SCANLIGHT

P L U S

U S E R   G U I D E

Computer Concepts Ltd

ScanLight Plus Version 2

Image enhancement software

User guide

Computer Concepts Ltd

This manual was entirely produced using Impression and ScanLight software. Finished pages were produced on a Computer Concepts' LaserDirect printer. No manual paste-up of any kind was required.

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Introduction

ScanLight Plus is a general purpose image manipulation program designed to work with scanned or digitised pictures from a variety of sources.

No specific details are included in this guide on any particular scanner as the program is designed to work with a variety of different image input devices. A section in this manual ('Scanning') describes the general method of obtaining a scanned image although the details are likely to vary with each device. The supplementary documentation describes any differences.

The software also works with standard Acorn sprite files and so can be used with sprites from any source.

Features

There follows a brief resumé of the ScanLight Plus software features. The software can display two windows onto the current image. These are referred to as the *Original* and *Altered* image windows which show:

    (a) the original, unmodified image and
    (b) the altered or enhanced image, respectively.

- Either window can display 61 grey-levels on screen by the use of screen dithering.
- The view magnification of either window can be altered from 1% to 800%.
- The Original image may be cropped to any rectangular shape.
- The Original image may be flipped vertically or horizontally (reflected around the vertical or horizontal axis).
- Either image may be printed, any scale, in portrait or landscape mode.
- Either image may be exported to other applications using the in-memory transfer system.
- Either image may be saved as a Sprite or Draw file containing a sprite for later recall or incorporation in other applications.
- Sprites can be saved as true 256 grey-level sprites compatible with Impression and the new RISC OS 3 sprite format.

continued...

- ScanLight only holds one copy of the image in memory. The altered view is calculated on the fly as it is displayed. This is a very important feature since scanned images can require a great deal of memory.

You can manipulate the Altered image in a variety of ways:

- by rotating the image by any angle in steps of 1°

- by altering the contrast or brightness

- by altering the grey-map, thus providing additional control over the brightness, contrast and grey-levels

- the grey-map may be edited by way of a spline curve to ensure smooth graduations

- by group sampling from the original using a variety of sampling sizes to provide a varying number of grey-levels

- copying the Altered image to become the new Original image

- by using one of the many built-in image enhancement filters. EG to sharpen or blur an image, to enhance the edges, or to produce special effects

Background

This manual assumes you have a general knowledge of RISC OS applications and conventions. This should cover the basic operations of opening and closing windows, selecting menu options, the use of the three mouse buttons and the RISC OS filing conventions (i.e. how to view disc directories, load and save files etc).

More information can be obtained on these functions from the User Guides accompanying the Archimedes computer.

Sprites

ScanLight Plus is a program dedicated to the manipulation of sprites. The word *'sprite'* is an Acorn term for any image file made up from pixel data. All forms of scanned, digitised or painted images are usually referred to as sprites.

Other computer systems use other terms such as bit-images, bit-map data etc. and store these in a bewildering range of different file formats, all of which are incompatible with the Acorn sprite file format. The Acorn system has the advantage that it is a standard used by all co-operating RISC OS applications so sprites from one application can almost always be used by other programs.

There is an ever growing range of conversion utilities that convert pictures from other machines and formats into Acorn standard sprite format. Of these the program called *ChangeFSl* is probably the most widely known.

Grey-levels

Sprites come in a variety of different formats, from one bitper-pixel to 8 bits-per-pixel (bpp). The greater the number of bits-per-pixel, the larger the number of colours or grey-levels that can be displayed. As ScanLight Plus is only concerned with manipulating grey-level images (i.e. not colour) the program only ever displays images as grey-levels, from black to white.

1 bpp	=> monochrome or two colours
2 bpp	=> Four colour or grey-levels
4 bpp	=> 16 colour or grey-levels
8 bpp	=> 256 colours or grey-levels

The greater the number of grey-levels in any given picture, the more realistic it appears. The disadvantage of more grey-levels is that the sprites require more memory and disc space.

For simple line drawings or for scanned text where only a black and white image is required, 1 bpp sprites are usually ideal. However, for photographic images, a minimum of 16 grey-levels is necessary, with ideally at least 64 grey-levels. Professional magazine-quality reproduction (when typeset) would normally require 256 grey-level images.

Note that grey-level images are quite often referred to as grey-scale or half-tone images, and that the number of grey-levels in a picture is sometimes referred to as the *grey-level depth* or *colour depth.*

Resolution

The resolution of the image obviously also determines the quality of the final reproduction, although in practice the number of grey-levels tends to be more important.

The resolution is nearly always specified in pixels or dots per inch (dpi). A 300 dpi black and white (i.e. 1 bpp) image can be made to look quite realistic (typical laser printer quality, poor newspaper photograph). A 300 dpi, 256 grey-level image would produce perfect photographic results as good as any photographic print.

However, currently there are very few methods of reproducing true grey-level images of this resolution. Photographic reproduction (using camera and film) is one and dye-sublimation printing also offers this potential, although *very* expensively.

So the quality of the image is a combination of resolution and grey-levels. Traditionally, printed work only uses black ink on white paper, so in effect it is no better than 1 bpp. However by having a very high resolution (perhaps 2000 dpi) it is able to simulate grey-scale work by dithering (see below).

For best results on a laser printer, an image should usually be at least 64 grey-levels at around 75 dpi. This would also produce acceptable pictures when typeset, although a resolution of 100 dpi would be better.

Sampling

ScanLight Plus is unique in that it lets you choose between the resolution and number of grey-levels in the final image.

By combining several pixels into one it is possible to increase the number of grey-levels, but at the expense of resolution.

For example, four 1 bpp pixels can be combined to produce a single pixel with more grey-levels:
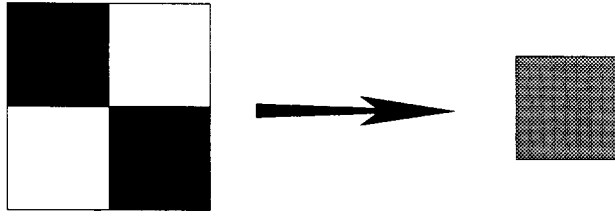
So, for example, by combining four single bit pixels into one, it is possible to get a 4 grey-level image, albeit at half the resolution. This is one of the core features of ScanLight Plus. It has been extended so you can choose the sample size (how many pixels will be combined) and will work on grey-level images as well as black and white 1 bpp images.

This example illustrates 8 x 8 sampling so that 64 source black and white pixels are combined to make one 64 grey-level destination pixel. The resolution of the altered image in this case would be one eighth of the original.
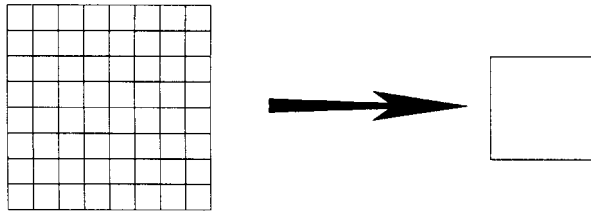
By sampling from a source image that is already made up of grey-level pixels, you can easily improve the quality of certain images. For example, by performing 2 x 2 sampling of a 16 grey-level original image, you get a 64 grey-level result of half the resolution. That is, four pixels of 16 grey-levels each are combined into one pixel of 64 grey-levels.

It might be assumed that as the resolution is reduced in favour of grey-levels it doesn't actually help. However it is quite common that images are available in resolutions higher than required, but with reduced grey-levels. By providing this sampling facility it is now possible to trade resolution against grey-levels and so increase the apparent quality of the image.

Three typical examples show where this technique can prove invaluable:

400 dpi hand-held scanners.

400 dpi monochrome scanners are quite common. These produce high resolution but limited grey-level (actually black and white) output. By performing 8 x 8 sampling these images can be converted into 50 dpi, 64 grey-level sprites. If the resulting sprite is to be incorporated into a document and shown at original size, then there is no doubt that 50 dpi is rather too low. However, if the resulting image is printed at half the original size, then the effective resolution is increased to 100 dpi. In other words, when the sprite is incorporated into the final printed page (assuming it is to be used in a DTP program, for example) if it is scaled to 50% it fits twice as many pixels into the same area, therefore effectively doubling the sprite resolution.

And, as indicated above, a 100 dpi, 64 grey-level sprite should produce top quality laser prints and quite acceptable typeset quality results.

16 grey-level scanners.

Some scanners can produce 16 grey-level output at 200 dpi. By performing 2 x 2 sampling their output can be converted into 100 dpi 64 grey-level results - good enough for top quality results.

If greater grey depth is required (more grey-levels) then larger sampling can be used. 4 x 4 sampling in this case would combine 16 pixels into one to produce a 256 grey-level result at one quarter the resolution, 50 dpi.

256 grey-level scanners

You might imagine that using sampling with a true 256 grey-level scanner offers no advantages since you already have enough grey-levels. While it is quite true that there is little point in group sampling to provide more grey-levels, it does perform another equally important role, that of averaging or smoothing. Indeed, you could substitute the term averaging instead of sampling to get a better idea of what it does. So 2 x 2 sampling is really performing a 2 x 2 pixel group average -it averages 4 pixels into 1.

When scanning images from magazines or printed material it is quite likely that due to the dotted nature of the printing process, the resulting scanned image suffers from interference or moiré patterns. Using the sampling facilities to averages it out, this can be greatly reduced if not eliminated.

Dithering

Many scanners, in particular hand-held scanners, can only produce monochrome (1 bpp) scans. However, they usually offer one or more dither options to simulate a greater number of grey-shades.

For example, the original Mitsubishi A4 hand-held scanner performed 4 x 4 dithering to simulate 16 grey-shades. Dithering can be seen as the opposite of sampling described above - a pattern of black and white pixels is used to simulate different shades of grey. Scanners offering dither options, such as these, sacrifice resolution in order to obtain a greater range of simulated greys.

This scanner dithering can be used very effectively with the ScanLight Plus sampling capabilities. If the two are matched then very good results can be obtained. In the above example, if ScanLight is set to perform 4 x 4 sampling from an image that is a 4 x 4 dithered 400 dpi output from this scanner, it results in a true 16 grey-level image at 50 dpi.

Sampling ➡
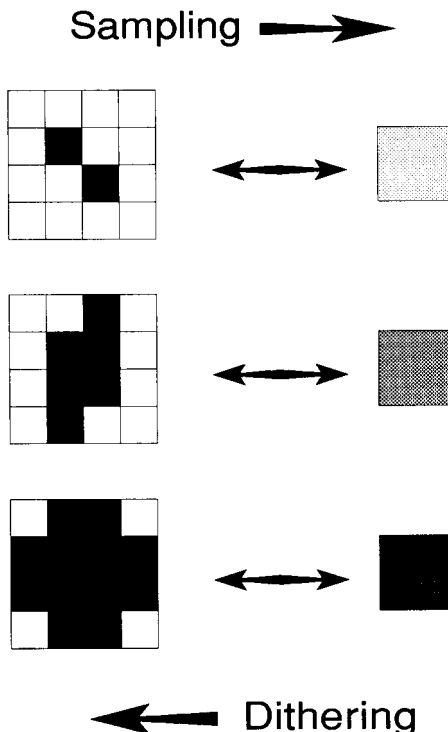
⬅ Dithering

The illustration on the previous page shows how the number of black pixels in the sample determines the grey-level of the resulting pixel, and how, when dithering, the grey-level determines the arrangement of pixels in the resulting dithered image.

Dithering is used by (almost) all printing systems to simulate the grey-levels on the printed page. In the case of ScanLight Plus (and all RISC OS applications) this is taken care of by the RISC OS printer driver. Obviously certain printer drivers or printers are better than others. Typesetting machines use a very fine dot pattern to simulate a very wide range of grey shades (the dot pattern is usually so fine it can hardly be seen). Laser printers, on the other hand, have a more obvious dot pattern and cannot represent so many grey-levels.

So you might ask, if scanners produce dithered patterns in the first place, and as printing requires dithered patterns, why change the picture into a grey-level image at all ? There are two answers to this:

- Grey-level sprites are much better looking on screen. As the computer screen can display true grey-levels, it would be pointless showing pictures made up from a very fine black and white dithered dot pattern. Also manipulating grey-level sprites produces far better results than black and white dithered sprites. Grey-level sprites can be scaled and rotated with a minimum loss of quality. Attempting to do this with dithered black-and-white sprites usually produces a nasty mess.

- The dither pattern best suited to any printer varies quite considerably from printer to printer. Most printer drivers produce a dither pattern best suited to each individual printer, taking into account the minimum dot size and sometimes even the dot shape and ink spread etc. Therefore it is always best to leave the dithering to the printer driver software, rather than attempt to use the dither pattern produced by the scanner.

Scanning

The software should be loaded in the normal RISC OS manner by double clicking on the *!Scanner* icon. After a few seconds the scanner icon appears on the left side of the icon bar:
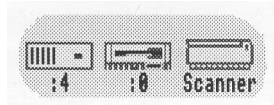
Menuing over this icon displays a small menu:
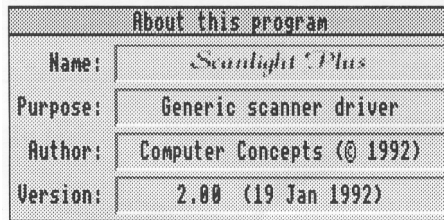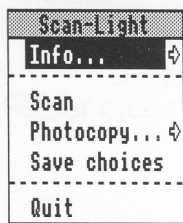
Info

This displays, amongst other things, the version number of the software. If ever you contact Computer Concepts about the program, please quote this version number (and date). (The version number in the illustration is 2.00.)

Scan

This displays the main scan dialogue that controls any scanner (or scanners) attached to the machine. Note that simply clicking on the Scanner icon has the same effect as choosing this menu option. The details of this dialogue are covered in the next section.

Photocopy

You can only use this option if you have a Computer Concepts LaserDirect printer connected in addition to a suitable A4 width scanner.

Click on this option to scan and immediately print the scanned image.

Select **Halftoned** when scanning photographs or other originals with shades of grey. Deselect it when scanning text or line drawings.
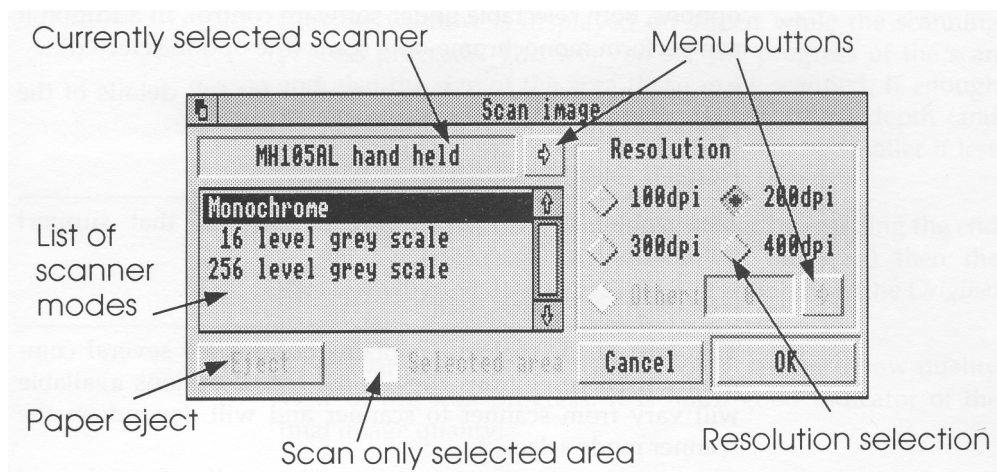
Save choices

Click on this option to save the current settings in the Scan Dialogue such as the current scanner and resolution (described later). These will then be the defaults when you load ScanLight in future.

Quit

This removes the program from memory.

The Scan Dialogue

Currently selected scanner   Menu buttons

Scan image

MH105AL hand held

Resolution

100dpi   200dpi

Monochrome
16 level grey scale
256 level grey scale

300dpi   400dpi

Other

List of scanner modes

Cancel   OK

Paper eject

Scan only selected area   Resolution selection

Currently selected scanner

This is indicated in the area at the top of the dialogue. If the mouse pointer is moved over this area it changes to a small 'mini menu' icon. This indicates that a menu is available at this point. Alternatively, pressing the menu button beside the name will also display the menu.

The menu lists one or more scanners. Some scanners, such as the Mitsubishi A4 scanners, can have optional paper feeders, in which case two scanners are listed. One will be indicated 'hand held' (as in the above diagram), the other will be labelled 'with feeder'.

Selecting a scanner from the menu changes the currently selected scanner.

Menu buttons

Two buttons are provided on this dialogue. As mentioned above, the pointer changes shape when moved over the button to indicate a menu is available. Sometimes a button will be 'greyed' when the option is not available or not applicable.

Menu button

Scanner modes

This scrolling list of options displays the different modes supported by the scanner. Some scanners only have one mode, or have modes that can only be selected by a switch on the scanner itself. In these cases the list will contain one item.

The scanner shown selected in the dialogue illustration on the previous page (the MH105AL) supports two grey-scale options, both selectable under software control. In addition it can perform monochrome-only scans (the option selected).

See the supplementary documentation for full details of the options available for your scanner.

Paper eject

This option is only available on scanners that support automatic sheet feeders.

Resolution selection

This area of the dialogue contains buttons for several commonly used resolutions. Again, the actual options available will vary from scanner to scanner and will depend on the scanner mode selected.

Some scanners are able to scan at resolutions other than those displayed on the buttons. In this case it is possible to enter the required resolution in the field once the 'Other' button has been pressed. In addition, pressing the marked menu button will display a list of other resolution options.

Selected area

A few scanners (usually of the flatbed variety) can scan only a specified part of their image area. This switch selects between scanning the entire image area and scanning only the specified area. Normally if you select an area on the original image (described later) this switch defaults to on. This means that with these scanners you can perform a quick, low resolution scan of the whole page, followed by selecting the area of interest. Then if you select the scan option again and choose a higher resolution and then press OK it will re-scan only the area of interest, at the higher resolution.

Cancel

This button cancels any selection and removes the dialogue from the screen.

OK

Pressing this button starts the scan. On scanners supplied with sheet-feeders this will usually automatically start the scanning process. On hand-held scanners it will be necessary to manually start scanning after this button has been pressed. See the supplementary documentation supplied with the

scanner for exact details on the scanning procedure.

With some scanners, usually only the hand-helds, a small preview window is displayed on screen while the scanning process proceeds. This lets you see the progress of the scan and also the size of the area that can be scanned. If enough memory is available this window will be of A4 depth (and the width of the scanner). The window will be smaller if less memory is available.

Once the scan has been completed (either by reaching the end of the available area or by stopping the scan) then the preview window disappears and a new window (the *Original image* view) is opened to show the scan.

Note that the preview window only shows a low-quality view of the scan progress. It is not a good indicator of the final image quality.

Loading sprites

Any Sprite file can be loaded into ScanLight Plus by dropping it onto the Scanner icon on the icon bar. If the sprite file contains more than one sprite then only the first is loaded.

As ScanLight Plus can save images as Draw files, it also allows any Draw file containing a sprite to be dropped onto the Scanner icon in the same way. (There are some advantages in saving images as Draw files; these are described later.)
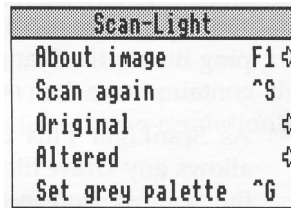
Any image loaded in this way will replace any already loaded.

Main menu

Once an image has been loaded, either from file or by scanning, a window displays this image on screen. This window always shows the original, unmodified sprite as best it can. This window is clearly marked as the 'Original' window on its title bar.

ScanLight Plus uses a screen dithering technique to improve the appearance of images. This can improve the maximum number of grey-levels that can be represented on screen from the normal 16 to 61. This technique is used in all screen modes, even black and white modes, and in both the Original and Altered window, so as to give the best possible representation of the picture in all cases.

Using the **Menu** mouse button (the centre one) over this window displays the main menu:
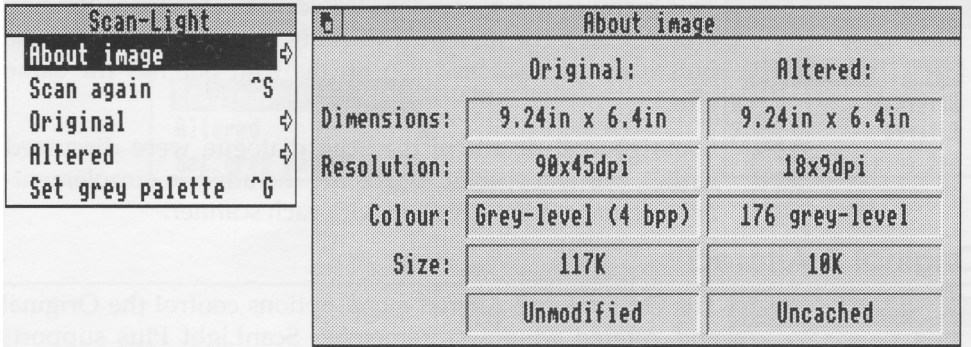
```
╔══════════════════════╗
║      Scan-Light       ║
╟──────────────────────╢
║ About image      F1 ⇨ ║
║ Scan again       ^S   ║
║ Original            ⇨ ║
║ Altered             ⇨ ║
║ Set grey palette ^G   ║
╚══════════════════════╝
```

These menus are described in the next few pages. Two options (**Original** and **Altered)** control windows onto the respective images. These two options lead onto submenus which are covered in the next section.

You can also choose many of the menu options from the keyboard. Where this applies, the keyboard short-cut is shown to the right of the menu option and also in these descriptions. (For example, **Scan again** has a short-cut of *Ctrl-S.)*

Note, as with most RISC OS applications, it is necessary to ensure ScanLight has input focus before the key short-cuts will function. Input focus is indicated by a yellow title to the window - if ScanLight does not have input focus, it is only necessary to click in the window.

About image

Keyboard short-cut F1

Scan-Light	
About image	⇨
Scan again	^S
Original	⇨
Altered	⇨
Set grey palette	^G

About image		
	Original:	Altered:
Dimensions:	9.24in x 6.4in	9.24in x 6.4in
Resolution:	90x45dpi	18x9dpi
Colour:	Grey-level (4 bpp)	176 grey-level
Size:	117K	10K
	Unmodified	Uncached

This gives details of both the original and altered images.

The resolution fields are only accurate if the image was obtained directly from an attached scanner or if it was loaded from a Draw file. This is because sprite files do not contain any resolution information and so these are usually assumed to be screen resolution and will show as 90 dpi. ScanLight image Sprites within Draw files do contain resolution information and so in this case the values shown here should be accurate.

The colour field indicates if the sprite was a monochrome (lbpp), or grey level sprite. If the latter, this may be either 2, 4 or 8 bpp. As indicated earlier, 8 bpp sprites can represent up to 256 grey-levels; however anything over 16 grey-levels will be stored as an 8 bpp sprite.

The size field is one of the most useful. This indicates how much disc or memory space the image requires. Since the original image is always stored in main RAM memory the value shown here indicates the amount of RAM required. The value shown under the Altered heading is useful if you want to know how large the file will be if the altered image is saved. Under normal operation the altered image is not held in memory so this figure is not required for RAM. However ScanLight Plus includes an option to cache the Altered image - in which case this is the amount of extra RAM it will require. See later for details of the cache option.

The last field under the Original heading indicates if the image has ben altered, for example by cropping or flipping. Under the Altered heading it shows if the Altered image is currently cached in RAM or not.

Scan again

Keyboard short-cut: Ctrl-S
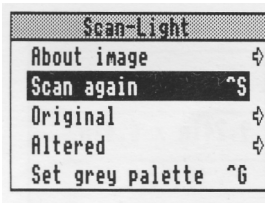
This menu option re-displays the scan dialogue, so allowing a new scan to be obtained. Clicking with the Select mouse button on the *!Scanner* icon on the icon bar has the same effect.

Some general details of the Scan dialogue were discussed earlier, but any specific details are included in supplementary documentation supplied with each scanner.
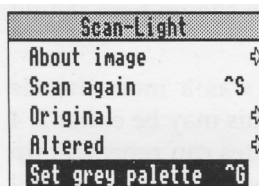
Original & Altered
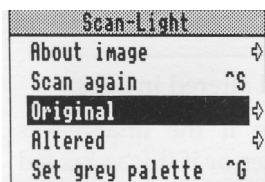
The Original and Altered menu options control the Original and Altered windows. Remember ScanLight Plus supports two main windows, one onto the unmodified, original image, and one onto the modified or altered image.

Both options lead onto submenus which are covered in the next section.

Set grey palette

Keyboard short-cut: Ctrl-G

Normally the 16 colour screen modes have a palette made up of eight greys and eight colours. As ScanLight Plus is designed to manipulate grey-level images, it means that the eight colours never get used.

The colour palette is, of course, controllable under RISC OS, and so it is possible to arrange the palette as 16 graduated levels of grey. In so doing more realistic images can be displayed and, when used in conjunction with the grey-level dithering, this allows 61 grey-levels to be represented on screen.

The default palette can be restored by selecting the Default menu option on the palette icon on the icon bar.

The best screen modes to use for ScanLight are the 16 colour modes such as mode 12, 20 or 27. Modes 20 and 27 require a multisync monitor and give a far better representation as they offer twice the vertical resolution of mode 12.

On new Archimedes models (such as the A5000 and A540) mode 31 provides the highest quality display, 800 x 600 pixels with 16 colours (Super VGA).

256 colour modes, such as 15 or 28, offer no advantage as these cannot display a greater number of grey levels.

Original window options
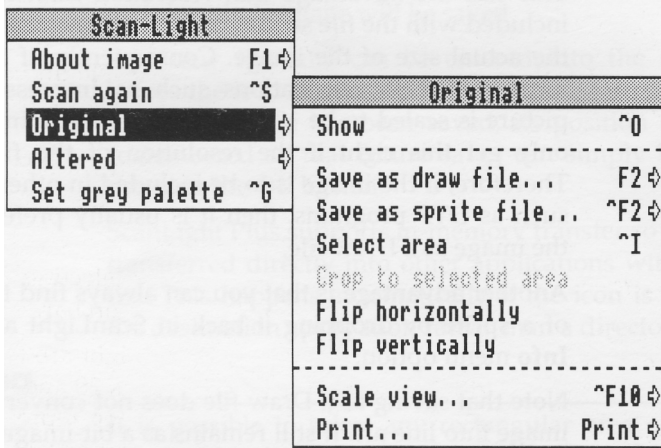
Each of the options on this submenu control various features of the Original image view.

Show

This option opens a window onto the original image, or if the window is already open, brings it to the top. (The Altered menu has a corresponding show option.) Either the Original or Altered window can be closed at any time in the conventional RISC OS fashion (click on the Close icon in the top left corner of the window).

When the mouse pointer is moved over either window it changes into a small hand icon. This shows you can 'push' the contents of the window around by pressing the Select mouse button while dragging. This is often much easier than using the traditional window scroll bars.

Closing *both* the Original and Altered windows deletes the image from memory.

Save as draw file
Save as sprite file

Keyboard short-cut: *as draw file F2*
                                      as sprite file Ctrl-F2

These options allow the original, unmodified image to be saved either as a Sprite or Draw file.
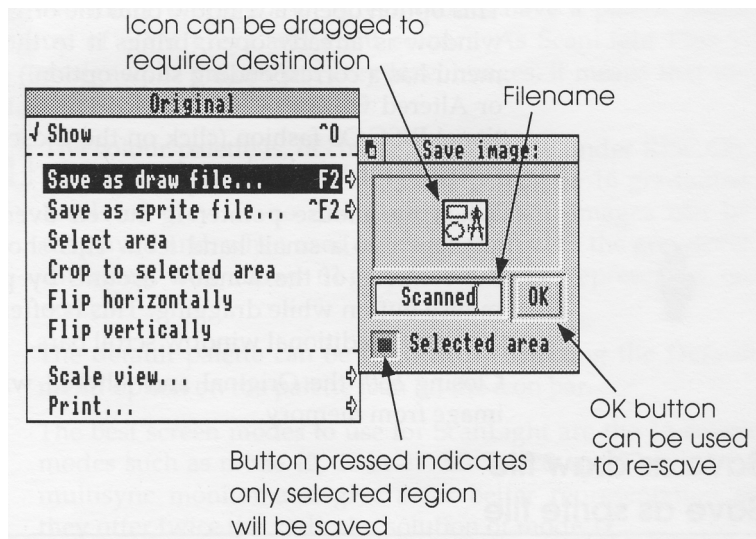
Saving as a Draw file

This has the advantage that resolution information can be included with the file so that programs can correctly calculate the actual size of the image. Consequently, if the picture is incorporated in applications such as Impression, and the picture is scaled to be 100% (i.e. actual size), Impression can only get this right if the resolution of the file is known. Therefore, if the image is to be included in other applications such as DTP programs, then it is usually preferable to save the image as a Draw file.

Another advantage is that you can always find the resolution of a sprite by dropping it back in ScanLight and using the **Info** menu option.

Note that saving as a Draw file does not convert the scanned image into line art. It still remains as a bit-image sprite and is simply a sprite *within* a Draw file.

Saving as a Sprite file

Certain applications (e.g. *!Paint)* can only recognise Sprite files. For loading into these applications save the image as a Sprite file.

The above diagram illustrates the display when saving the image as a Draw file or sprite file. If a selected area exists (see next menu option) then the selected area button will be pressed indicating that only the selected rectangular area, rather than the whole image, will be saved. If the entire sprite

is required then this button should be released (click on it). If there is no selected area then the button cannot be pressed and the whole image will be saved.

Any new filename can be entered into the filename field before the icon is dragged to the required directory window. Once the image has been saved, its position on the disc is remembered so that future saves can simply be effected by pressing the OK button.

ScanLight Plus supports in-memory transfer so images can be transferred directly into other applications without going to file. This happens automatically if the icon is dropped onto the destination application rather than a directory window.

Select area

It is possible to select any rectangular area of the Original image either for subsequent saving or for cropping.

Scanned images can be very large and so it is often advisable to save only the area of interest.

Once the menu option has been selected, the pointer will be centered on a pair of cross-hairs. These cross-hairs indicate what will form the top left corner of the selected area. To position the bottom left corner of the selected rectangle, it is necessary to click with the **Select** button *and hold the button pressed* while dragging the mouse pointer to the required bottom right corner. Release the mouse button when the required region is surrounded.

The selected area will now be marked by a rectangular box with eight 'handles'.
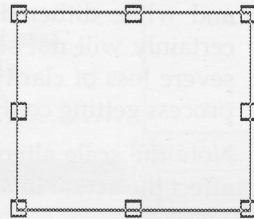
These eight handles indicate adjust points on the box. When the pointer is over any handle, the pointer changes to a 'snowflake' shape, indicating it is possible to adjust the required side or corner of the box with the pointer.

Crop to selected area

Once a selected area has been marked this option will throw away all parts of the Original and Altered images outside the selected rectangle.

Flip horizontal & vertical

These two options will flip both the Original and Altered images about the centre line of the image. Some users find it easier to use the scanner backwards - that is they scan from bottom to the top of the image - in which case using the Flip vertical option will restore the image to the correct orientation.

Scale view

Keyboard short-cuts: F5 – halve current scaling
F6 – 100%
F7 – double current scaling

This leads to a sub-dialogue that allows the size of the Original image view to be altered. Normally the image is shown at 100%. This *does not* mean that it is represented on screen as true size. It does mean that each horizontal pixel of the sprite is represented by a pixel on screen.

In other words, a scale of 100% represents a one to one scaling of pixels on the scanned image to pixels on screen. So, the higher the resolution of the image, the larger the actual picture in the window.

If the original image is a grey-level image, then it will usually scale up or down successfully - i.e without losing too much quality. On the other hand, if the original image is a black and white dithered picture from a scanner, then it almost certainly will not scale down to smaller sizes without some severe loss of clarity. This is simply the result of the scaling process getting confused by the dither pattern.

Note the scale alters only the view of the image; it does not affect the actual image itself.
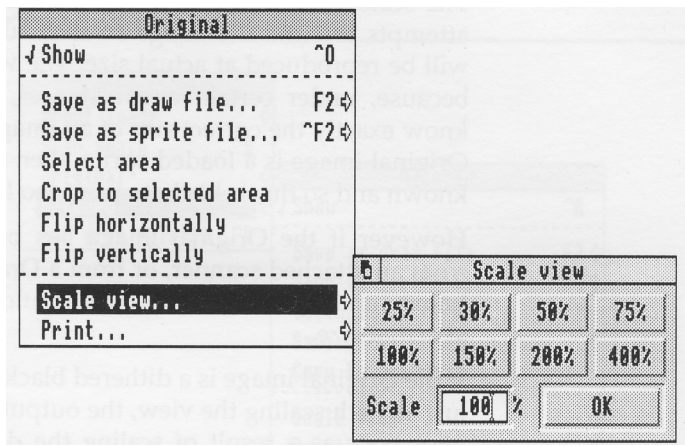
Any value between 1% and 800% will be accepted; click on the OK button to make the change. At 800% the individual pixels of the image are clearly visible (represented by eight screen pixels).

Print

This option will print the unmodified Original image to the currently installed RISC OS printer driver. (A printer driver is installed as normal by double clicking on the printer driver icon. After a few seconds the icon should appear on the left side of the icon bar.)
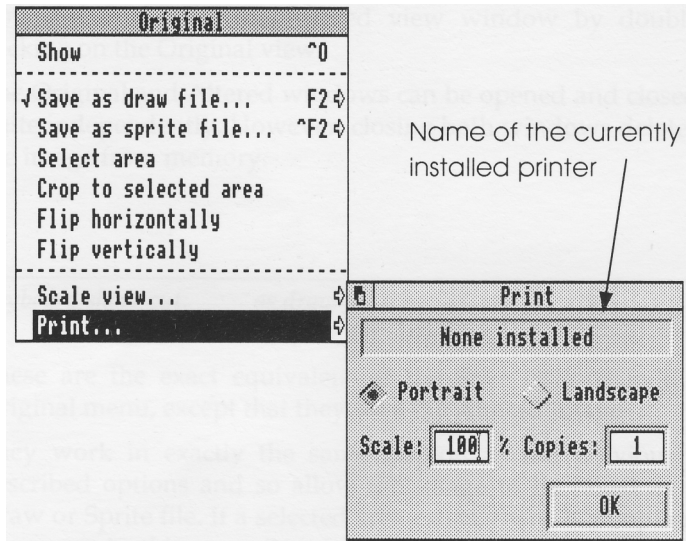
The portrait or landscape button determines if the image is printed sideways (landscape) or not.
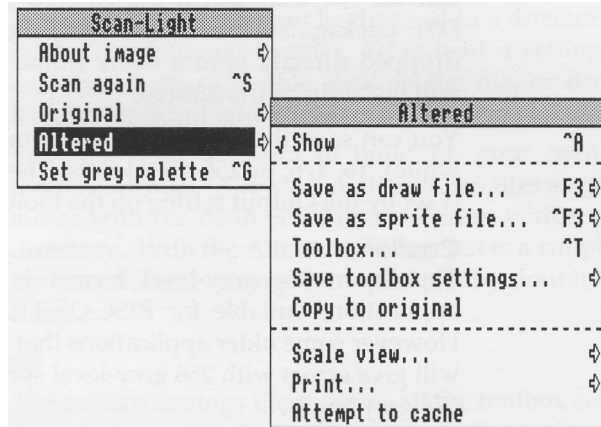
The scale value determines the printed size. ScanLight Plus attempts to scale the image so that 100% means the image will be reproduced at actual size. The word 'attempt' is used because, under certain circumstances, it is not possible to know exactly the correct size of an image. For example, if the Original image is a loaded sprite, then no size information is known and so this is likely to print too large.

However if the Original image has been obtained directly from an attached scanner, or from a Drawfile, then the size is known and a print scale of 100% should reproduce the image at actual size.

If the Original image is a dithered black and white scan, then, just as with scaling the view, the output quality is likely to be very poor as a result of scaling the dither pattern. Indeed, there is little point in printing the Original dithered scan as ScanLight Plus provides the option to print the Altered image, and if this is converted into a grey-level image, via sampling, the print quality is likely to be superior.

Pressing the **OK** button will initiate the print.

Altered window options

```
┌──────────────────────┐
│▒▒▒▒▒ Scan-Light ▒▒▒▒▒│
│ About image        ⇩ │
│ Scan again        ^S │
│ Original           ⇩ │
│▓Altered▓▓▓▓▓▓▓▓▓▓▓⇩│▒▒▒▒▒▒ Altered ▒▒▒▒▒▒▒
│ Set grey palette  ^G ⇩│√ Show               ^A │
└──────────────────────┘ ┄┄┄┄┄┄┄┄┄┄┄┄┄┄┄┄┄┄┄┄┄ │
                         │ Save as draw file...  F3⇩│
                         │ Save as sprite file... ^F3⇩│
                         │ Toolbox...           ^T │
                         │ Save toolbox settings...  ⇩│
                         │ Copy to original         │
                         │┄┄┄┄┄┄┄┄┄┄┄┄┄┄┄┄┄┄┄┄┄ │
                         │ Scale view...           ⇩│
                         │ Print...                ⇩│
                         │ Attempt to cache         │
                         └─────────────────────────┘
```

The Altered submenu controls all aspects of the other main window
in ScanLight Plus. In practice the Altered window tends to be
more important as it shows the results of the modification and
enhancements performed by this program.

Show

Keyboard short-cut: Ctrl-A

Choose this option to open the Altered window. If the
window is already open the option will be ticked, as shown.

You can also open the Altered view window by double
clicking on the Original view.

The Original and Altered windows can be opened and closed quite
independently. However, closing both windows deletes the image
from memory.

Save as draw file
Save as sprite file

Keyboard short-cut: as draw file F3
*   as sprite file Ctrl-F3*

These are the exact equivalent of the Save options in the Original
menu, except that they save the Altered image.

They work in exactly the same fashion as the previously described
options and so allow the image to be saved as a Draw or Sprite file.
If a selected area exists, there is an option to save only this area. (
Note the selected area can only be marked on the Original view.)

Because ScanLight Plus supports in-memory transfers, the Altered image can be transferred directly into other applications. For example, if the Altered image is required in a DTP package such as Impression, then the file icon can be dropped directly onto a blank frame whereupon the image will instantly be transferred.

You can save the Altered image as monochrome (black and white), 16, 176, or 256 grey levels. The number of grey levels is set by the Output setting on the toolbox (described later).

Caution:

The Acorn 256 grey-level format is relatively new. Most applications suitable for RISC OS 3 can accept this format. However some older applications that have not been updated will give errors with 256 grey-level sprites – in such cases use 176 grey levels.

All current versions of Computer Concepts applications can accept 256 grey-level sprites.

Toolbox

Keyboard short-cut: Ctrl-T

This displays the main ScanLight toolbox dialogue that controls all the main image manipulation facilities. It is described in a later section.

Save toolbox settings
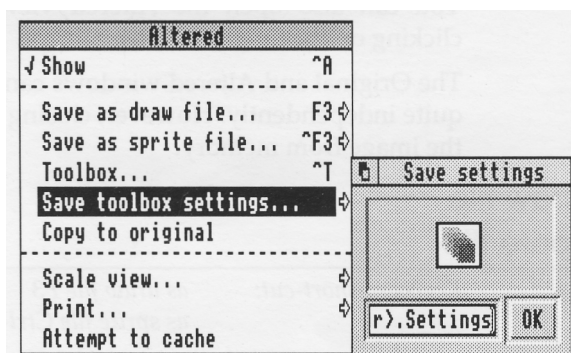
ScanLight Plus provides a way of saving all the toolbox settings. As it can be quite time consuming to get the grey-map exactly right, this option allows a particular sampling setup and grey-map to be re-used on different images.

Clicking on OK without changing the file name saves the current toolbox settings into the ScanLight application. These

settings will then apply when ScanLight is next loaded and the Altered view is shown.

Alternatively the icon can be dragged to a directory window in the conventional manner. To re-load a settings file it is only necessary to double click on the file, or drop the file icon on the ScanLight Plus icon on the icon bar.

You may find it useful to build up your own library of toolbox settings. A few example settings files are included on a disc with the main ScanLight program within the Settings directory. With the Altered view open it is a simple matter to try the different settings examples just by double clicking on them.

Note for advanced users:

The toolbox settings file contains all the toolbox settings, such as sample size, angle of rotation, enhance options as well as the control points for the grey-map. Therefore all these values are set when loading a settings file. However this file is a plain text file and can be edited in a text editor, such as !Edit, so that the file only alters those settings that you wish to change.

Copy to original

This option replaces the original image with the altered one. This is useful if you want to perform successive enhancement operations on an image. If the Altered image is cached (see below) then this operation is very fast. If it is not cached then this menu uses a temporary disc file to transfer the image, so it can take some time.

Scale view

Keyboard short-cuts: *F9 – halve current scaling*
                          F10 –100%
                          F11 – double current scaling

This allows the size of the image shown in the Altered window to be altered. Like the equivalent option in the Original menu, 100% represents a one to one scaling, it does not mean that the image will be shown actual size. With large sampling values, the Altered image tends to be shown quite small, so it is quite common to set the window scale to greater than 100%.

A maximum value of 800% means that each pixel of the Altered image is represented by eight pixels on screen. The individual pixels will be very noticeable.

Print

Again this is the direct equivalent of the Print option in the Original menu, except that this will print the Altered image. This can be useful if you want to be sure the image will print satisfactorily before it is saved or transferred to other programs, such as DTP programs. As before, a scale of 100% will only print at actual size if the original image came direct from an attached scanner or from a Draw file. Printing the Altered image can take some time particularly if any enhance options have been selected. This is because ScanLight has to process the image to the printer resolution rather than the screen resolution.

Attempt to cache

Normally only one copy of the image — the Original — is held in memory. The Altered image is always calculated from the Original image during display. This can slow down screen updating because of the processing required particularly for the enhance options.

When you click on this option, ScanLight attempts to store the altered image in memory. If there is insufficient spare memory the cache attempt fails.

When processing the cached image, the hourglass shows the percentage of the image that has been processed.

The menu is shown ticked if cacheing is on. To switch it off simply select the menu option again.

The advantages of cacheing

- Once the image is cached, screen updating is quicker. For example, the image is redrawn faster when you open menus or drag other windows over it.
- Copy to Original is faster.

The disadvantages of cacheing

- More memory is needed. (The amount depends on the size of the Altered image.)
- ScanLight must cache the entire image rather than just the visible portion. This can mean more processing time.

The Toolbox

This is the main dialogue for controlling the Altered image. Through it the image can be sampled, rotated and have its contrast, brightness and grey-map modified. The toolbox can be opened by:

- an option on the Altered menu,
- using the keyboard short-cut of *Ctrl-T,* or
- double clicking on the Altered window.

Nº of grey levels available at current sample size

Sampling options

Enhance options

Rotate

The grey-map

The number of grey-levels in output file
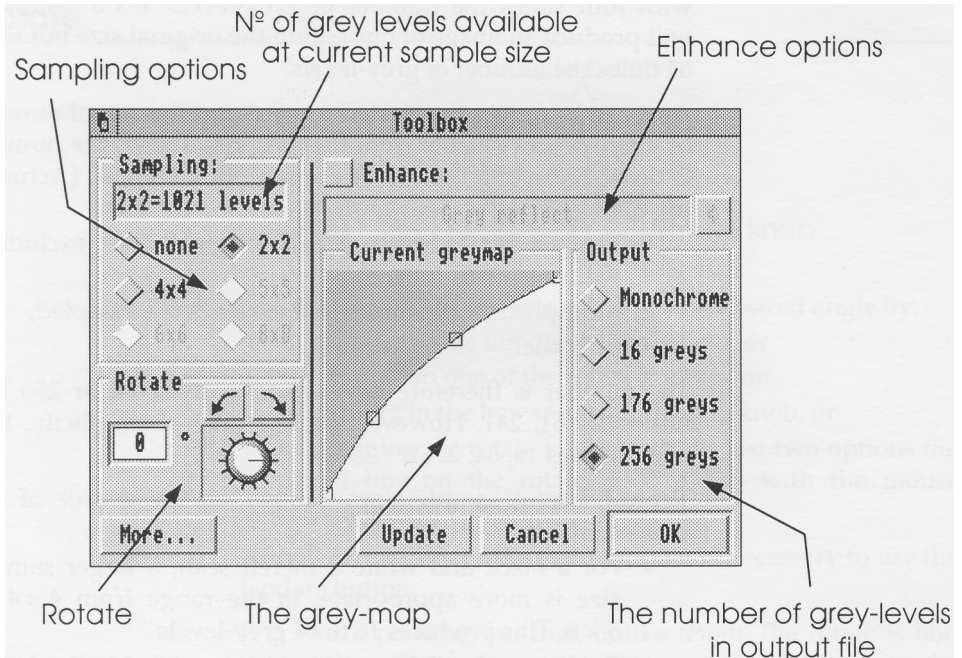
The grey-map and enhance options are described later in separate sections.

More... button

Click on this to display the enlarged grey-map and grey-map controls such as brightness and contrast.

Update button

Any changes you make to the toolbox do not immediately update the Altered image. To update the image you can:
- click on Update with either **Select** or Adjust, or
- click on OK with either Select or Adjust.

Select clicking on OK closes the toolbox. Clicking on Update or Adjust clicking on OK retains the toolbox on screen.

Sampling

Sampling was described in the introduction. Refer to that section for a background on the principles of sampling.

ScanLight Plus offers six different sampling options, from no sampling at all to 8 x 8 sampling; the larger the sample size, the smaller the altered image. For example, 2 x 2 sampling will produce an altered image of half the original size, but with four times the number of grey-levels. 8 x 8 sampling will produce an image of one eighth the original size but with 64 times the number of grey-levels.

As it can be quite complicated to work out the actual number of grey-levels available from the Original image, the number is displayed along the top of the sampling section. (Actually the calculation is:

- the number of levels in each original pixel excluding white,
- multiplied by the number of pixels being sampled,
- plus one.

The number is therefore never exactly 16 or 64 or 256 but rather 17, 61, 241. However, for the sake of simplicity, this manual uses 16, 64, 256).

Typical, useful sample sizes depend on the source of the Original image:

- For a black and white dithered scan, a larger sample size is more appropriate, in the range from 4 x 4 to 8 x 8. This produces 16 to 64 grey-levels .
- For a grey-level image (say 16 grey-levels), the lower range of sample sizes is more suitable. 2 x 2 sampling gives 64 greys, 4 x 4 sampling gives 256 greys.
- If the image already has over 64 greys, then it is not necessary to use sampling to provide more grey-levels, although it can be useful to average out small imperfections in the original image or to reduce moiré patterning. Values of 2 x 2 or 4 x 4 are usually successful in removing or substantially reducing patterning.

If the original is a 256 grey level image, ScanLight allows only up to 4 x 4 sampling.

Four, 16 level pixels, are combined to make one 64 level pixel

Rotate

Rotate buttons

Rotate

Editable field
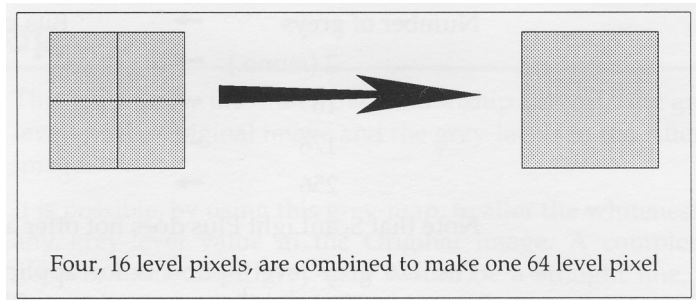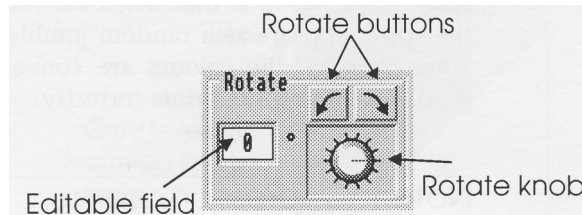
Rotate knob

The Altered image can be rotated by any desired angle by:

- typing a value into the editable field, or
- clicking on one of the rotate buttons, or
- clicking in the box around the rotate knob, or
- dragging the rotate knob. With the last two options the red line on the rotate knob aligns with the mouse pointer.

As before, in order to see the rotation it is necessary to use the Update button.

It is worth pointing out that, unlike *!Paint,* the rotate is non destructive. That is, multiple successive rotations can be performed without any cumulative distortion of the image occurring. This is because the Original image is always kept intact, and the rotated view is calculated from this.

Enhance

ScanLight provides a selection of options to "enhance" the altered image. Most effective are the range of sharpening options. All the enhance options are described later.

Output

You can choose the number of grey-levels in the altered image from four different values; 2, 16, 176 and 256 greys.

Number of greys	➡	Bits per pixel (bpp)
2 (mono.)	➡	1 bpp
16	➡	4 bpp
176	➡	8 bpp
256	➡	8 bpp

 Note that ScanLight Plus does not offer a 4 grey-level option.

The 176 grey level option is for applications which cannot accept sprites in the newer Acorn 256 grey-level format. (Many applications have now been modified to use 256 grey-level sprites.) ScanLight saves 176 grey-level sprites as colour sprites. The result is that when viewed on a colour display, the sprite appears as a random jumble of colours. However when printed, the colours are converted to suitable grey shades and the sprite prints correctly.

Note to Impression users:

Versions of Impression before 2.15 (Impression Junior 1.15) can only handle 176 greys. Attempting to load 256 grey-level sprites may cause errors.
Version 2.15/1.15 and later can handle 176 & 256 greys correctly.

Note to RISC OS 3 users:

Although !Draw supplied with RISC OS version 3.00 does cope with 256 grey-level sprites correctly, !Paint does not. Future updates of the operating system will provide support in both programs.

The more output grey-levels, the more precise is the control over the height of the grey-map bars. So, if a monochrome output is requested, then the output can have only two levels, black or white, and the bars of the grey-map have only two heights. With 16 grey-level output, each bar of the grey-map may be one of 16 different heights, and with 256 output, each bar can be set to one of 256 possible heights. The consequence is that the more grey-levels in the output, the smoother the grey-map curve can be.

The grey-map

This graphically illustrates the relationship between the grey-levels of the Original image and the grey-levels in the Altered image.

It is possible, by using this grey-map, to alter the whiteness of any grey-level value in the Original image. A completely normal, unmodified grey-map would be a straight line, i.e. there is a direct linear relationship of the grey-levels in the Original image to those in the Altered image. Such a grey map would look like this.
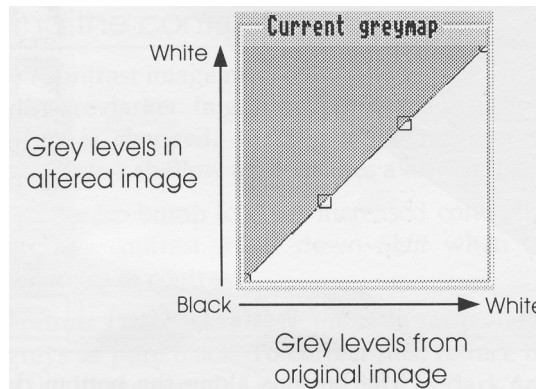
In other words, black pixels of the Original become black pixels of the Altered image, and white map to white pixels.

The grey-map can be used to alter the brightness and contrast and to compensate for non-linearities in the scanner or the printer. Few, if any, scanning or printing devices can accurately reproduce a linear scale of greys. Quite often scanners and printers tend to accentuate the blacks, resulting in images that have too much contrast. By experimenting with various grey-maps for different printers or scanners, it is likely that a particular grey-map will be found that can compensate, at least to a certain degree, for the deficiencies of a particular scanner or printer.

The actual number of grey-levels available from the Original depends on two factors. Firstly, the number of grey-levels in the Original image. Secondly, the sampling size chosen. The sampling options have already been described.

The more grey-levels available from the Original image, the more bars exist along the horizontal axis of the grey-map.

The number of grey-levels possible in the Altered image simply depends on the number of output greys selected. This also has already been described.

Click on the **More...** button on the toolbox to open the grey-map dialogue box:
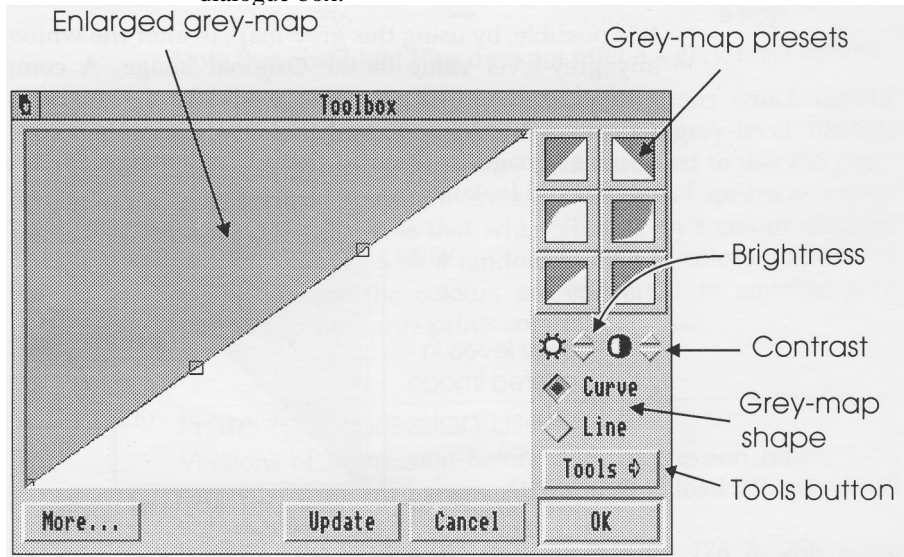
The buttons along the bottom duplicate the buttons on the toolbox. The **More...** button returns to the main toolbox.

Changing the grey-map

There are several ways to change the grey-map:

- altering the brightness,
- altering the contrast,
- clicking on one of the presets,
- using one of the grey-map tools,
- editing the curve.

To update the image to use the new grey-map click on either **Update or OK.**

Altering the brightness

Click on the bump icons. Click on the up icon to make the image brighter and the down icon to make it darker.

Hold down *Shift* when clicking for larger changes in brightness.

Current greymap — Darker

Current greymap — Lighter
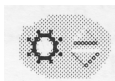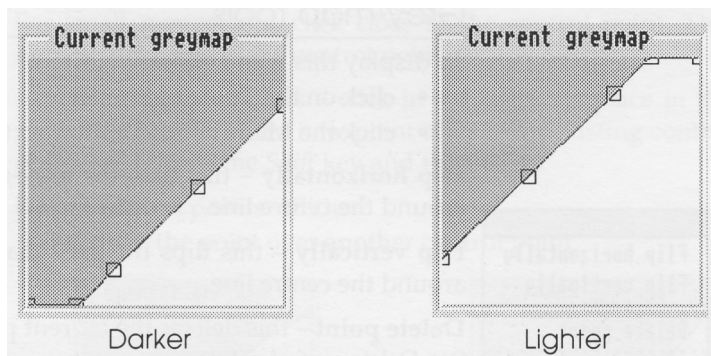
Altering the contrast

A higher contrast image means that the whites are lighter and the blacks are darker. In grey-map terms this means the angle of the line is changed. A steep angle represents a higher contrast, while a shallow angle makes a low contrast image.

Click on the up bump icon for increased contrast, the down icon for less contrast. Hold down *Shift* when clicking for larger changes in contrast.

Many printers show very light greys as pure white and very dark greys as pure black. To correct this, reduce the contrast so that the image contains no very light or dark greys and no pure white or black.

Current greymap — High contrast

Current greymap — Low contrast
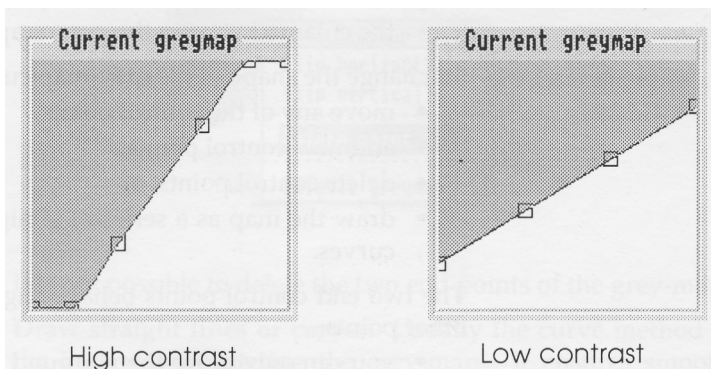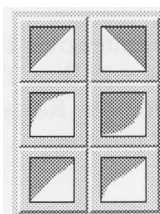
Grey-map presets

On the right of the dialogue box are several preset grey-maps. Clicking on the appropriate icon changes the grey-map. The first one select a straight line default grey-map. The second is the inverse of this, useful for viewing scanned photographic negatives.

Grey-map tools

To display this menu either:

- click on the **Tools** button, or
- click the **Menu** mouse button on the grey-map.

Flip horizontally — this flips the grey-map from right to left around the centre line.

```
       Greymap
 Flip horizontally
 Flip vertically
- - - - - - - - - - - - - -
 Delete point
- - - - - - - - - - - - - -
 Default greymap
```

Flip vertically — this flips the grey map from top to bottom around the centre line.

Delete point — this deletes the current point on the grey-map. See *Delete control points.*

Note that you can never delete the end points of the grey-map.

Default grey-map — this discards the current grey-map and replaces it with the default grey-map stored inside the ScanLight application.

(To change the default grey-map, save the current toolbox settings to the ScanLight application using the **Save toolbox settings** menu option described on page 24.)

Editing the grey-map curve

You can edit the curve using either:

- the toolbox window, or
- the enlarged view in the grey-map dialogue box.

To change the shape of the grey-map curve you can:

- move any of the control points,
- add new control points,
- delete control points, or
- draw the map as a series of straight lines or a series of curves.

The two end control points behave slightly differently to the other points:

- you can only move them around the edges of the grey-map box, and
- you cannot delete them.

Moving a control point — position the mouse pointer over the control point. Press and **hold down Select.** As you drag the mouse, the control point follows the mouse pointer. Release **Select** when the control point is in the required position.
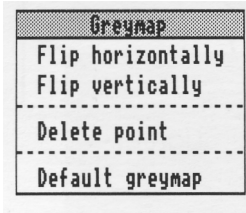
For small movements, click close to the control point. This immediately moves the control point.

Add new control points — click in the required place in the grey-map box. To add a new point close to an existing control point, hold down the *Shift* key and then click.
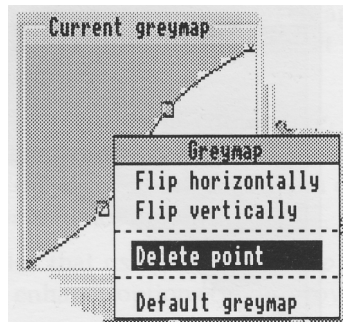
Delete control points — Either:

- move the point over another control point,
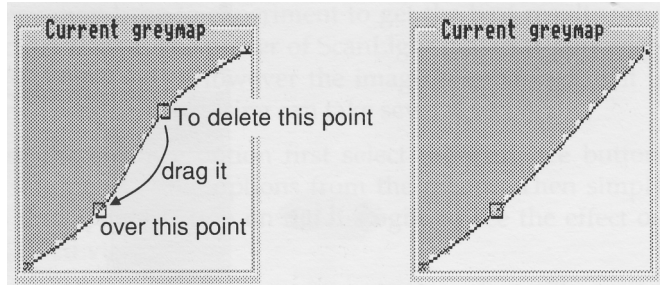
or

- click on the control point to select it, click **Menu** on the grey-map box and then choose the menu option **Delete point**

    .

It is not possible to delete the two end points of the grey-map.

Draw straight lines or curves. Usually the curve method is the best way of altering the grey-map - it ensures smooth graduations of the grey-levels. Occasionally though you may find that you want to put sharp angles or bends in the grey-map. In this case selecting the Line option draws straight lines between the control points, as shown in the following diagram.
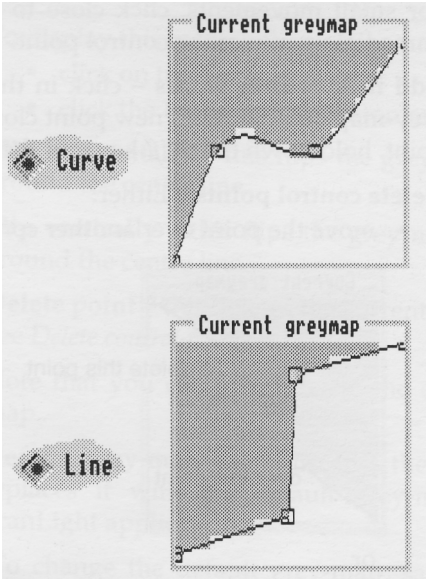
Typical grey-maps settings
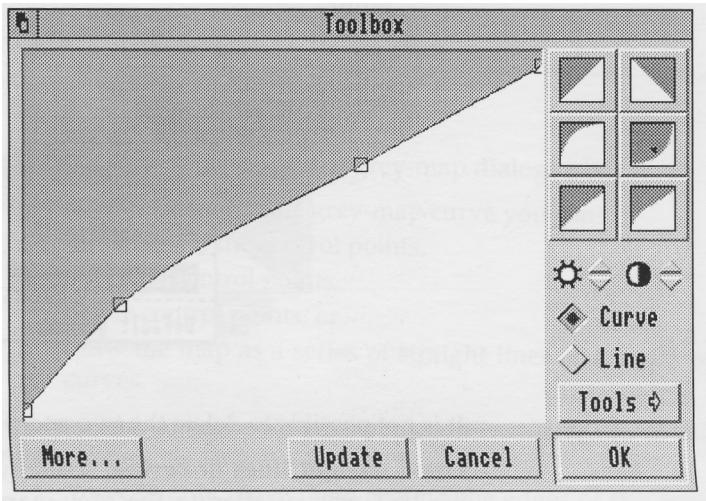
A typical grey-map for most type of scanners would look like this. Most scanners produce pictures that are rather too dark so the bulge in this grey-map tends to compensate for this. Depending on the scanner and original source image it may be necessary to exaggerate or lessen this bulge.

The enhance options

The enhance button allows one of a selection of general purpose image enhancements to be performed. These options let you improve the image quality or produce special effects. It isn't possible to define 'rules' for their use as only you know what effect you're seeking. This section just gives you guidelines. Often the differences between options are small and you may have to experiment to get the best results for a particular image. The power of ScanLight makes experimenting quick and easy. However the image is enhanced as it is redrawn and the processing can take several seconds.

To use the enhance option first select the **Enhance** button, then select one of the options from the menu. Then simply press the Update button on the dialogue to see the effect on the Altered view.

The enhance options do not change the file size for the image (unlike changing the resolution or sampling).

Note that the enhance options are not cumulative — that is, you can choose any number of enhance options without destroying or affecting the original image. To revert to the unenhanced image at any time, deselect the **Enhance** button on the toolbox.

If you want to make them cumulative, apply and enhance option and then copy the Altered image to the Original image, using the **Copy to original** menu option. You can then apply another enhance option.

Remember also that using the grey-map controls in conjunction with the enhance options can improve image quality.

Many of the options have three alternatives **(Low, Medium, High)**, which give extra control over the application of the effect.

The following examples show some of the enhancement options. All the images below are 100dpi but reproduced at 80% of their normal size so the resulting printed resolution was about 120 dpi.

Unenhanced image

This is the image with the enhance button off.

Grey reflect

This changes:
- pure white or pure black to black, and
- inverts grey tones (light to dark).

Sharpen

This slightly exaggerates the boundary between grey tones. It is probably the most effective and useful of the enhance options. It is very useful in bringing out detail in scanned photographs.

It is not suitable for gentle transitions between grey shades; the change from one shade of grey to the next is made more obvious.

Example image at medium sharpen

The three levels of sharpening work best at different sampling levels. Tests show that with no sampling, low sharpen is adequate. At 2x2 or 4x4 sampling, low or medium is best. High tends to over-sharpen except in a few cases at 4x4 sampling.

You may also find that high levels of sharpening and small sample sizes that it also enhances any image "noise" and make the image look like a poor photocopy.

Example image at high sharpen
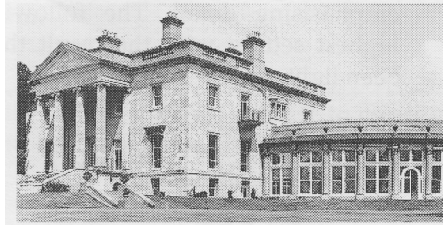
Blur

The opposite of Sharpen; boundaries between grey tones become less distinct. This can be useful to reduce image noise or patterning.

Transition detect

This can produce an effect similar to solarization in conventional photography. That is, transition boundaries appear dark and other areas, regardless of their original colour, appear light. Using the **High** option tends to detect the slightest noise. The **Low** or **Medium** settings tend to work better.
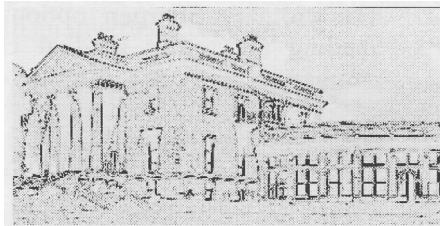
Darken transitions

This options draws a dark line, one pixel wide, along the boundary of grey-shades. It is useful for emphasising edges.
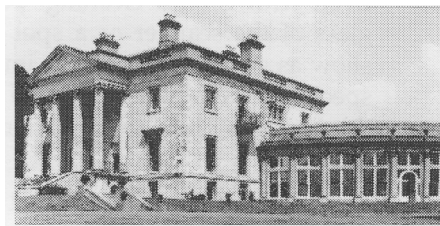
Lighten transitions

This has the opposite effect to **Darken transitions** and draws a thin light line along transitions. Again it is useful for emphasising detail. The following example is using the highest setting with the result that most of the picture has been lightened.
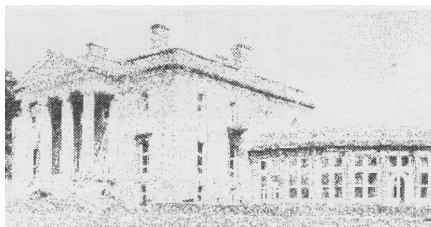
Edge detect
Darken edge
Lighten edge

These are similar to the **transitions** options just described except they are applied only to edges. (An edge is defined as a sharp change in adjacent grey levels.)

Clever sharpen

The ordinary **Sharpen** options can cause problems with shading and other gradual changes of grey. They also emphasise noise and dust detected during scanning. This option performs a medium sharpen on what it decides is an edge. The three options — **low, medium, high** — work on different thresholds in deciding what constitutes an edge.

On the example picture there is no visible difference between this option and medium sharpen illustrated above.

Noise remove

Even with careful cleaning, you may still get dust on the glass of the scanner or a spot on the photograph. This can show as a white spec on the image. This option detects these specks and removes them from the image. With most images, this shouldn't lead to loss of detail but you should check for this.

Because ScanLight is a general purpose image manipulation package, you can use it with images from sources other than the scanner. One possible source is a video digitiser. Images

from digitisers are very prone to white or black specks caused by 'noise' from the video source. You can use **Noise remove** to clean up the image. Because digitisers produce relatively low definition images, loss of detail shouldn't be a problem.

Shadow

This displaces the image slightly to create a shadowed effect. It creates an interesting result although with possible loss of detail.
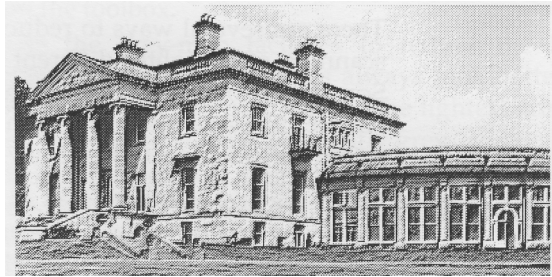
Combining effects

The following "chalk on blackboard" effect was produced by using the edge detect filer with a strange grey-map setting -then copying this to the original view and combining a low blur with an inverted grey-map.
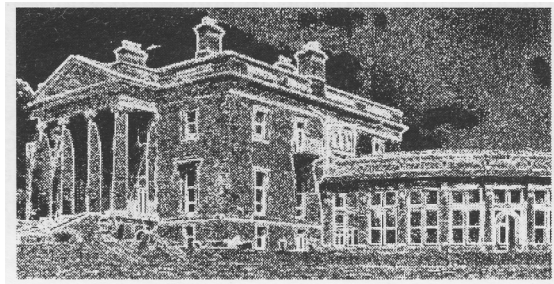
Patterning

On printed material such as photographs from magazines and the like, the dot pattern that makes up the printed image tends to be in the same resolution range as the scanner. The result is that, when scanning images from printed material, it is almost inevitable that some form of patterning will be visible on the resultant image. In fact, grey scale scanners are more prone to this than older black-and-white scanners as they are more sensitive.

There are several ways to reduce this patterning. Sometimes scanning at a slightly different angle can affect the results. Scanning at only 5° off the normal scan axis can dramatically reduce the patterning. The ScanLight Plus software lets you rotate the image so it's very easy to correct the angle.

By far the best way is to scan at a higher resolution and then use the sampling option in ScanLight Plus to 'average' out the patterning. At 256 grey-levels, the maximum sampling is 4x4 which is often not enough. Therefore, one trick that can be useful is to scan at 16 grey-levels and use the larger sampling options (5x5 or 8x8) to reduce the patterning. As this also increases the number of grey-levels, the resultant images are not restricted to only 16 grey-levels.

It has been found that when scanning images from magazines and similar printed material, scanning at 300 or 400 dpi, 16 grey-levels and then sampling often gives better results than scanning at 200dpi (or lower), 256 grey-levels.

Because true photographic prints are not made up from dot patterns (like magazine pictures), they will always produce better results and should never suffer from patterning. Therefore, when scanning true photographic prints, better results will nearly always be obtained by using the 256 grey-level scanning modes.

Hints and tips for the best results

- If the image is too wide, try scanning along the image and using the rotate option on the toolbox to turn it the correct way round. Either 90° or 270° is likely to be correct.

- For the best results for scanned images on a Laser-Direct HiRes laser printer set the printer to 600 x 300

dpi resolution using screen 2. This resolution is the best compromise between printable grey-levels and half-toning screen density.

- To reduce patterning when scanning printed material:

    – scan at the highest possible resolution (switch down to 16 grey-level mode if necessary),

    – use at least 4 x 4 sampling to remove the patterning. It can also help to scan the picture at different angles.

- For the most accurate control over the grey-map for 176 or 256 grey output settings, use the enlarged grey-map on the toolbox.

- Use the grey-map facilities to reduce the brightest white level. Printed images always look better if they never contain any pure white. The lightest areas of the picture should always be slightly grey.

- It is never usually necessary to have a final resultant resolution of over 200 dpi, even for the highest quality typeset results. For laser or dot-matrix printers, the final resolution can be a lot lower. Although printers regularly achieve a 300 dpi resolution, when printing half-tone or grey-scale pictures they all use dot dithering to simulate grey-shades. This reduces the effective resolution of the printer so that, for example, most 300 dpi lasers only have effectively 75 dpi resolution when printing grey-scales. Therefore, there is little to be gained by printing sprites at higher resolutions.

- Remember that, if the picture is to be included in a printed document and either the picture is reduced in size, or the final page is reduced in size, this increases the effective resolution.

- Following on from this, it is better to reduce the size of the final picture. When scanning from printed material, higher quality results will be obtained by reproducing the picture smaller than the original.

- Select the **Set grey palette** menu option to ensure the best on-screen representation of the scanned image. Also, try to use square pixel screen modes if possible. Examples are modes 20 and 31, both of which require multi-sync monitors.

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