Insert Dropdown list
	Insert List
	Insert Text area
	Insert File browse
	Insert ActiveX element
	Align Left
	Align Right
	Align Top

	Align Bottom
	Make Same Width
	Make Same Height
	Make Same Size

- The *Form view* tab – preview of HTML-form

User command (script) Arguments

User custom commands (scripts) can use additional individual parameters (arguments) for different launch sessions. (Such scripts must implement the *ScriptSetup* function). The script must define a type and a number of arguments. For example, assign different arguments to the buttons that run the same script.

This feature means the same for a script as the *Preferences* dialog for RxSpotlight. It is used to specify those script custom settings that will be rarely changed.

To assign arguments values - create a toolbar button for the script and right-click on it. Click the *Arguments* button in the *Tool Setup* dialog that appears and then assign arguments values for this button (launch session).

DDE

RxSpotlight supports interaction with other programs through its DDE interface (*Dynamic Data Exchanging*). Using DDE give access to the commands listed in the RxSpotlight script. The syntax of the commands is the same as in RxSpotlight script.

An example of DDE usage

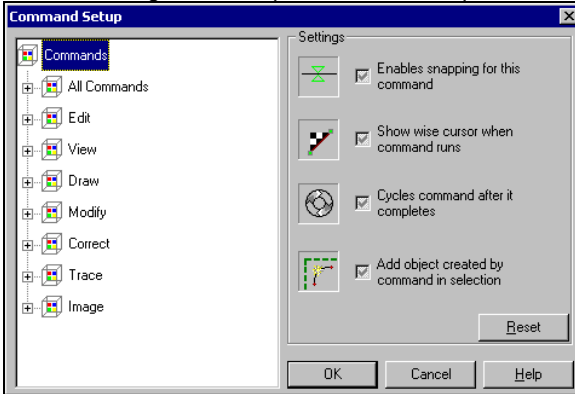
This is an example of DDE usage for MS Excel VBA:

```
Sub Main()
Dim channelNumber As Long
` Connect to application
channelNumber = Application.DDEInitiate("csapp",
"System")
` Ask user for file
cmd = "[OpenDocument|FNAME|" & Chr(37) & "1]"
Application.DDEExecute channelNumber, cmd
` Save document with another name
cmd = "[SaveAsDocument|FileName|C:\Program
Files\Rasterex\RxSpotlight Pro
11\samples\ResavedThroughDDE.cws]"
Application.DDEExecute channelNumber, cmd
` Print document with current settings and closes
RxSpotlight
cmd = "[RunPrinting|""|""][Exit]"
```

```
Application.DDEExecute channelNumber, cmd
` Close DDE connection
DDETerminate channelNumber
End Sub
```

Command setup




Use this dialogue to set up the commands' performance.



The left hand pane shows the commands grouped in categories; the right hand one, *Settings*, contains the available options.

To set up options for command:

1. Click on the “+” sign at the appropriate category to open the list of commands. Select the command.
2. Check boxes in the *Settings* pane.
3. Click OK to apply options. The changes take effect immediately.

Dialog controls	Description
	Defines if snap is active during command operation. The snap is set in <i>Tools > Snap Setup</i> dialog. See description of snaps on page 298 for more information.
	In checked, the Wise cursors are shown. They help with learning RxSpotlight as they show the current command and its mode.
	In checked, the corresponding command remains active after finishing its previous action. This can be used again and again until ESC is pressed or another command is chosen.



If checked, then the object created by the command is added to the selection if *Add* composition mode is on or, in *Single* mode, only the last created object is selected. If this option is unchecked, then created objects are not selected.

Reset button

Cancels changes made by the user and restores the default settings. To reset all changes, select *All Commands* and click *Reset*.

Customizing menus and toolbars

New menus and toolbars can be created and populated with RxSpotlight commands, buttons and fields from the *Inspector* window. To enter the customizing mode choose *Customize* from the *Tools* menu.

While this dialog is opened (on any tab) the next operations can be performed with RxSpotlight interface:

To move an existing toolbar button or menu item to other toolbar or menu:

Drag a button or menu item to another toolbar or menu with the mouse.

❖ Use this method to copy items in the *Inspector* to any toolbar or menu.

To copy an existing toolbar button or menu item to other toolbar or menu:

Drag a copy of the button or menu item to another toolbar with CTRL pressed.

To remove a button from toolbar or an item from menu:

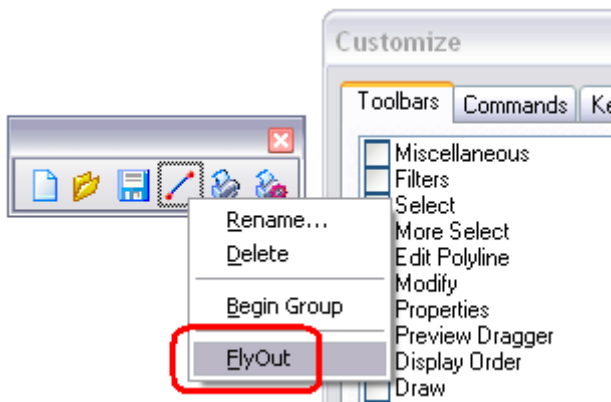
Drag a button or menu item out from the toolbar or menu so that it will not fall onto any other toolbar or menu.

or

Right click on the toolbar button or menu item and choose *Delete* item from the popup menu.

To create drop-down toolbar:

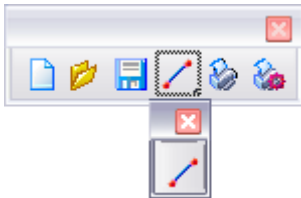
Right-click appropriate button on the toolbar and choose *FlyOut* in the context menu:



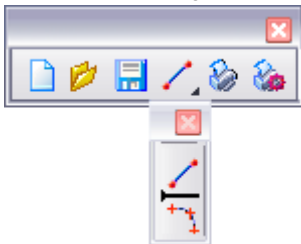
Then the small black arrow in the lower-right corner of this button will appear:



Click this arrow. The drop-down toolbar will appear:



Use standard drag-and-drop technique to fill this toolbar with buttons:



To create/remove a separator line in toolbar or menu:

1. Place the cursor over a toolbar button or menu item and right click.
2. Click *Begin Group* item in the popup menu.
 - The separator line will be shown or deleted.

To rename a toolbar button or menu item:

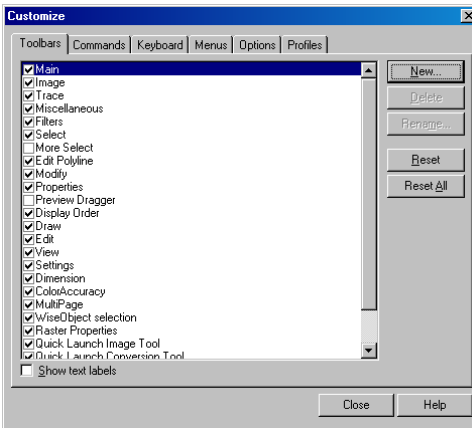
1. Right click on a toolbar button or a menu item.
2. Click *Rename* item in the popup menu.
3. Change the name specified in the dialog and press OK.

- ❖ Customizing operations that involve dragging items from one command or toolbar to another can be implemented without the *Customize* dialog open. Items can be dragged with the ALT button pressed.

Switch to the appropriate tab to perform other customization operations such as:

- New toolbar creation.
- New menu creation.
- Specifying any command as a toolbar button or menu item.
- Modifying right-button menus.
- Assigning shortcuts to commands.
- Reset ALL custom changes of the RxSpotlight interface.

The Toolbars tab



This is a list of all the toolbars available within the RxSpotlight environment. The *Show text labels* checkbox controls the display of inscriptions below the icons.

The *New* button creates a new empty toolbar, which can be filled with any combination of buttons.

The *Rename* button renames and the *Delete* button deletes only custom toolbars.

The *Reset* button resets the standard contents of a chosen toolbar.

The *Reset All* button undoes ALL the changes made by the user to the standard system of RxSpotlight menus, toolbars and shortcuts.

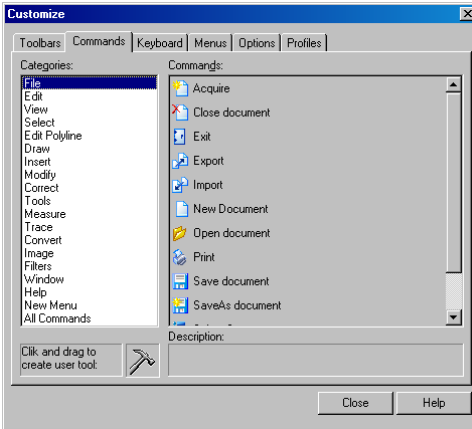
To create a new toolbar:

1. Open the *Toolbars* tab and click the *New* button.
2. In the intermediate *Toolbar Name* dialog enter the toolbar name and press OK.

To reset ALL the changes made by the user to the standard system of RxSpotlight menus, toolbars and shortcuts:

1. Open the *Toolbars* tab and click the *Reset All* button.
2. In the intermediate dialog window click OK.
3. Restart the application.

The Commands tab

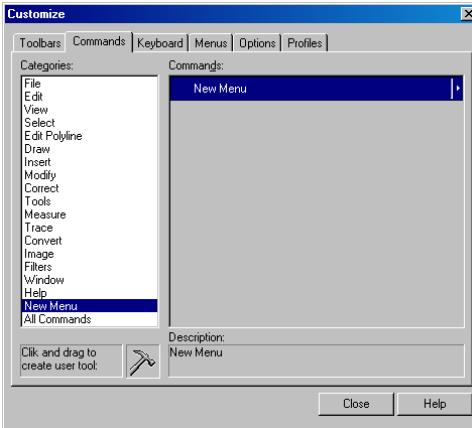


When this tab is open, RxSpotlight commands can be dragged and dropped into toolbars and menus.

The *Description* field shows the description of the chosen command.

To create a new menu:

1. Open the *Customize* dialog on the *Commands* tab and select *New Menu*.



2. Drag a *New Menu* item from the *Commands* list to a toolbar or menu.
3. Place the cursor over the created *New Menu* and right click on the mouse.



4. Select *Rename* to rename or *Delete* to delete the new menu.
5. Select *Begin Group* to create a separator on the left of the new menu.
6. Select *All Commands* in the *Categories* list of *Customize > Commands* dialog. Drag commands from the *Commands* list to the new menu. Use the right mouse button to create or remove separator lines.
7. A *New Menu* item (see step 2) can also be dragged to any toolbar.

To specify any RxSpotlight command as a toolbar button or menu item:


1. Open the *Customize* dialog on the *Commands* tab.
2. Drag a command from the list to any toolbar or menu with the mouse.

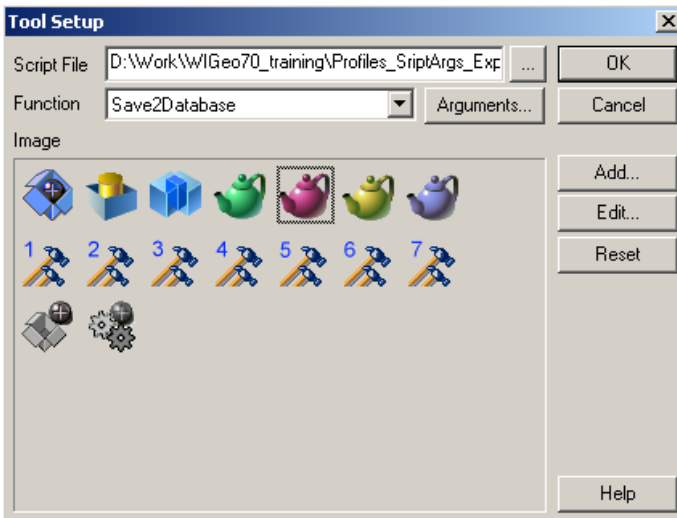
Custom user buttons

Use RxSpotlight to create custom user buttons for custom user commands (scripts). Such commands are created using the RxSpotlight script or the WIOA script

For detailed information about work automation and creating custom commands see the page 348.

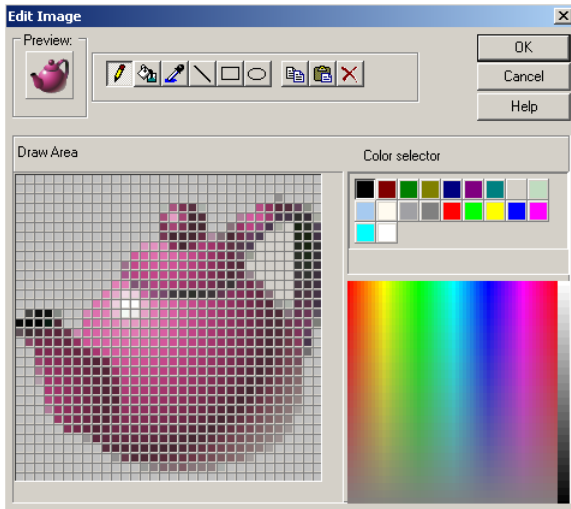
To create a custom command button or menu item

1. Choose *Customize* from the *Tools* menu, and then go to the *Commands* tab.
2. Drag the  icon onto any toolbar or menu to create a script invocation button. Close the *Customize* dialog.
3. Click on the new button. The *Tool Setup* dialog appears.



4. Chose an image for the button or create a new one by clicking the *Add* button in the *Tool Setup* dialog.

5. In the *Edit Image* dialog create a new image using the tools located at the top of the dialog.



6. Press *OK*. A new image will appear in the *Image* section of the *Tool Setup* dialog. This can be edited in the *Image* section: select the button and press *Edit*. To delete the created image click *Reset*.
7. To assign a custom user command to this button, select the script file previously created in the *Script File* box.

User's command Arguments

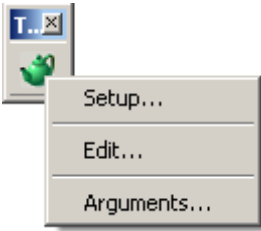
Custom user commands (scripts) can use additional individual parameters (arguments) for different launch sessions. (Such scripts must implement the *ScriptSetup* function). The script must define a type and a number of arguments. So, for example, assign different arguments to the buttons that run the same script.

This feature means the same for a script as the *Preferences* dialog for RxSpotlight. It is used to specify those script custom settings that will be rarely changed.

Create a toolbar button for the script and right-click on it. Click the *Arguments...* button in the *Tool Setup* dialog and then specify arguments for this button (launch session).

Right-click menu

After creating the custom button and assigning the script, call the *Tool Setup* or the *Arguments* or edit an assigned script by the right click on the button and choose appropriate menu item.



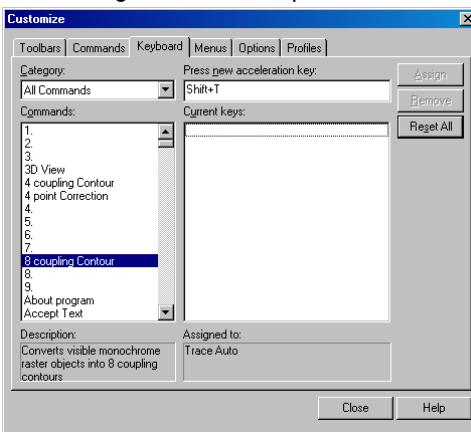
The Edit item calls the *Active Script Studio* for WIOA script or the *Script Studio* for RxSpotlight script.

The Keyboard tab

Use this tab to assign keyboard shortcuts (accelerators) to every RxSpotlight command.

To assign a shortcut to a command:

1. Choose a command from the *Commands* list, move to *Press new acceleration key* field and press buttons on the keyboard that are intended to become a shortcut. They will be shown in the upper right field. Usually keyboard shortcuts are produced by simultaneously pressing a letter button with CTRL, SHIFT and/or ALT. For example, CTRL+A, ALT+SHIFT+Q, etc.
2. If the shortcut is not assigned to any other command, then the *Assigned to* field will show "Unassigned".
3. Press *Assign* to finish the operation.



This figure illustrates a situation of conflict: the shortcut offered for the chosen command (*8 coupling Contour*) has been used by another command (*Trace Auto*); so it will not be assigned.

If a command also has an accelerator, then it will be shown in the *Current keys* field. More than one accelerator can be assigned to a command. Unnecessary accelerators are removed from the list by choosing them and pressing *Remove*.

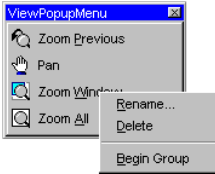
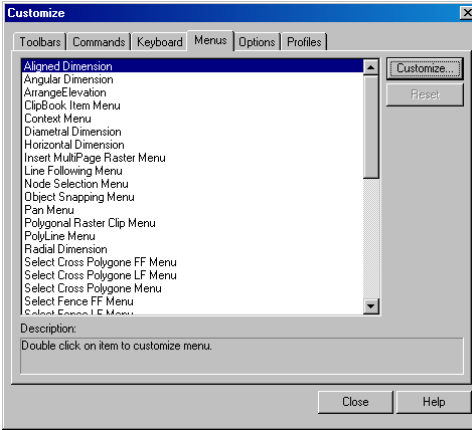
Reset All removes all custom shortcuts.

Description field shows the description of the chosen command.

Category list contains “All commands” category and the names of custom menus if any.

The Menu tab

Partly customizes right-button menus.



Customize button opens the selected menu for editing.

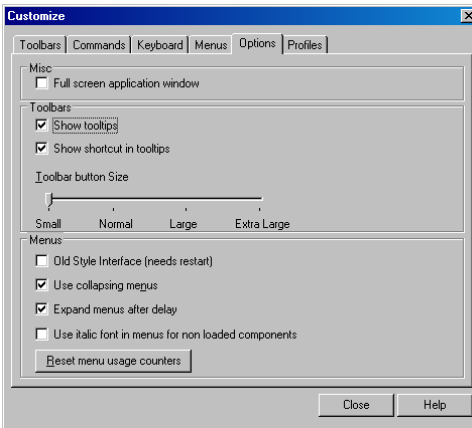
Use techniques described in this section to add commands and separators to a menu.

Close applies changes.

Reset button deletes all customization changes.

The Options tab

Controls the representation of buttons and commands.



Option	Description
<i>Full screen application window</i> checkbox	Enlarges useful workspace to maximum screen size at the expense of hiding the RxSpotlight window caption and cropping outermost toolbars and status bar.
<i>Show tooltips</i> checkbox	Show tooltips next to the buttons
<i>Show shortcut in tooltips</i> checkbox	Show shortcuts next to the buttons (the procedure is described above).
<i>Toolbar button size</i> slider	Changes the size of toolbar items (buttons and combo-boxes).
<i>Old Style Interface</i> checkbox	Sets old interface style (needs application restart).
<i>Use collapsing menus</i> checkbox	Use menus with a reduced list of commands.
<i>Expand menus after delay</i> checkbox	Shows the full menu contents if the user does not leave the menu after a delay.
<i>Use italic font in menus for non loaded components</i> checkbox	Shows program components names for which dll's have not been dynamically loaded in this RxSpotlight session with italic font.
<i>Reset menu usage counters</i> button	Resets the original menu structure, i.e. cancel the order of commands in a menu list depending on the frequency of their usage.

Profiles

Use profiles to switch document options on the fly and import/export document settings between different documents and/or workstations.

Every RxSpotlight profile can store:

- Interface settings (customize options, preference options).
- File format settings.
- Paper settings.

Although many profiles can be created, only one of them can be a *current* one. By default, RxSpotlight stores the current options in a profile named <<Unnamed>>.

The profile information is stored in the system registry. When modifying interface settings, file formats and paper settings, the current profile is automatically changed.

- ❖ Export a profile to a file once and import it every time it is needed, to prevent unwanted current profile modification.

To manage profiles in RxSpotlight:

Use the *Switch to Profile* dialog (Menu: *Tools / Switch Profile*) to switch profiles or choose a required profile in the *Profiles* tab in the *Customize* dialog box and click the *Set Current* button to make this profile current (applies all profile settings to the application).

While the *Switch to Profile* dialog is used for rapidly switching and creating profiles, the *Profiles* tab is used for creation, removing, switching, exporting and importing profiles.

Profile creation

The newly created profile inherits the current profile settings.

Every RxSpotlight profile contains three parts (the interface settings, the file format settings and the paper settings). However, during new profile creation which part to read from the profile each time it is loaded can be specified (making it current).

For example, create a new profile “*Interface5*” and specify that it must contain only the interface settings. The next time this profile is made current, only the interface settings will be changed, while file formats and papers settings will remain unchanged.

Profile import / export

The current profile can be saved (exported) into a file with a .WIP extension.

Once a profile is saved, it can be exported as a WIP file to different computers. So, for example, predefined settings can be transferred to all workstations in a department in a moment.

If after making changes to the current profile during a RxSpotlight session one wants to revert to a previous profile, then simply import the corresponding WIP file.

During profile exporting specify which of its three parts must be written into a file. Importing of WIP file modifies only those parts of a current profile which were saved into this file. Other settings will remain unmodified.

For example, export only the paper settings.

If an imported profile (a WIP file) includes the interface settings part, then RxSpotlight creates a new profile which has the name of the imported profile. This newly created profile automatically becomes the current one.

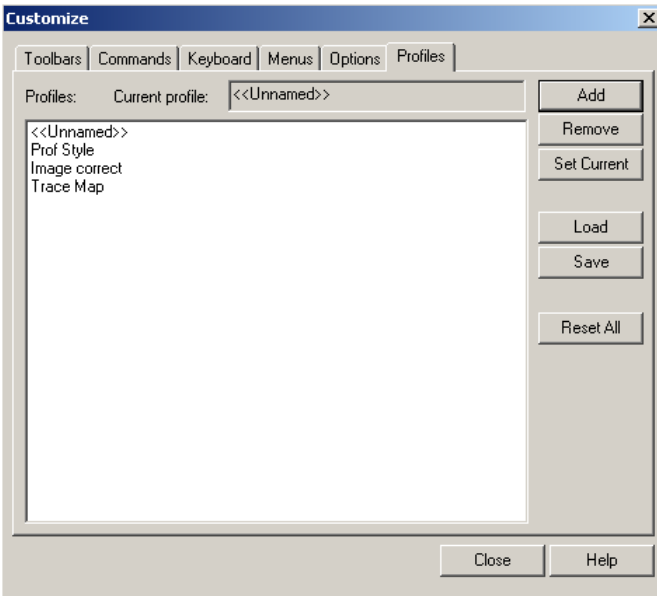
Otherwise, if an imported profile does not include the interface settings part, then the remaining part(s) adjust the current profile settings and the current profile name becomes:

Current Profile Name+Imported Profile Name

For example: *Vector recognition profile+Corporate paper formats*

The Profiles tab

This manages such operations as profile switching, creation, deleting, making current, exporting, importing and others. The current profile name will be seen at the top of the dialog. All existing profiles are listed below in the profiles list.



The **Add** button shows the *Add Profile* dialog window to create a new profile. In the dialog enter a new profile name and specify settings to be read from the profile every time it is made current. Click the *Ok* button to add the new profile. See *Profile creation* and *Profile import / export* in the previous section for additional information.

The **Remove** button deletes a selected profile.

The **Set Current** button makes a selected profile current (applies all profile settings to the application).

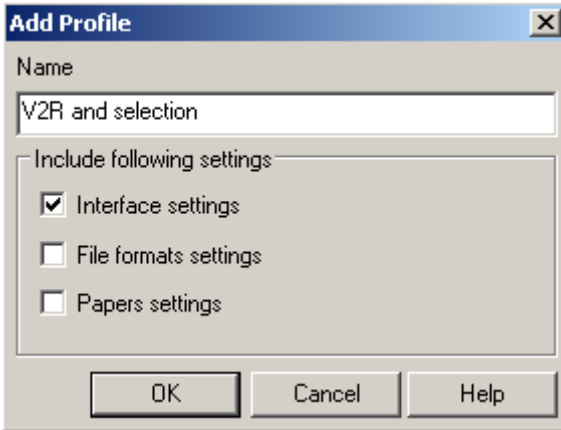
The **Load** button exports a profile from a WIP file. See *Profile import / export* in the previous section for additional information.

The **Save** button shows the *Add Profile* dialog window to import the current profile to a WIP file. See *Profile import / export* in the previous section for additional information. In the dialog type a name of the newly created profile for a WIP file. Specify settings which will be exported to a WIP file and click the *OK* button. Specify a name for the exported file and click the *Save* button in the dialog window.

The *Reset All* button Deletes all profiles and sets the default one. Actually this operation removes all the custom profiles from the registry and restores the default one from the .CFG file. These changes will take effect after reloading the application.

The Add Profile sub-dialog

This sub-dialog may be called from the *Profiles* tab or the *Switch to Profile* dialog.



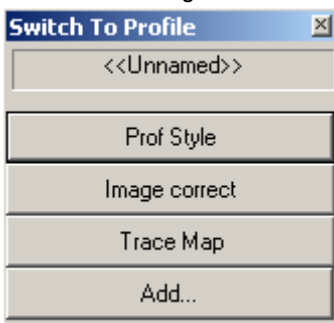
Specify here a new profile name and which settings you want to include into your new profile.

- Interface settings – settings that are located in the *Customize* dialog and *Preferences* dialog (except for the Raster File formats and paper settings).
- File Format settings – settings which are located in *Preferences / Raster File Formats* tree.
- Paper settings – settings which are located in *Preferences / Papers* tree.

Rapid profiles switching

The *Switch to Profile* dialog is used for rapidly switching and creating profiles.


To start the dialog click the *Switch Profile* from the *Tools* menu

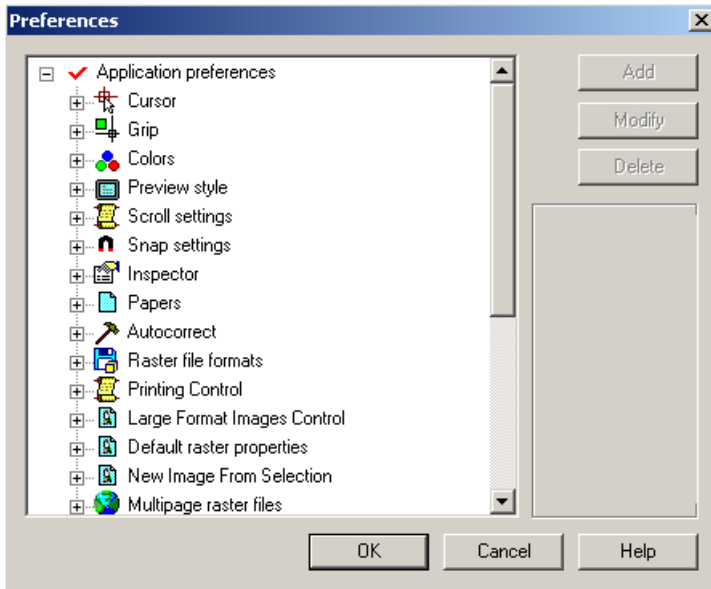


Click the button with a profile name to make it current.

Click *Add* button to create a new profile. In the *Add Profile* dialog enter a new profile name and specify settings to be read from profile every time it is made current. Click the *Ok* button to add the new profile.

Tuning the application


Use the *Preferences* dialog, to define the general settings of the program. To open this dialog, choose *Preferences* from the *Tools* menu or click the  button on the *Settings* toolbar




New values can be added, deleted and existing ones modified, or items set active. If a value can be modified, then the *Add*, *Modify*, and *Delete* buttons are active.


The settings are arranged by sections; to work with them do the following: first select a section, and then select the desired subsections and settings.


The Settings box contains the following items:


	Cursor	Changes the appearance and size of the graphic cursor.
	Crosshair	Sets the size of Crosshair.
	Full Screen	Sets the size of Crosshair to the full screen size.
	Size	Sets the size of Crosshair as a percentage of the screen size.
	Pickbox	The Pickbox size.


Show Crosshair	Turns off Crosshair in the Selecting mode.
PickBox size	The pickbox size in pixels.
Colour	Cursor colour.


 Grip	Changes the size and colour of Grips.
Grip size	Grips size.
Grip max objects count	The maximum number of objects selected which have the Grips displayed.
Single object grip colour	The Grips colour of a single selected object.
Multiple objects grip colour	The Grips colour of multiple selected object or grouped objects.
Inactive objects grip colour	The Grips colour of an inactive selected object.
Node edit mode grip colour	The Grips colour in the Node edit mode.
Node edit mode selected grip colour	The selected Grips colour in the Node edit mode.








 Colours	Sets the program colours.
Raster Selection	Sets raster selection parameters
Raster Selection	The colour of a selected raster object.
Semitransparent	Sets the semitransparent view mode for monochrome raster selections
Preview frame	The frame colour that indicates an image preview area inside the preview window.
Background	The colour of the program window background.
Found raster symbol	The colour of a found raster symbol when working with the Search and Replace command.
Print Area	The frame colour that indicates a print area.
Print Grid	The frame colour that indicates the paper format edges.
Grid Colour	The colour of Grid points.
Layout Paper	The color of document paperspace (Layouts).

	Preview style	Sets the display mode of an obtained monochrome image in the preview window.
	Opaque	Displays an obtained monochrome image on a white background.
	Semitransparent	Shadows an original image and displays an obtained image.
	Transparent	Puts an obtained image over an original one without shadowing.

	Scroll setting	Defines the scroll parameters of a document in the program window.
	Scroll step	A step of document movement when using the Scrollbar.
	Arrow step	A step of document movement as a percentage of the window size when using the ALT+ keyboard arrows.
	Mouse Wheel scale factor	Scale factor used to scale with the Mouse Wheel.
	Drag&Drop scroll area	The width of the invisible viewport borders used for scrolling a current view during a drag process.

	Snap Setting	Defines Snap settings.
	Hold Aperture Size	The size of a cursor frame in snap mode.
	Snap Marker size	Snap marker size.
	Show Tooltips	Turns on the display of a snap name.
	Vector Marker Colour	The colour of the snap marker when snapping to a vector object.
	Raster Marker Colour	The colour of the snap marker when snapping to a raster object.

	Inspector	Defines the Inspector settings.
	Properties mode	Defines an operation mode of the command properties
	Document Transparent	Changed properties during command running also change default document settings
	Command sensitive	Changed properties during command running do not affect default document settings
	Multiple selection	Inspector properties behaviour on multiple selections

	Max count of controlled objects No limit	The maximum count of selected objects which have properties displayed Properties of objects are displayed regardless to selection contents
	Papers	Contains standard paper formats. Allows the modification of an existing format or adding a new one. The formats contained in this section are applied to the Change Size, Print, New Image commands.
	Autocorrect	Sets the command to be performed during Autocorrection.
	Raster file formats	Allows a list of raster formats for the <i>Open</i> and <i>Save</i> commands to be specified, the creation of default format settings for file saving as well as a new format based on an existing one.
	Printing Control Disable print optimization Enable printing by stripes	Defines print settings. Turn on this checkbox if there is a problem with printed output. Enable printing by stripes.
	Default raster properties DPI Transparent Color	Sets the parameters of a raster image used by the program if they are not set by the user. For example, when opening an image with no resolution information. Resolution in DPI. Defines a Transparent Color property for monochrome images.
	New image from selection Keep Selection Erase Selection	Defines the New Image From Selection settings. Creates a new image without erasing selected objects. Erases the selected objects of a raster image.
	Multipage raster files	Setting options to work with multipage files.

Enter multipage mode automatically

When loading multipage raster files always switch to multipage mode automatically.



Point

Allows the appearance of all points in a document and the sizes of their markers to be changed.

Size

Sets the size of a marker in pixels.

Point style

Sets the type of a point marker. Allows users to turn on a rectangular or round frame for a point. When the Dot type is chosen, an element of 1 screen pixel is displayed.



Template Usage

Controls the actions of RxSpotlight on opening new documents and images.

For new documents

Actions on the *File > New* command

None

No action taken

Use default

Opens file specified in *Default Template File Name*

Ask for file

Opens dialog *File > Open*

Default Template File Name

Shows and lets change *Default Template File Name*

For opened raster

Actions on *File > Open* command for raster image

None

No action taken

Use default

Opens the file specified in *Default Template File Name*

Ask for file

Opens *File > Open* dialog

Default Template File Name

Shows and allows change *Default Template File Name*



Script

Defines the settings for Script operation.

Linear Units

Sets measurement units. If this value is not specified, then the units set in UCS Setup are used.

Angular Units

Sets angle measurement units. If this value is not specified, then the units set in UCS Setup are used.

Default Log file

The name of a text file to which the results of Script performance are placed.




Display View


Effect of displaying zoomed images.


Half tone paint


Turns ON/OFF monochrome raster high quality paint.





Draw Raster Frame	Turns ON/OFF display of a raster image frame.
Fit Dashed Lines	Adapts the view of dashed contours of vector lines at the expense of slightly changing dashed and spaced size lengths. This mode guarantees that the endpoints of lines, polylines and arcs will be started and ended with a dash.
Use Screen Width for Lines	Shows width of lines in screen pixels. Switch OFF this checkbox to display it in millimeters (RxSpotlight units) to scale line width during zoom operations.
Use Screen Line Types	Set this parameter to view and print symbols, markers, hatches and etc. with constant size independently from a document scale.
<hr/> ❖ When this item is selected, the <i>Use Screen Width for Lines</i> item is selected automatically.	

	GIS	GIS option
	Use World File	Writing the raster coordinates in a special text file (world file) when saving. To make this world file readable when opening a raster file this parameter must be on.
	Use TAF file	Writing the raster coordinates in a special text file (TAF file) when saving. To make a TAF file readable when opening a raster file this parameter must be on.

	Conversion parameters	Parameters of R2V and V2R conversions.
	Scale independent	Applies unified R2V conversion parameters to raster images with different insertion scale. Affects R2V, V2R, Raster selection, Tracing commands.

	Text	Text parameters.
	Text Tab size	Multitext tab size.

	DWG Export	Export to DWG file options.
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<p>Apply UCS scale to geometrical object properties</p>	<p>Switches to apply or not to apply the UCS scale to geometrical object properties, such as Text Height and Line Width during DWG export.</p>
<p> Standard directories</p>	<p>Sets a folder in which the miscellaneous system files, the OCR templates' folder and the SHX fonts' folder are stored.</p>
<p> Saving Parameters</p> <p>Generate backup copies</p> <p>Autosaving every <XX> min</p>	<p>Sets parameters for backup and recovering operations.</p> <p>Generates backup copy of current document right before save to a file. Backup copy is a complete copy of a document with BAK extension. It can be renamed back to CWS an opened at any time.</p> <p>Specifies time interval between automatically savings of opened documents. To switch OFF automatic saving set 0 for this parameter.</p>
<p> Vector correction edge</p> <p>Width</p> <p>Color</p>	<p>Sets the appearance of an edge, which is made with the <i>Group/Ungroup by Edge</i> command.</p> <p>Sets an edge width in pixels.</p> <p>Sets an edge color.</p>
<p> Markup</p> <p>Show automatically</p> <p>Show semitransparent</p> <p>Alert</p>	<p>Sets parameters for Markup objects showing.</p> <p>Shows markup automatically on document open if markup file is exists.</p> <p>Shows markup using semitransparent fill.</p> <p>Shows warning message in case of unknown markup.</p>

After making changes, press OK to complete.

Appendix A. Command directory

Command	Function	See page(s)
File	File opening, saving and printing	
New	Create a new document	
Open	Open a document from a file	27
Close	Close the current document	
Save / Save As	Save the current document to a file	28
Import	Importing files	81
Export	Export to raster, vector and hybrid (such as DWG) formats	77
Explore	Opens the Explore window	27
Select source	Select a scanner	85
Acquire	Get image from a scanner	84
Print Options	Opens the Printer Setup dialog	91
Print	Opens the Print dialog	96
Files LRU list	Last 5 opened files	
Directories LRU list	Last 5 opened directories	
Edit	General edit and selection operations	
Undo/Redo	Undoing and redoing	33
Paste	Paste a selection set.	290
Paste Special	Paste a selection set onto the chosen image.	290
Paste Separate	Creates a separate embedded image from a selection set.	290
Hyperlink	Allows editing and assigning a hyperlink to a document or any object.	45
Select Auto	Automatic selection of a clicked object or area enclosed in a rubberband rectangle.	108
Select by Filter	Selection of objects by type, layer or colour.	120
Select/Unselect all	Select all objects and Unselect all	107

Command	Function	See page(s)
Search and replace	Search and replace of vector and raster objects	306
WiseObject selection	Selection of certain types of objects, such as <i>hatch</i> , <i>text</i> , <i>'speckle'</i> , <i>linear objects</i> , in the whole image or a specified area	122
View	View, pan and zoom	
Birds Eye	The tool with combined zoom and pan functionality	31
Zoom...	Group of zooming options	30
Pan	Pan the image	31
Zoom Dynamic	Zooming by moving mouse up/down	31
Show Width	Toggles displaying/hiding of object line widths	37
Hide Vectors	Toggles displaying/hiding vectors in the drawing	37
Hide Raster	Toggles displaying/hiding of raster data in the drawing	37
Display Order	Control for displaying stacked objects	39
Show Toolbar	Show/Hide toolbars	22
Show Command Line	Show/Hide Command Line	59
Draw	Drawing and editing graphics	
Line By	Line drawing (2 methods)	221
Arc By	Arc drawing (3 methods)	222
Circle By	Circle drawing (3 methods)	224
Ellipse By	Ellipse drawing (2 methods) and elliptic arc drawing.	225
Rectangle By	Rectangle drawing (2 methods)	224
Point	Drawing a point	226
Polyline	Polyline drawing	227
Spline	Spline drawing	232
Hatch	Creating a hatch	226
Text	Inserting a text line	237
Multiline text	Inserting multiline text	237

Command	Function	See page(s)
Create Block	Block creation	235
Dimension	Dimension object creation (3 methods)	239
Raster	Raster editing tools	
Pencil	Pixel drawing tool	291
Eraser	Erasing tool	291
Flood Fill	Flood filling tool	292
Flood Erase	Flood erasing tool	292
Colour Flood Fill	Colour flood filling tool	311
Edit Raster Text	Replace raster text with new text	298
Block	Inserts block	235
Insert	Inserting images and blocks	
New image	Create a new image with specified size, type, resolution and so on	50
From file	Inserts an image from file	50
New Image form Selection	Converts a selection set into a new image	292
New Image form Scanner	Acquires image from a scanner	86
Block	Inserts block	235
Modify	Object modification commands	
Group/Ungroup	Create and dismiss a group	257
Polyline	Enter polyline editing mode	227
Move	Move a selection set	248
Copy	Copy a selection set	249
Duplicate	Duplicate a selection set	249
Rotate	Rotate a selection set	249
Scale	Scale a selection set	251
Mirror/Flip H/Flip V	Mirror and flip selection set	251
Align	Align objects to a predefined position and size	252
Array	Create an array of selection set	253
Duplicate by vector	Create multiple copies along the path	255

Command	Function	See page(s)
Merge (Rasterize)	Rasterize a selection set onto the destination image	290
Merge a Copy (Rasterize)	Rasterize a copy of a selection set onto the destination image	290
Explode	Break complex objects to simpler objects.	257
Correct	Vector corrections and transformations	
Offset object	Create an offset copy of the selected object	262
Merge vectors to <object type>	Convert selected vectors to an object of a specified type	263
Auto	Create vectors from selected ones with automatic definition of the created object	265
Convert to Spline	Convert polyline to spline	265
Group/Ungroup Edge	Create/dismiss cutting contour	269
Trim vectors by Edge	Trim selected vectors using edge	273
Extend vectors by Edge	Extend selected vectors using edge	271
Break Vectors	Break selected vectors using edge	269
Correct To Intersection	Extend/trim objects to their intersections	268
Create Chamfer	Creates chamfers connecting two lines or arcs	265
Create Fillet	Creates fillets connecting two lines or arcs	266
Align Angle and Distance	Aligns vector objects by position of one of them	274
Polyline Correction Options	Settings for polylines correction mainly produced as a result of automatic vectorization or tracing. Dependently on the settings it will perform merging, removing or the combining of polylines.	286
Polylines Autocorrect	Launches polylines correction procedure	289
Tools	General tools and tuning	

Command	Function	See page(s)
Inspector	Show/hide list of properties of selected object(s)	40
Layers	List of layers and their properties	45
Images	List of images and their properties	52
Blocks	List of blocks and their properties	235
Coordinate system	Define custom coordinate system settings	65
Style	List of line styles and their properties	211
Text Style	List of text styles and their properties	219
Clipbook	Open the Clipbook window	72
Measure	Measure lengths, perimeters, areas and a create log	69
Create Marker	Create arrow heads and end markers of arbitrary shape	258
Create Fill Shape	Create symbols to fill a closed area	261
Snap Setup	Tuning of snap options and performance	298
Grid Setup	Grid options and usage tuning	306
Run Script	Run a WI script in background mode	350
Script Studio	Edit and run a WI script	353
Batch Studio	Edit and run a batch of WI scripts	368
Command Setup	Setting up general performance of some commands	376
Customize	Create and rearrange menus, accelerators and toolbars	377
Preferences	Tune operations and procedures	389
Switch Profile	Rapid profile switching	388
Purge	Dialog for removing unused block definitions, image definitions, layers, and Text Styles from a Document	75
Active Script Studio	Built-in code editor for creation custom script commands using WIOA script (Jscript, VBScript); and a visual HTML-form editor.	372

Command	Function	See page(s)
Convert	Raster to vector conversion and vectorizing commands	
Vector Autocorrect	Automatic correction of vector objects	278
Auto	Automatic tracing mode	162
Line/Arc/Circle	Forced tracing modes	163
Hatch	Tracing a hatch	164
Line Following	Tracing a polyline	165
Outline	Tracing an outline contour	164
Symbol	Tracing a symbol	169
Vector (Keep Raster)	Tracing mode in which a vector object is created	170
Vector (Erase Raster)	Tracing mode in which a vector object is created and corresponding raster one is removed	170
Erase Raster	Tracing mode in which a vector object is not created and corresponding raster one is removed	171
Smooth Raster	Tracing mode in which a raster object is replaced with rasterized vector one	171
Raster2Vector	Apply automatic vectorization	181
Raster2Contours	Apply automatic vectorization of closed contours	203
Edit OCR Text	Edit recognized text	195
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Colour Conversion Options	Conversion tuning options for automatic vectorization of colour and greyscale raster images	204
Vector Correction Options	Tuning vector correction	276
Fine OCR	Optional OCR feature	347

Command	Function	See page(s)
Image	Operations with a image	
Convert to	Convert to colour, greyscale and 8-bit indexed	313
Brightness/Contrast	Tune brightness, contrast, hue and saturation by changing their numeric values	318
Equalize	Tune brightness, contrast, hue and saturation by changing the histogram	319
Autocorrect	Apply sequence of image autocorrection operations	134
Change Size, Resample	Change size and/or resolution of an image	126,128
Image Clip	Defines a subregion on an image to apply operations to.	57
Crop	Cut out a piece of raster	130
Mirror	Mirroring of an image	251
Rotate	Rotation of an image	249
Deskew	Automatic or manual deskewing of an image	132
4-point Correction	Correct projective distortions	135
Calibration	Correct arbitrary distortions of images	137
Binarization	Copy coloured areas to a separate layer(s)	329
Adaptive Binarization	Binarize and correct blueprint and sepias in Greyscale mode	340
Gamma Correction	Enhance the overall quality of an image by changing its "colour profile" (distribution of brightness)	321
Colour Classifier	Modify the raster image colour palette	322
Colour Reduction	Used to reduce colour set	346
Colour Separation	Separate to layers by colours	343
Separation by Size, Separation Linear Objects, Separate Text Areas, Separate	Extract objects of defined sizes and types to a separate layer	158

Command	Function	See page(s)
Hatches		
Filters	Filters for colour, greyscale and monochrome images	
Unsharp Mask	Unsharp Mask	326
Blur	Blurring filter	324
Median	Median filter	327
Adaptive Blur	Blurring none uniform colour areas inside the colour transition boundaries in the image	325
Line Breaks Filling	Eliminate the breaks in raster lines (monochrome)	156
Speckle Remover	Remove speckles and small-sized objects (monochrome)	149
Hole Remover	Remove small-sized holes (monochrome)	150
Smoothing	Used to smooth outlines of raster objects (monochrome)	151
Inversion	Invert each pixel's colour (monochrome)	156
Thinning	Used to thin line objects (monochrome)	153
Thickening	Thickens line objects (monochrome)	154
Segmentation	Finds and highlights the borders on colour raster image	328
Contour	Used to create 4-coupling and 8-coupling outline (monochrome)	155

Appendix B. Glossary

Accuracy

The precision of RxSpotlight operations and function performance.

Aligning

An operation that makes objects change with respect to selected objects or their properties.

Array

An operation that creates multiple copies of selected objects and places them in columns and rows.

Background colour

On monochrome image; the colour that is used to show blank areas.

On a colour image; the colour that fills cut-outs and newly created areas.

Base point

The point that is used when inserting an image or block.

Batch (RxSpotlight batch)

A sequence of RxSpotlight scripts executed in a row.

Binarization

An operation that creates monochrome image from a coloured one using specific criteria of a pixel's brightness and colour.

Birds Eye

A tool that combines pan and zoom functionality. Used to navigate in the document and examine details.

Block

A combination of one or more objects that create a single object.

Blur

A filter that produces blur effect, making an image slightly "out of focus".

Border

1. The dashed rectangle around the image that is created by RxSpotlight to facilitate scaling, rotating and moving. It is not saved with the image.
2. Clipping border.

Breaking

The splitting of vector objects into smaller parts by edge or other objects.

Breaks

Gaps on raster objects – lines, arcs, circles, polylines, hatches, symbols, etc.

Calibration

A correction of a raster image using mathematical methods and pairs of characteristic points.

Calibration pairs

Pairs of points that define the transformation parameters during calibration.

Chamfer

A line of specified length and/or angle connecting two vector lines.

Clipbook

The storage area to keep arbitrary fragments of RxSpotlight documents for exchange and reuse between sessions.

Clipping

The clip region may be defined on the image to restrict viewing area and the operation usage. Clipping also decreases loading time.

Colour model

A system of assigning numerical values to colours.

Composition of Selection (set)

A procedure of one or more steps with each step being a single selection operation.

Contour

An outline created around contiguous sets of pixels.

Coordinate system

A system for measuring distances and angles in the document and also for inputting coordinates of all objects in all dialogs.

Corrections

Operations that prepares row data (raster and vector) for further more precise processing.

Cropping

An operation that cuts off blank margins or parts of a document outside the clipping border.

Crossing polygon

A polygonal area drawn to select objects fully or partly within its borders.

Crossing window

A rectangular area drawn to select objects fully or partly within its borders.

Cursor menu

See "Right-Button menu".

Customizing

The rearranging menus, accelerators and toolbars, creating new ones and tuning of their performance.

Deskewing

Operation that turns the whole image by a small angle.

Dimensions

Objects that can be created to show the linear dimensions or angles.

Display order

The order in which the stacked objects are drawn on the screen and printed.

Duplicating

An operation that creates a new version of the existing object by copying.

Edge

A temporary boundary used to define where the vector correcting operations must be applied.

Elevation

An optional property of an object of general usage that can be also treated as the Z-variable in other applications after exporting objects with attributes.

Embedding

A method of storing raster images in a document. Embedding is a property of the image which determines whether image data is stored inside the RxSpotlight document.

End Marker and Start Marker

Objects that are placed at the ends of vector line, arc or polyline.

Equalizing

An operation that selectively adjusts brightness, contrast, hue and saturation of the image pixels.

Exploding

An operation that disassembles a complex object into simpler objects.

Extending

The changing the length of vector line or arc to reach edge or another vector object.

Fence

A multi-segmental line specified to select objects it passes through.

Fill Shape Symbol

A symbol made of vector objects that are used to fill closed areas.

Fillet

An arc connecting two lines.

Filter

1. A logical condition used to select an object.
2. A condition restricting the set of properties shown in the *Inspector* window.

Flip

Operation that creates a new version of an existing object by reflecting it symmetrically with respect to horizontal or vertical axis.

Floodfilling

1. Selection type (algorithm) used to select contiguous raster areas and all intersecting objects.
2. An operation on a raster image.

Forced operation

An operation that yields a predefined result.

Grid

Regularly spaced dots on the screen used to aid drawing and precisely move objects. The space between grid dots is adjustable. Grid dots are not plotted.

Grip

Small coloured squares that appear on selected object(s). After selecting a grip, edit the object by dragging it with mouse.

Hatch

An object consisting of lines that form a pattern.

Highlighting

Method of indicating the raster selection by colour.

Holes

Small-sized spots on the coloured parts of monochrome raster image.

Hybrid object

An intermediate object generic to RxSpotlight to with both raster and vector operations can be applied.

Insertion

An operation of placing the object into the document.

Insertion point

The point in the document where the base point of an image or block is placed.

Inspector

A dialog window containing the list of selected object(s) and command properties. Can be used to control operations and change properties of objects by entering precise values to the appropriate fields in this window.

Interval of width

The lines with widths that fall between certain maximum and minimum values can be transferred to separate layers or coloured uniformly.

Isolated raster object

A contiguous set of pixels.

Layer

A logical grouping of data that are like transparent windowed overlays on a drawing. Layers can be viewed individually or in combination.

Layering

An operation that results in creating layers and distribution of data on them according to specified criteria.

Life indicator

An indicator on the status bar that shows the memory usage and program activity during time-consuming operations.

Linefollowing

1. Polyline tracing method.
2. Selection type (algorithm) used to select raster polyline segments.

Linked image

A method of referencing raster images in a document. When raster image is linked, any changes to it in the source file are automatically updated in any document, containing a link.

Measuring

The process of getting the dimension and angle values of raster and vector objects using the mouse or through the Measure window.

Medianing

A filter that eliminates extremes in pixel colour and brightness.

Merging

An operation that creates one object from two or more source objects.

Method of binarization

A rule that defines which point must become black (foreground) and which white (background) during a binarization operation.

Method of calibration

A mathematical algorithm that transforms the entire image such that specified (measured) points are move to predefined positions

Method of selection

A set of modes that define the selecting algorithm, type of selected object, and other selection options that are to be applied to the next selection operation.

Mirroring

An operation that creates a new version of an existing object by reflecting it symmetrically with respect to a prescribed line.

Mode

The software setting of a operations' performance.

Node

An end of the segment of a polyline.

Noise

Speckles, holes and all unnecessary and excess pixels.

Object

An item that can be created or processed by RxSpotlight commands and tools.

Object type recognition

A tool that is used in tracing and selection operations that automatically determines the arcs, lines and circles.

Offsetting

The operation that creates a offset version of a vector object.

Operation

The process started by a command or button that changes or creates data and/or properties of objects.

Orthogonalization

Drawing mode in which new and existing lines are aligned to the coordinate axis or specified angle.

Palette

The set of colours used in the colour image.

Pan

To shift the view of a document without changing magnification often done to centre a certain object or feature.

Pixel

A coloured dot on the image.

Point

An object consisting of a single coordinate location.

Polar snap

Snap to direction.

Polygon

1. A geometrical multisided figure.
2. A temporary multisided area specified for select objects.

Polyline

An object consisting of one or more connected line and arc segments treated as single object.

Preview window

A tool to show details of document and preview operation results.

Procedure

A sequence of operations that achieve predefined goal.

Raster image

An image consisting of coloured dots (pixels).

Raster entity

A group of pixels on a raster image that look like geometrical objects or symbols.

Raster object

A contiguous set of pixels that look like lines, arcs, circles or another objects.

Raster2Vector button

The button that launches automatic vectorization.

Rasterization

The process of converting vector objects to raster.

Recognition

An operation that determines the type of raster object and optionally creates corresponding vector or raster object.

Reference

Information kept by the program on the image's origin.

Resampling

The changing the size of an image by changing the number of pixels. The resolution is thus also changed..

Resolution

The number of pixels in a specified unit length (usually, one inch).

Right-Button menu

The menu that is displayed when the right mouse button is pressed. The contents of the menu depends on the selected object on which the mouse pointer rests and the current operating modes.

Rotating

An operation that creates a rotated version of the existing object(s).

Rubberline

A line that dynamically follows the movements of the cursor to show the drawing, selection or editing operations' intentions.

Scaling

An operation that creates enlarged or reduced version of existing object(s).

Script

A sequence of a command executed in a row. Script files can be created and edited inside or outside RxSpotlight and saved in text format.

Segment

Line or arc in the polyline.

Selection (set)

One or more objects specified for processing as a unit.

Separation

Operation that separates raster data by colour or by size of objects.

Smoothing

Filter that smoothes raster objects outlines.

Speckle

Small-sized spots on the non-coloured parts of a monochrome raster image and pixels that make raster lines look jagged.

Symbols recognition

Procedure of recognizing symbols on the image for (optionally) deleting or replacing them with vector representations.

Template file

A file that stores parameters of commands.

Tracing

An interactive procedure converting raster lines and arcs to vector polylines, arcs, lines, circles, outlines, symbols, hatches.

Training

The creating of samples for text recognition.

Trimming

The changing the length of vector line or arc to fit an edge or another vector object.

Tuning

The setting modes and options for commands and operations.

Unsharp mask

Filter that improves sharpness of colour transition boundaries.

Vector object

A mathematical expression that defines the object geometry.

Vectorisation

A conversion of raster objects to their vector analogues.

Vertex

A location where polyline segments meet or the end of polyline.

Width table

A table that defines layering and colouring of line objects of different widths during vectorization.

Zoom

To reduce or increase the apparent magnification of the graphics display.

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