Imagecopy 3

The essential image utility

```
Desk  File  View  Options
┌──────────────────────────────────┐
│ □        Imagecopy 3             │   BALLOONS.GIF
│ Imagecopy File Options          │
│ SYSTEM INFORM  View        V    │
│ Free memor   Print       P      │
│ Resolution   Convert     X      │
│ Colours      Slideshow   L      │
│ Palette      Select      ◇      │
│                                  │
│              Copy image   C      │
│              Print screen D   .TIF
│              Save image   S      │
│                                  │
│              Quit        ^Q      │
└──────────────────────────────────┘
                              ROSE.JPG
TRASH
```

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Imagecopy 3

The essential image utility

Imagecopy Version 3

Contents

Chapter 1
Introduction

1.1 Imagecopy 3

Imagecopy 3 is a multi-purpose image utility which can be used to perform a variety of tasks:

□ Display images in any ST/TT/Falcon video mode. Colour-mapping and dithering is used to display images in video modes which contain fewer colours. Up to 20 images may be displayed at the same time (on versions of TOS which do not impose their own limit of 7 windows). Images may be displayed in GEM-window or full-screen display modes.

□ Display slide shows in any resolution, in GEM-window or full-screen display modes.

□ Print images and screen dumps in black and white or colour on a wide range of printers, including 9-pin and 24-pin dot-matrix printers, Bubblejet printers, Deskjet, and Laserjet printers. Imagecopy can print images containing up to 16.7 million different colours (24-bit true colour), and offers print scaling, a choice of halftones (up to 16x16) for realistic colour depth, and comprehensive colour controls. Print-colour options include: monochrome, CMY colour, CMYK colour, CMY separation, CMYK separation, and CMY+K separation. Colour separation modes can be used to print full-colour images on a monochrome printer. Printing is normally fast. Imagecopy can also save colour separations as IMG files which can be loaded into monochrome DTP programs and printed (in colour).[1]

□ Catalogue images with up to 40 or more images on a single page, in monochrome or colour.

□ Convert images between different formats or to different colour types (e.g. true-colour to 256-colour). Imagecopy 3 supports an extensive range of image formats. It can read images in any of the following formats: Art Director, Calamus Raster Graphic, DEGAS, DR Doodle, GIF, IFF, IMG, JFIF (JPEG), Macpaint, Neochrome, OS/2 Bitmap, PC Paintbrush, Pictor (PC Paint), Pixart, Portable Bitmap, Prism Paint, RSC free image, Spectrum, Targa, TIFF, Tiny, True Paint, and Windows bitmap. Images can be saved in in DEGAS, GIF, IFF, IMG, JFIF (JPEG), PC Paintbrush, Prism Paint, RSC free image, Targa, TIFF, and Windows bitmap formats. TIFF support includes baseline TIFF apart from Huffman compression (rare), common extensions such as LZW compression, and the ability to read non-standard TIFF images produced by ST programs such as Retouche.

□ Print or convert batches of images. Imagecopy can process all images in a directory (using wildcards to limit the selection), or all images listed in a

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[1]   See § 3.6

batch file. A separate utility allows batch files to be created easily.

☐ Copy images from screen in any ST/TT/Falcon video mode. Images can be copied by pressing [Alt-Help], or by selecting Imagecopy's 'copy' option. Using [Alt-Help] allows you to copy images at times when the desk menu is inaccessible, such as when a menu or dialog box is displayed, or inside a program which does not provide access to desk accessories. Imagecopy provides a flexible rubber-banding system which allows images to be selected with a fine degree of accuracy. Imagecopy works with large screens and virtual large screens.

Imagecopy 3 is supplied as a desk accessory (*imgcopy3.acc*) and as a stand-alone program (*imgcopy3.prg*). The stand-alone program offers a convenient way of viewing or printing images when you don't have Imagecopy installed as a desk accessory. The main drawback is that you cannot use it to copy or print images within other programs, unless you are using a multitasking environment such as MultiTOS (or Mag!x or Geneva).

1.2 Installing Imagecopy

1.2.1 Accessory version

To install the accessory version of Imagecopy, simply copy it into the root directory of your boot disk (or boot partition). Please note that in addition to the full accessory version there is also a cut-down version which does not support JFIF (JPEG) images. This takes up about 45k less memory than the full version.

1.2.2 Stand-alone version

The stand-alone version of Imagecopy can be installed to display image files which are double-clicked from the desktop, but you may prefer to install *imgc3.prg* to do this (see next paragraph).

1.2.3 Imgc3.prg

This is a small program which calls the accessory version of Imagecopy, or attempts to load a stand-alone version if the accessory version has not been loaded. You can install *imgc3.prg* with the desktop 'install application' option so that image files are loaded into the accessory (or stand-alone) version of Imagecopy when you double-click on their file icon. Loading files into the accessory version of Imagecopy is quicker than loading files into the stand-alone version because it is already in memory. If you use *imgc3.prg* to load the stand-alone version of Imagecopy, this should normally be in the same directory as *imgc3.prg* or in the root directory of your boot drive.

To install *imgc3.prg* for a particular image type, click on its file icon and select 'install application' from the Options menu of the desktop; type the image extension (TIF, IMG etc.) beside 'document type' and click on 'Install' (or

'OK').[1] With TOS 1.0 or 1.2, you can repeat this procedure to install other image types. However, with later versions of TOS, this has the effect of deinstalling your original selection.[2] Finally, to make the installation permanent, insert your boot disk and select 'save desktop' from the Options menu.

If you work from a command shell you can load image files with *imgc3.prg* by typing 'imgc3 filename'.

☞ *imgc3.prg will not work if you rename it as imgcopy3.prg or if you rename imgcopy3.acc (or imgcopy3.prg) as something else. This is a consequence of the fact that GEM identifies programs by the first part of their filename (without the extension).*

1.2.4 Installing Imagecopy to work with Hyperpaint

The accessory version of Imagecopy can be used inside paint programs in place of their normal print routines. However, this will only work if you have enough memory in your computer. If you use Hyperpaint, there is an alternative method which uses less memory. Rename *imgc3.prg* as *paint.prt* and copy it in place of the *paint.prt* module which accompanies Hyperpaint. If you have not installed the accessory version of Imagecopy you should then copy the stand-alone version into the same folder as Hyperpaint, or else check that it is available in the root directory of your boot drive. Once you have done this, Hyperpaint will call Imagecopy whenever you select its 'output' option, and Imagecopy will return you to Hyperpaint when you quit from it. Hyperpaint is unloaded from memory whenever Imagecopy is called in this way, so you can print images with limited amounts of computer memory.

If you use Imagecopy from Hyperpaint in this way, it does not immediately print the image which you have been working on, since you may wish to adjust print settings before printing. Once you have done this, select 'print', and Imagecopy will display a file selector containing the name of the file which you had loaded into Hyperpaint. Remember to save any changes to images before you print them in this way, or they will be lost when Hyperpaint is unloaded from memory. (This is also the case if you use the normal Hyperpaint print module.)

1.3 Configuring Imagecopy

Imagecopy contains built-in configuration options. Use the 'printer type' and 'page size' options to configure it for your printer - select the appropriate configuration and click on the 'Save' button (see § 3.3.2 for advice on

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[1]   You can use wildcards if you wish: TI? will match Retouche TIFF files (TIC, TIH, TIM, and TIP) as well as standard TIFF files.

[2]   If you wish to install *imgc3.prg* to display different types of image files with TOS 1.4 or higher, you can do so by editing the *desktop.inf* file on your boot disk with an ASCII text editor (or wordprocessor in ASCII mode). Copy the line which mentions *imgc3.prg* and change the file pattern from *.TIF to *.IMG (etc.).

configuring page size). You can also configure other features, such as the default format used for saving images, by using the 'Save' button in other dialogs.

If Imagecopy cannot find its program file[1] in order to save default settings, it will display a file selector allowing you to locate it.

☞ *Imagecopy will be unable to save preferences if you have compressed its program file with a program packer. In this case you should decompress the program file before saving default settings.*

1.4 User interface

Imagecopy uses a standard GEM interface, with enhancements such as submenus, pop-up dialog menus, extensive keyboard shortcuts, and a menu window in place of the more normal menu bar.[2]

1.4.1 Menu window

The menu window works in a similar way to standard GEM menus, except that it can be moved around the screen, and remains visible until you remove it or cover it with a window. The menu can be removed from screen by clicking on the close button or by pressing [Insert] (or [Delete]) when it is the top window on screen. If the menu window is hidden, you can display it by pressing [Insert], or by selecting 'Imagecopy' from the desk menu. If you are using the stand-alone version of Imagecopy, you can activate the menu window by selecting 'menu' from the desk menu.

1.4.1.1 Submenus

```
┌─□────────────Imagecopy 3──────────────────────┐
│ Imagecopy  File  Options                       │
│                  Screen      ◇                 │
│  SYSTEM INFORMATION  Printer  ◇                │
│  Free memory  : 2  Copying    ◇                │
│  Resolution   : 7  Windows    ◇ Overlapping ⇧^O│
│  Colours      : 2  Preferences ◇ Tiled     ⇧^T │
│  Palette      : 262144      ⌘   Full       ⇧^F │
│                                  Hide       ⇧^H │
│                                  Show       ⇧^S │
└────────────────────────────────────────────────┘
```
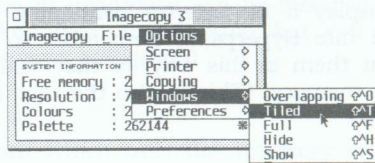
Imagecopy uses hierarchical submenus for some menu options. These are normally displayed to the right of the menu option to which they are attached - but may appear on the left if there is not enough room on the right - and they are indicated by a small arrow on the right (or left) of the menu option. Submenus are not displayed until the mouse has stopped moving for a fraction of a second:[3] this prevents submenus from flashing on screen as the mouse is

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[1]   *Imgcopy3.acc* or *imgcopy3.prg*, according to whether you are using the accessory version or stand-alone version.

[2]   Desk accessories cannot use standard menu bars.

[3]   The default setting is 30 milliseconds (1000ths of a second). This can be changed using the 'System preferences' option (§ 4.3.3.5.5.1).

moved through a menu. Once displayed, they remain on screen until the mouse is moved over a different menu item. To make it easier to move the mouse into a submenu, they also remain on screen while the mouse is dragged towards the submenu over other menu items (but disappear if the mouse is dragged away from the submenu over another item, or moved vertically over another item). Submenus can also be selected with keyboard shortcuts (§ 1.4.1.2.2).

1.4.1.2 Menu shortcuts

Imagecopy provides two types of keyboard shortcuts for selecting menu items: single-key shortcuts (as used in other GEM programs), and multi-key shortcuts which are similar to shortcuts used by (PC) Windows programs. Multi-key shortcuts are provided for all menu options, and are useful if you can't remember a particular single-key shortcut.

1.4.1.2.1 Single-key shortcuts

Single-key shortcuts are alphanumeric standard or control keys (shifted or unshifted) which select a single menu option. These are displayed to the right of their menu option, and can be reconfigured with the 'menu keys' option (§ 4.3.3.5.2). Single-key shortcuts can be used when the screen menu is not the top window on screen, provided that the top window belongs to Imagecopy and not to some other application.

1.4.1.2.2 Multi-key shortcuts

These are PC-style shortcuts which select a menu followed by an option from that menu. Multi-key shortcuts are indicated by underlining under one of the letters of the menu or menu option (usually the first letter). The menu is selected (and displayed) by pressing an alternate key (e.g. [Alternate-F] for File menu), and the menu option is then selected by pressing an alternate or non-alternate key ([Q] or [Alternate-Q] for 'quit'). If a menu option has a submenu, this is selected by a third key. Menu options can also be selected by using arrow keys followed by [Return]: [Uparrow] and [Downarrow] are used to move through a menu, and [Rightarrow] and [Leftarrow] to select adjacent menus. [Shift-Uparrow] and [Shift-Downarrow] can be used to move through a menu without selecting submenus. You can also use the mouse to select menu options from a menu which has been displayed with a keyboard shortcut, and vice versa. Multi-key shortcuts automatically bring Imagecopy's menu window to the front of the screen.

1.4.2 Dialogs

Enhanced dialog features include pop-up menus, radio buttons, selection boxes, and keyboard shortcuts.

1.4.2.1 Pop-up menus

```
Image format...

Format          None
                RLE
Compression    √ LZW

True colour      24-bit

  Save           OK      Cancel
```
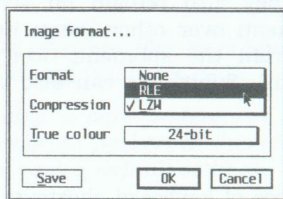
Pop-up menus are activated by clicking on shadowed dialog buttons: either click and hold the left mouse button before releasing it over an item in the pop-up menu, or click and release the left mouse button and then click it a second time over a menu item. Pop-up menus can also be activated by keyboard shortcuts (indicated by underlining), and menu items can be selected by keyboard shortcuts, or by using [Uparrow] and [Downarrow] keys followed by [Return].

1.4.2.2 Radio buttons and selection boxes

```
Slide show...                  OK

  ◉ Full screen               Cancel
  ○ Window
                               Pause
  ☐ Reverse order
  ☒ Hide mouse                 Stop
  ☐ Show file names
  ☐ Lock slide show

Interval : 15 seconds
```
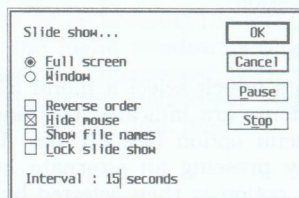
Radio buttons are empty or filled circles which indicate alternative choices (only one button may be selected at a time, like the buttons on a car radio). Selection boxes are empty or crossed boxes which indicate non-alternative choices (different combinations of boxes may be selected at the same time). Radio buttons and selection boxes can be selected by clicking the mouse over them, or by clicking the mouse over the accompanying text, or by using a keyboard shortcut.

1.4.2.3 Dialog shortcuts

Almost all dialog options can be selected with keyboard shortcuts. These are indicated by an underlined letter, and the option is selected by pressing the equivalent key with [Alternate] (compare the use of [Alternate] keystrokes for multi-key menu options). Pop-up menu items can also be selected by using non-alternate keys once the pop-up menu has been displayed (cf. non-alternate keys for selecting menu items after a menu has been displayed).

Cancel buttons in dialogs and alerts can be selected with the [Undo] key. In addition, [Shift-Tab] can be used to move to a previous editable text field (same as [Uparrow], and analogous to using unshifted [Tab] to move to the next editable text field). [Shift-Leftarrow] and [Shift-Rightarrow] can be used

to move to the beginning or end of an editable text field.

1.4.3 Alerts

```
┌──────────────────────────────────┐
│ ⚠  Printer not responding.        │
│                                  │
│        ┌─────┐ ┌──────┐          │
│        │Retry│ │Cancel│          │
│        └─────┘ └──────┘          │
└──────────────────────────────────┘
```
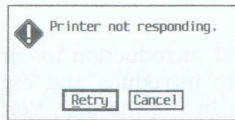
Alerts are automatically positioned so that their default button is placed under the mouse cursor (or as near as possible if the cursor is close to the edge of the screen); this makes the program faster to work with.[1]

Cancel buttons can be selected with the [Undo] key, and some other buttons have alternate-key shortcuts which are indicated by underlining.

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[1]   There is also a 'preferences' option to have dialogs positioned in the same way: § 4.3.3.5.5.3.

Chapter 2
Computer Graphics

This chapter contains a general introduction to computer graphics as it relates to Imagecopy. Its purpose is to introduce and explain some basic terms and concepts that occur elsewhere in the manual. You can use Imagecopy without reading this chapter, but if you are unfamiliar with terms such as 'true-colour', '24-bit colour', 'CMYK', 'LZW compression' and 'JPEG compression', you will probably find the following sections helpful.

2.1 Bitmapped and vector graphics

Computer screens and most printers (apart from daisy-wheel printers) are bitmapped devices. All graphics are ultimately represented by bit maps - patterns of bits (a bit, or binary digit, is the smallest unit of computer memory) which are converted into pictures by the computer screen or printer. A monochrome screen is a two-dimensional pattern of dots which are (normally) either black or white. An ST high-resolution screen is 640 dots wide and 400 dots high, giving a total number of 256,000 dots or 'pixels' (picture elements). Each of these dots is stored in the computer's memory as a single bit which is either on (normally black) or off (white).

Bitmapped graphics are direct representations of pictures that can be displayed on screen or output to a printer. Any picture can be represented as a bit-mapped image by being broken up into a pattern of monochrome or coloured dots. If the dots are small enough the pattern is perceived as a complete image rather than a collection of dots. Paint programs allow bitmapped images to be drawn manually, while scanners allow pictures and photographs to be converted to bit maps.

Bitmapped graphics can be contrasted with vector graphics, which are produced from geometrical shapes (lines, curves, etc.) which can be drawn at any size. The main advantage of using vector graphics rather than bitmapped graphics is that they are not fixed in size. Bitmapped graphics can be scaled to different sizes, but the scaling process introduces distortions, especially when an image is scaled up in size, whereas vector graphics can (in theory) be printed or displayed at any size. A second advantage is that because vector graphics are stored as shapes rather than dots, they normally take up less memory than bitmapped graphics. Drawing programs allow vector graphics to be created by hand, and auto-tracing programs can convert some types of bitmapped image into vector images. The drawback to vector graphics is that many images and pictures (especially photographic images) cannot easily be reduced to geometrical shapes. Vector graphics must be converted into bitmapped graphics before they can be displayed or printed: this is done automatically by programs which display and print vector graphics.

☞ *Imagecopy is currently limited to bitmapped images, but the ability to view and print some types of vector graphics will probably be added in a*

future version.

2.2 Colour bit maps

Colour bit maps are created by using more than one bit for each pixel. Two bits per pixel can represent four colours, such as black, white, red, and green on an ST medium-resolution screen, and four bits per pixel can represent sixteen colours, as on an ST low-resolution screen. To get more than sixteen colours, we can increase the number of bits per pixel still further: eight bits per pixel gives 256 colours, sixteen bits per pixel gives 65536 colours, and 24 bits per pixel (24-bit colour) gives 16,777,216 different colours. One problem in doing this is that a 16-bit colour picture takes up sixteen times as much memory as a monochrome picture of the same size, and the hardware needed to display it becomes more expensive. When the ST was first designed, this problem was resolved by reducing the total screen size to match the increased number of bits per pixel: different video modes use the same amount of screen memory, but ST medium-resolution screens have half as many pixels as high-resolution screens, and ST low-resolution screens have half as many pixels as medium-resolution screens.

2.3 Palette colour and true colour

The human eye is capable of distinguishing around 300,000 different colour shades, although it is more sensitive to certain colours than others. True-colour video systems attempt to reproduce this range of colours by allowing each pixel to represent a different colour shade. If we assign 24 bits to a pixel, each pixel can represent any of 16 million (16,777,216) different colours, which is more than can be distinguished by the human eye. Less expensive true-colour systems such as the Falcon 030 use 15 or 16 bits to represent 32768 or 65536 different colours.

Using fewer than 15 bits per pixel to display colour on screen causes obvious problems. Sixteen colours (4-bit colour) or 256 colours (8-bit colour) is only a small fraction of the total number of colours which can be perceived by the human eye. One way of coping with such a small number of colours is to allow them to be chosen from a larger palette of possible colours. Early STs could display 16 colours from a palette of 512 possible colours: each pixel was represented by only 4 bits, but palette colours were represented by 9 bits each. (STEs and TTs have 12-bit palettes, giving 4096 possible colours.) In palette-colour modes, pixels do not represent actual colours (as in true-colour modes), but serve as indexes into a palette (or look-up table) which contains the actual colours. A pixel with a value of 3 is displayed as whatever colour is stored as the fourth entry of the look-up table (fourth entry because the first entry stores the colour for pixels with a value of 0). Since the pixel values are indirectly related to the colours they display, palette-colour modes are sometimes referred to as 'indirect-colour' modes. True-colour modes are also known as 'direct-colour' modes.

Palette-colour modes do not necessarily display a smaller number of possible

colours than true-colour modes. 8-bit video modes (with 256 colours on screen) can have 24-bit palettes, so that each screen colour is chosen from a palette of over 16 million possible colours. On the Falcon 030, the number of colours which can be displayed in true-colour video (65536 = 16-bit colour) is smaller than the number of possible colours from which colour palettes can be selected (262,144 = 18-bit colour).

It is worth noting that 24-bit palette-colour images are reduced to 9-bit (ST), 12-bit (STE, TT), or 18-bit (Falcon 030) palette-colour images when they are displayed (in the same resolution) on an ST(E), TT, or Falcon 030 computer. Similarly, 24-bit true-colour images are reduced to 16-bit images when they are displayed in true colour on a Falcon 030. If you use Imagecopy to copy an image which has been displayed in this way, the copied image will not be identical with the original image: some of the colour information has been lost.

2.4 Output resolution

Resolution is the number of dots or pixels that are printed or displayed in a given area. With computer screens, this usually means the total number of dots that can be displayed on screen: ST high-resolution screens contain 640x400 dots, medium-resolution screens have 640x200 dots, and low-resolution screens have 320x200 dots. Other resolutions are available on TTs and Falcons.

Printer resolution is usually defined as the number of dots that can be printed in an inch. Low-resolution printers (such as dot-matrix printers) print between 60 and 360 dots per inch (dpi), while high-resolution devices (such as typesetters) normally print at 1200 or 2400 dpi. Laser printers (and inkjets) fall in the middle of this range, with typical output resolutions of 300 or 600 dpi. The quality of printed output is also affected by the size of individual dots. 24-pin printers can print at 360 dpi, which is higher than the normal (300-dpi) resolution of laser printers, but laser output looks better than 24-pin output because the individual dots are smaller: 24-pin printer dots are 1/180th of an inch in diameter, whereas laser dots are 1/300th of an inch wide.

2.5 RGB colour

One way of creating different colour shades is to mix primary colours. Computers display colour images by mixing Red, Green, and Blue (RGB). This can seem like a strange choice of primary colours. Most people think of green as a combination of blue and yellow rather than a primary colour, and this is true as far as paint pigments are concerned. However, video screens use light beams rather than paints, and coloured lights mix differently from coloured paints. The difference between coloured light and coloured paint (or ink) is that light sources emit colours and create more intense (brighter) colours if they are added to other light sources, while paint pigments absorb coloured light and create less intense (darker) colours if they are mixed together.

Technically, coloured light produces *additive* colour whereas coloured paint and ink produces *subtractive* colour. The three additive primaries, Red, Green, and Blue, mix together to form white light. Individually, Red and Green mix to produce yellow, Green and Blue produce cyan (turquoise), and Blue and Red produce magenta (purple).

On a 24-bit video system, 8 bits of colour information are assigned to each of the three primaries: there are 256 shades of Red, Green, and Blue which can be mixed in different combinations to produce a round total of 16 million colours. The same principles apply to colour systems which use fewer bits per colour, except that there are a smaller number of primary shades which can be mixed together. Early STs had only 8 shades of each primary colour. STEs and TTs distinguish 16 shades for each primary, and Falcons can distinguish 64 shades for each primary colour in palette-colour modes. In true-colour modes, the Falcon 030 distinguishes 64 shades of Green and 32 shades of Red and Blue.

Image formats which are designed to be portable across different computer systems sometimes use 24-bit palettes which can be reduced to match hardware systems with fewer colour bits. An alternative approach uses a virtual palette with more than 8 bits for each primary. GEM uses a palette of 1000 shades for each primary colour. It is unlikely that anyone will produce a hardware system to display one thousand million different colours: the GEM palette is a virtual palette which can be converted into different hardware palettes.

2.6 CMY and CMYK colour

Colour printers use coloured inks rather than light beams to produce different colours, so colour printing relies on mixing Cyan, Magenta, and Yellow (CMY), which are the subtractive equivalents of Red, Green, and Blue. Cyan ink absorbs Red light and reflects Green and Blue light to produce a Cyan reflection; Magenta ink absorbs Green light, and Yellow ink absorbs red light. Mixed together, Cyan and Magenta inks produce Blue ink (they absorb Red and Green light and reflect Blue light), Magenta and Yellow inks produce Red (they absorb Green and Blue), and Yellow and Cyan inks produce Green. If all three primary ink colours are mixed together, they absorb all light colours to produce Black. Imagecopy and other print programs print colour by converting RGB colours into CMY colours and sending these to the printer. As a further refinement, Black is commonly printed as a separate colour since this saves ink (it is otherwise produced by mixing Cyan, Magenta, and Yellow) and produces cleaner shades of black and grey. This is normally referred to as CMYK colour: K is used for blacK to avoid confusion with B for Blue.

2.7 Colour correction

Simple conversion of RGB colour to CMYK colour produces poor-quality printouts. Images typically seem darker and muddier than they did on screen. One reason for this is that ink colours are normally darker (or less intense)

than video colours. A simple solution to this problem is to lighten each colour before it is printed, but it turns out that lightening colours by a linear amount is not a good way of doing this. The human eye is sensitive to ratios of intensity levels rather than to absolute intensity values, so dark colours seem more affected by absolute changes in brightness than light colours. The standard technique for applying non-linear adjustments to brightness levels (to create an illusion of linear adjustment) is known as gamma correction. Imagecopy uses this technique for the brightness control in its 'screen colour' and 'print colour' dialogs (§§ 4.3.3.1.3, 4.3.3.2.3.4).

Images which are brightened in this way are a major improvement on unbrightened images, but they can often seem grey in comparison with screen images. The probable reason for this is that printed colour represents a smaller area of colour space than the area which can be displayed on a video screen: it has a smaller *gamut* (colour range). This means that if we apply the same scale to print colours as screen colours, the distance (or difference) between print colours is less than the distance between equivalent screen colours. Imagecopy provides two ways of compensating for this: 'contrast' (§ 4.3.3.2.3.5) increases the contrast between colours in the middle of the colour range (by sacrificing contrast between colours at either end), and 'saturation' (§ 4.3.3.2.3.6) makes colours which are not intended to be grey seem less grey or dull than they would be otherwise.

2.8 Greyscale images

Greyscale images are achromatic (non-colour) images which represent colours as different shades of grey (like black and white photographs). They contain different levels of brightness without colour. Realistic greyscale images contain at least 64 grey levels.

2.9 Dithering

Dithering is a way of representing more colours or greyscales than are actually available on a particular device such as a screen or printer. It does this by juxtaposing colours which do exist, to create an illusion of inter-mediate colours. A monochrome computer screen can display only two colours, normally black and white, but it can create the illusion of grey shades by using patterns of black and white dots. Newspaper photographs create the same illusion with printed dots of different sizes.

There are different ways of dithering images. Screen images can be dithered using fixed patterns (ordered dithering) or with random systems that try to avoid fixed patterns (random dithering). Random dithering usually gives better results with realistic images, but is less good with non-realistic images such as cartoons and charts. It is also slower than ordered dithering. The same methods can be used in printing images, but commercial printing systems normally use a third method known as halftoning. This is similar to ordered dithering in that it uses fixed patterns, but dots are clustered to produce larger dots of varying sizes (halftones).

The halftoning process originated as a photographic technique in which net-like screens are placed in front of a camera lens. This has the effect of breaking up an image into dots of varying sizes: light shades of grey are broken into small black dots, and darker shades are broken into larger dots which can merge together to leave small white dots between them. Low-resolution halftones are created with coarse screens, and high-resolution halftones with fine screens. Halftone resolution (or 'frequency') is measured in lines per inch or lpi - a line is a row of halftones. In commercial printing this can vary from 65 lpi to 300 lpi. The angle of the screen can also be varied: greyscale prints are normally created with 45-degree screens which produce a diagonal pattern of dots. Digital halftoning copies this process by combining printer dots (or pixels) which are fixed in size into different-sized halftones. With this process, halftone frequency depends on how many printer dots are combined to create halftones and the actual size of each printer dot: with a 300-dpi printer, 4x4 halftones (halftones with a maximum size of 4x4 dots) produce 75-lpi output.

Colour dithering and halftoning is similar to greyscale dithering, but uses different coloured pixels and halftones to create an illusion of further colours. Colour printing normally works by overlaying separate screens of cyan, magenta, yellow, and black halftones. Good-quality colour halftoning requires high-frequency screens, which are normally overlaid at different angles to avoid unpleasant interference patterns.

In ordered dithering systems, the number of colours or greyscales which can be represented depends upon the size of the dithering matrix. A 2x2 matrix can represent 5 different levels for each primary colour or 5 different levels of grey, while a 16x16 matrix can represent 257 colour or greyscale levels. In colour printing, where each primary colour is printed separately, a 16x16 matrix is capable of representing over 16 million colours. In digital halftoning, the size of the halftone matrix is not necessarily the same as the size of individual halftones: a 16x16 matrix may contain four 8x8 or sixteen 4x4 halftones.

2.10 Image compression

Bitmapped images tend to use large amounts of memory: a standard ST screen requires 32,000 bytes and Falcon true-colour screens can take up half a megabyte (or more). 24-bit true-colour images may easily need several megabytes of memory. This creates problems in storing images. To solve these problems, images are commonly stored in a compressed format which reduces their size. There are a number of different compression schemes which are used for this purpose.

2.10.1 RLE compression

The simplest (and commonest) scheme is RLE compression, which uses run-length encoding to store sequences of identical bytes in a more compact format (usually by inserting code bytes which mean 'repeat the next byte x times'). This gives reasonably good compression ratios with monochrome and palette-colour images, but true-colour images sometimes end up larger than

they would be if they were uncompressed (this is known as negative compression).

2.10.2 LZW and Huffman compression

A more complicated compression scheme is LZW compression, named after its originators: Lempel, Ziv, and Welch. This codes patterns of bits, which may be variable in length, and produces much better compression ratios than RLE compression, especially with true-colour images. One disadvantage of LZW compression is that it takes longer to decode and encode than RLE compression.

Huffman compression is similar to LZW compression, but requires a table of compression codes to be stored with the compressed image.

2.10.3 JPEG compression

RLE and LZW are 'lossless' compression schemes, in which the compressed image is identical to the original image when it is reconstructed. It is also possible to compress images so that information is lost and the reconstructed image is not identical with the original image. This is known as 'lossy' compression. At first sight, this seems like a bad idea: surely the whole point of compressing images is to store them in a more compact format without losing any of the original data? In fact, it turns out that some types of image (such as photographs) contain information which can be discarded without this being readily apparent to the human eye. JPEG compression (developed by the Joint Photographic Experts Group) makes use of this fact and uses it to achieve very high compression ratios. High-quality JPEG images are hard to distinguish from original images, with compression ratios of around 8:1, and low-quality images (with more information lost) give even better compression. JPEG compression was designed to be used with photographic or realistic images, and does not cope well with other types of image, such as cartoons or program screen shots.

Human visual perception is more sensitive to changes in intensity (brightness) than to changes in chromaticity (colour). JPEG compression takes advantage of this by *subsampling* colour information: using a colour model (YCbCr) which stores brightness information in one channel (Y) and colour information in two further channels (Cb and Cr), JPEG averages out the colour values for each 2x2 block of pixels and saves these averages. Thus instead of saving 12 samples for each 2x2 block (4 Y samples, 4 Cb samples, and 4 Cr samples), JPEG saves only 6 (4 Y, 1 Cb, and 1 Cr), effectively halving the amount of space needed to store the image.

The human eye is also more sensitive to gradual changes in brightness or colour than to sudden changes. JPEG exploits this by converting colour data to spatial frequencies using a mathematical transform known as DCT (Discrete Cosine Transform). The resulting data is *quantized* (its values are truncated) so that higher-frequency components (representing sudden changes) are stored with less precision than lower-frequency components (gradual changes). Quantization is the major lossy stage in JPEG compression, and it is possible to trade compression against quality by varying the degree to which an image is quantized. This is controlled by a percentage value which is normally between 25% (heavy quantization) and 100% (no quantization).

Problems which occur with heavily quantized images include blurred details, ghost contours around edges, and abrupt steps in colour gradients.

After quantization, image data is further compressed with a lossless compression method (normally Huffman compression).

Chapter 3
Using Imagecopy

This chapter contains general information on using Imagecopy, with cross-references to more detailed reference sections in the following chapter.

3.1 Viewing images

Viewing images is a simple matter of selecting 'view' (§ 4.3.2.1) followed by the image which you wish to display. You can also configure certain details of the way images are displayed. If you have a Crazy Dots card you should use the 'screen display' dialog (§ 4.3.3.1.1) to configure Imagecopy to work with this card. This dialog also allows you to select a greyscale display (pictures are displayed in greyscale instead of colour on a colour monitor), and to control whether the order of colours in a colour image should match the order of colours in the default screen palette. Matching colours avoids unpleasant displays in which menus and windows appear in strange colours and may be difficult to read, but images take slightly longer to load if this option is selected.

Some images may contain more colours than can be displayed in a particular video mode. Imagecopy deals with this by creating a reduced colour palette and dithering the image to produce an illusion of more colours or shades. You can alter the way it does this by changing settings in the 'colour mapping' dialog (§ 4.3.3.1.2). The 'palette' option controls the way in which colours are mapped onto a reduced palette: 'uniform' uses the same reduced palette for any image, and is the fastest option; 'adaptive' chooses a reduced palette which is adapted to match the original image, and is slower. Images with reduced palettes are normally improved by dithering: ordered dithering is quite a bit faster than random dithering, but random dithering normally gives better results. You can select different settings for viewing images in monochrome or colour (the monochrome palette is always black and white).

A third dialog ('Screen colours', § 4.3.3.1.3) allows you to process colours to make them brighter or increase their contrast. This is not normally necessary.

Once an image has been displayed on screen, you can view it in a standard GEM window, or press [Esc] to view it on the full screen. Images can be scrolled in full-screen mode by moving the mouse cursor to the edge of the screen. Another way of scrolling images (in full-screen or window mode) is to use cursor keys.

If you double-click on an image window, or press [Return] when it is the top window on screen, Imagecopy displays a dialog with information about the image (§ 4.3.2.1).

3.2 Viewing slide shows

Another way of viewing images is to display a sequence of images at fixed intervals with Imagecopy's 'slideshow' option (§ 4.3.2.4). Images can be selected from a folder or from a batch file (§ 3.9). Once again, Imagecopy offers you the choice of displaying images in a window or on the full screen. Other options include reversing the order in which images are displayed - which is useful if you wish to go back and look at an image which has just passed - and 'locking' the slideshow to prevent anyone else from interfering with it once it has started (see § 4.3.2.4.6). The interval between images can be configured to any value from 1 to 99 seconds. Typing 0 creates an indefinite interval, during which Imagecopy waits for the [Space] bar to be pressed before displaying a new image - this is useful for looking through a folder of images, when you don't want an image to be moved on before you have finished looking at it.

```
Slide show...                    [   OK   ]
  ● Full screen                  [ Cancel ]
  ○ Window
                                 [ Pause  ]
  □ Reverse order
  ⊠ Hide mouse                   [  Stop  ]
  □ Show file names
  □ Lock slide show

Interval : 15 seconds
```
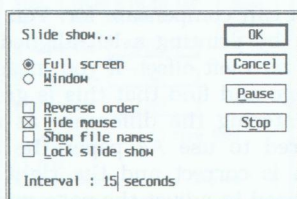
Unless it has previously been locked, the slideshow option can be interrupted by pressing [Esc] or [Undo].

3.3 Printing images

3.3.1 Selecting a printer type

Before you try to print any images you must configure Imagecopy to work with your printer. This is done using the 'printer type' dialog (§ 4.3.3.2.1). Imagecopy contains generic drivers for different types of printer. 'Epson 9-pin' can be used with any Epson-compatible 9-pin printer, and 'Epson 24-pin' can be used with any Epson-compatible 24-pin printer (most dot-matrix printers are Epson-compatible). Similarly, 'Laserjet' can be used with any Laserjet-compatible laser printer, which includes most laser printers. If you have an inkjet printer, choose 'Deskjet', 'Epson inkjet' or one of the 'Bubblejet' options to match your printer (see § 4.3.3.2.1.1 for further advice on choosing between the different Bubblejet options).

Other options in this dialog include 'colour', which lets you print in colour, and 'resolution', which selects an output resolution - this should normally be the highest resolution which your printer is capable of (see § 4.3.3.2.1.3). If your printer does not have an automatic sheet feeder, set the 'feed' option to 'manual'.

When you have chosen the right settings for your printer, select 'save' to

make these the default options.

3.3.2 Configuring page size

You should use the 'page size' dialog (§ 4.3.3.2.5) to configure Imagecopy for the size of paper you are using; otherwise Imagecopy will be unable to position images correctly (it uses this information to calculate the correct position of images on the page). This is particularly important if you use the 'catalogue' option.

'Page size' should match the size of paper which you are using. If you use A4 paper, you may also need to configure your printer (with a dip-switch setting or similar) to use this size paper. The other options in this dialog ('left offset' and 'top offset') can be used to compensate for the fact that some printers leave automatic margins at the sides or top and bottom of a page.

The 'left offset' setting can usually be left at zero with dot matrix printers. However, laser printers and deskjet printers leave automatic left and right margins which this option can compensate for. You can calculate an appropriate value for your printer by printing a left-aligned image with a 1-inch left margin (§ 4.3.3.2.4.1) and zero left offset. If you measure the distance from the left of the page to the image and find that this is greater than 1 inch, you can compensate for this by entering the difference as a left offset. With deskjet printers that are configured to use A4 paper the appropriate figure is 0.13 inches. If the left margin is correct and the right margin (on right-aligned images) is incorrect, you need to adjust the page-width figure: reduce the page width to increase the right margin, or increase the page width for a narrower margin.

The 'Top offset' setting is useful with most types of printer. You can determine the appropriate offset for your printer by printing a top-aligned image with a 1-inch top margin (§ 4.3.3.2.4.2) and zero top offset; if the printed margin is greater than 1 inch you should enter the difference as a top offset. With Deskjet printers the appropriate figure is between 0.09 and 0.15 inches; dot-matrix printers require an offset of around 0.85 inches. If the top margin is correct, but the bottom margin (on bottom-aligned images) is incorrect, you need to adjust the page-height figure: reduce the page height for a wider bottom margin, or increase it for a narrower margin.

When you have chosen the right settings for your printer, select 'save' to make these the default options.

3.3.3 Print dithering

Colour and greyscale images are dithered before they are printed. The 'print dithering' dialog (§ 4.3.3.2.2) can be used to change the dithering method used, but the default method (12x12 45-degree halftone matrix) works best in most cases.

3.3.4 Colour correction

Use the 'print colours' dialog (§ 4.3.3.2.3) to change colour correction settings. The default settings work well in most cases, but you may want to vary the 'brightness' setting for light or dark images. You may also find that 'saturation' adjustments are slow with true-colour images: set this value to zero if

you want to speed up true-colour printing (but leave it at its default setting for palette-colour printing). The 'blue balance' and 'grey balance' options can be used to correct for the fact that some printers print blue with a purple tinge, while others print grey or black with a blue or cyan tinge (see § 4.3.3.2.3.2-3 for more information on this).

3.3.5 Printing

To print an image, select 'print' followed by the file name of the image you wish to print. You can also print batches of images (§ 3.9). Imagecopy displays a 'print layout' dialog, which can also be selected from the 'printer' submenu (§ 4.3.3.2.4).

```
Printing TISSNGTN.TIF          OK

X pos : 00.50 ins           Cancel
Y pos : 00.50 ins
Size  : 00.00 x 00.00 ins    Save
Scale : 100 % x 100 %
                             Page
Orientation    Portrait

V alignment      Top

H alignment      Left

□ Catalogue      □ Form feed
□ File names
□ Text
□ Whole scale          Copies :  1
```
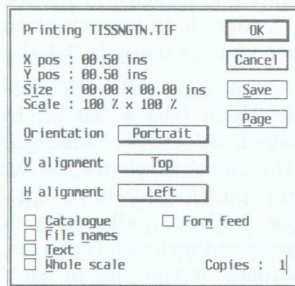
The 'print layout' dialog allows you to select the position and size of the printed image. This can be determined to within a hundredth of an inch or centimetre, but you can also use standard settings if you do not need this kind of precision. The 'size' option controls the size of the printed image: Imagecopy provides a set of standard sizes along with the ability to define customized sizes. You should also note that the size which you select is normally a maximum size, since the actual width and height is normally adjusted to preserve the correct aspect ratio (or proportion) of the image. If you select 2x2 inches, an image whose width is greater than its height will be printed with a width of 2 inches and a height of less than 2 inches. The default size (0x0) has a special function: it causes an image to be printed at its original pixel size (with each pixel in the image represented by a printed dot on the page), or at a scaled value of its original size if the 'scale' option is varied from its standard setting.

The 'scale' option normally controls the aspect ratio of an image. A value of 100% x 100% causes an image to be printed with its aspect ratio unchanged, while 100% x 200% causes the height of an image to be doubled in relation to its width. Selecting a non-square aspect ratio is useful if you are printing an image which originated on a screen with non-square pixels: ST medium-resolution screens, for example, have pixels that are twice as high as they are wide, so 100% x 200% is an appropriate setting for printing a medium-resolution screen shot. If you change this setting to 0% x 0%, images are scaled to the exact size which is specified by the 'size' option, irrespective of their correct proportions. Selecting 200% x 200% is normally equivalent to 100% x 100%, unless you have selected 0x0 for the 'size' option, in which case an

image is printed at exactly twice its original pixel size.

Other options in this dialog allow you to select landscape or portrait orientation, different alignment positions, 'whole' scaling, form feeds, number of copies etc. (see § 4.3.3.2.4 for details). You can have the file name of an image printed underneath the image, and you can also insert additional lines of text before an image (or batch of images) with the 'text' option.

Printing can be aborted by pressing [Undo].

3.4 Cataloguing images

Imagecopy can be used to catalogue images, in monochrome or colour, with up to forty or more images on a page. It is important that Imagecopy is correctly configured for the size of paper you are using (§ 3.3.2).

To catalogue images, select 'print' followed by a folder or batch file containing the images you want to catalogue (see § 3.9 on batch printing). When the 'print layout' dialog is displayed, select the 'catalogue' and 'file names' options (§§ 4.3.3.2.4.8, 4.3.3.2.4.9). The number of images which will fit on a page is determined by the 'size' and 'position' options: '1x1 inch' for 'size' and '0.5' inches for 'X pos' and 'Y pos' will normally print 40 or more images in five columns. If you have a line-based printer (such as a dot-matrix printer or inkjet printer), Imagecopy pauses at the end of each column and displays an alert asking you to reinsert the page for successive columns. With page-based printers (laser printers), the entire page should print without being re-fed.

Imagecopy stores different layout settings for catalogue printing and normal printing, so you can catalogue images at a small print size, while using a larger size for normal printing.

3.5 Converting images

Imagecopy can be used to convert images to a different format, or resave images in compressed or uncompressed format, or change colour images to greyscale or monochrome, or change the number of colours in an image (e.g. convert a true-colour image into a 256- or 16-colour image). Imagecopy can convert single images or batches of images: see § 3.9 for information on converting batches of images.

```
Convert...

Colours = 16777216

Format           [    JFIF    ]

Compression      [    JPEG    ]

Colour type      [   Colour   ]

Colour depth     [   24-bit   ]

Quality : 95%

[ Save ]        [ OK ] [ Cancel ]
```
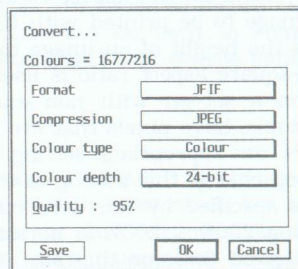
3.5.1 Format conversion

Converting an image to a different format (§ 4.3.2.3.1) is obviously useful if you wish to use an image with a program which is unable to read the original format. You can also convert defective IMG and TIFF files which are produced by some ST programs into correct files; you may find that other programs are unable to load these correctly. Imagecopy will display an alert that the file is defective, but will then convert the data that it has managed to read from the file.

Some image formats require the number of colours to be increased or reduced. If you convert a true-colour image to GIF format, the number of colours will be reduced to 256 (GIF images cannot contain more than 256 colours).

3.5.2 Compression

The 'convert' option can also be used to convert uncompressed image files into compressed files, or to compress images more efficiently (§ 4.3.2.3.2). Imagecopy produces better RLE and LZW compression ratios than some other programs. (IMG files are often saved with little or no compression.)

See § 2.10 for a general discussion of image compression. RLE compression is a simple compression system which can be reasonably effective with mono-chrome and palette-colour images, but often produces negative compression with true-colour images. LZW and JPEG compression give much better compression ratios and are useful with different types of image. JPEG compression (which is provided by JFIF format) is a *lossy* compression scheme: decompressing a compressed image does not produce an identical copy of the original image. JPEG produces impressive compression ratios with photographic-type images, but is not suited to other types of image (such as screen shots). High-quality JPEG images (with a quality setting of 95%) are hard to distinguish from the original image, while lower-quality images (with a quality setting of around 75%) produce higher compression ratios and are often pretty close to the original image (§ 4.3.2.3.5). LZW compression (available with TIFF and GIF formats) produces high compression ratios with non-photographic images, such as screen shots, and can also be used for lossless compression of photographic-type images.

3.5.3 Colour conversion

Colour conversion changes the number of colours in an image (§ 4.3.2.3.4), or converts its colour type from colour to greyscale or monochrome (§ 4.3.2.3.3).

Changing the colour depth of an image is useful if you want to reduce the number of colours in an image to match the number of colours available in ST colour resolutions (so the image can be displayed quickly). You may also want to increase the colour depth of an image for compatibility with other pro-grams. Many programs can only read greyscale or palette-colour TIFF images with 4-bit and 8-bit colour depths (some German ST programs cannot read 4-bit images), and true-colour images with 24-bit colour depth.

If you reduce the colour depth of an image to 8 bits or less, Imagecopy displays a second dialog which controls the way in which colours are mapped and dithered in the converted image. Select 'adaptive' palette with Floyd-Steinberg dithering for best results; a 'uniform' palette with 8x8 ordered

dithering is faster but the results are less good.

```
Colour mapping...              ┌─────OK─────┐
                               └────────────┘
                               ┌───Cancel───┐
                               └────────────┘
Palette                      ┌────Adaptive────┐
                             └────────────────┘
Dithering                    ┌─Random dither──┐
                             └────────────────┘
Dither filter              ┌─Floyd-Steinberg──┐
                           └──────────────────┘
```
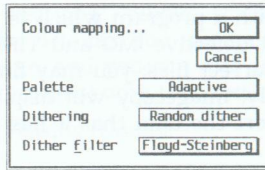
3.6 Creating halftone images

If you have a wordprocessor or DTP program which is capable of printing simple monochrome images, but is unable to print colour or greyscale images (or gives poor results), you can use Imagecopy to produce halftone images which can be imported as simple monochrome images. The following halftone image was printed from That's Write.
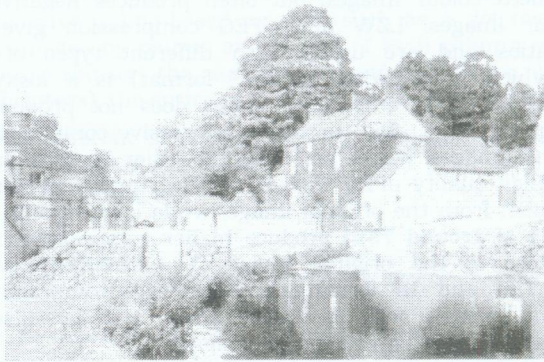
The following method can be used to create halftone images. Firstly, select 'IMG file' as the output option in the 'printer type' dialog (§ 4.3.3.2.1.5). This causes print output from Imagecopy to be redirected to an IMG file. Then, select 'print' followed by the file name of the image which you wish to convert. When Imagecopy displays the 'print layout' dialog, change the size of the image to the exact size which you want to it to be printed at in the final document. Once Imagecopy has saved the halftone image, import it into your wordprocessor or DTP program at its correct size. That's Write (or Write On) allows you to select any resolution for an image by double-clicking on it. To prevent an image from being scaled when it is printed, simply enter the resolution of your printer (or select the 'printer' button to do this automatically). With Timeworks Publisher, create a frame which is slightly larger than the image you are loading. Once you have loaded the image, select 'scale picture' from the Graphics menu and click on 'horizontal' and 'vertical' for

'whole pixel scaling' but set 'preserve aspect ratio' to 'ignore' (some versions of Timeworks Publisher produce strange results if you select 'preserve aspect ratio' at the same time as 'whole pixel scaling'. With Calamus, images are printed at their original resolution if you select 'proportional lock' and 'optimize size for printer' from the picture frame toolbox.

If you want to be more ambitious, you can use Imagecopy to produce full-colour printouts from a monochrome DTP program. Select 'CMYK separation' in the 'printer type' dialog and print out a colour image as described above. This time Imagecopy will save four different IMG files (one for each primary colour). If you load these onto four separate pages in your DTP program, with each image at the same position on each page, you can combine them at print time by feeding the same sheet back into the printer and using a different colour ribbon or cartridge for each separation.

3.7 Copying images

There are two ways you can copy images from screen (§ 4.3.2.6). One is to select 'copy image' from Imagecopy's menu (or type [C] which is the keyboard shortcut for this option). An alternative method is to press [Alt-Help]. This is often more convenient, since it can be used in situations where Imagecopy's menu is unavailable (e.g. when a menu or dialog is displayed, or within a non-GEM program).

Whichever method is used, Imagecopy displays a pointing hand and waits for you to outline an area which you wish to copy on screen. If you want to copy the entire screen you should click the right mouse button or press [Clr/Home] to set the box to its maximum size. The outline area can be moved or resized using the mouse or cursor keys, and you can also type in an exact size by pressing [Insert]. When you have selected the area you wish to copy, press [Return] or click the right mouse button inside the copy area for it to be copied. Imagecopy will display a file selector or dialog to allow you to name the image before saving it. If you want to copy (part of) an image which is larger than the size of the screen you can do so by displaying it in full-screen mode and pressing [C] (not [Alt-Help]).

See § 4.3.2.6 for more detailed information on copying images.

The 'copying' submenu allows you to configure aspects of the way images are copied (§ 4.3.3.3), while the 'paths' dialog allows you to set a default path for saving images (§ 4.3.3.5.4).

3.8 Printing screen dumps

Printing screen dumps is similar to copying screen images except that the image is sent directly to the printer instead of being saved as a disk file. Screen dumps can be made by selecting 'print screen' (or typing [D] which is the keyboard shortcut), or by pressing [Control-Alt-Help]. The method for defining an area to be printed is similar to that used in copying images. If you want to copy (part of) an image which is larger than the size of the screen you
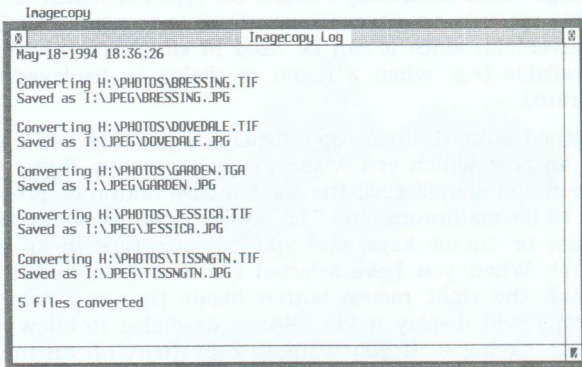
can do so by displaying it in full-screen mode and pressing [D] (not [Control-Alt-Help]).

See § 4.3.2.7 for more detailed information on printing screen dumps.

The 'copying' submenu allows you to configure aspects of the way screen dumps are printed (§ 4.3.3.3).

3.9 Batch operations

Operations such as printing and converting images can be automated so that they process batches of images instead of single images. One way of doing this is to select a folder of images instead of a single image. An alternative (more flexible method) is to use a *batch file* created by *Filelist* (§ 5.2). Imagecopy opens a log window to record progress and report problems. This information is normally duplicated in a log file (*imgcopy3.log*), so you can leave Imagecopy to work unattended and consult the log file for any problems which may have occurred.

```
Imagecopy
┌────────────────────────── Imagecopy Log ──────────────────────────┐
│ May-18-1994 18:36:26                                               │
│                                                                    │
│ Converting H:\PHOTOS\BRESSING.TIF                                  │
│ Saved as  I:\JPEG\BRESSING.JPG                                     │
│                                                                    │
│ Converting H:\PHOTOS\DOVEDALE.TIF                                  │
│ Saved as  I:\JPEG\DOVEDALE.JPG                                     │
│                                                                    │
│ Converting H:\PHOTOS\GARDEN.TGA                                    │
│ Saved as  I:\JPEG\GARDEN.JPG                                       │
│                                                                    │
│ Converting H:\PHOTOS\JESSICA.TIF                                   │
│ Saved as  I:\JPEG\JESSICA.JPG                                      │
│                                                                    │
│ Converting H:\PHOTOS\TISSNGTN.TIF                                  │
│ Saved as  I:\JPEG\TISSNGTN.JPG                                     │
│                                                                    │
│ 5 files converted                                                  │
│                                                                    │
└────────────────────────────────────────────────────────────────────┘
```

Batch operations can be interrupted by pressing [Undo].

Further information on batch processing is given in § 4.5.

3.10 Problems

This section lists problems which can occur in using Imagecopy. If you encounter a different problem, you can contact the FaST Club for advice. Please specify which version of Imagecopy you are using (this is given in the information dialog § 4.3.1.1), and include details of your system such as the computer model, TOS version, how much memory, screen resolution, and printer type. If you find what appears to be a bug, try running Imagecopy without other resident programs and accessories, in case the problem is caused by a bug in one of these programs.

3.10.1 Memory problems

As a desk accessory, Imagecopy is subject to memory limitations which do not affect stand-alone programs. There are two main problems: (1) some programs grab all available memory for their own use, and (2) any memory which is used by Imagecopy is released by TOS when a main program terminates. The first problem may cause Imagecopy to display a 'not enough memory' alert when it is used within a memory-grabbing program, while the second problem causes unsaved images to be discarded when a main program is started or finished. To avoid these problems, Imagecopy can be configured to reserve a screen-size buffer for copying and viewing images etc. (§ 4.3.3.3.3.3). This is available for Imagecopy to use inside memory-grabbing main programs, and is not released by TOS when a program terminates.

☞ *Imagecopy 3 can copy images from screen without needing extra memory so long as the 'autosave' option is selected (§ 4.3.3.3.3.1).*

Imagecopy may still run out of memory if it is configured to reserve a screen buffer. This can happen if you try to print or view an image which is larger than your screen, or if you print or view a second image when one is already displayed.

3.10.2 GEMDOS calls

Imagecopy tries to avoid interrupting GEMDOS calls when copying images with [Alt-Help] if the 'autosave' option in the Copy format dialog is selected (file operations which are carried out during a GEMDOS call normally lead to a system crash). However, the method which it uses to avoid this situation is not one hundred percent foolproof. On rare occasions it is possible for an [Alt-Help] interrupt to occur at the beginning or end of a GEMDOS call, when Imagecopy will be unaware that one is being executed. This is more likely to happen with non-GEM programs than with GEM programs,[1] and it is possible that you will never encounter this problem, but you are advised to save important work before copying images in this way.

3.10.3 TOS 1.0

This version of TOS contains a bug which prevents it from displaying some images which are larger than the standard screen size. If you run across this problem you can display these images by switching to full-screen mode (hit ESC or press the right mouse button), since Imagecopy uses its own non-GEM routines in this mode.

3.10.4 Accessory scroll arrows

Some versions of TOS (>= 2.06) contain a bug which prevents scroll bars and arrows from working properly with desk accessory windows. You can use cursor keys to get around this problem, or click the right mouse to get into full-screen mode and scroll by moving the mouse to the edge of the screen. This bug does not occur with MultiTOS.

---

[1]   Despite its name, GEMDOS is part of the non-GEM component in the ST operating system: it controls file operations and other relatively low-level device functions.

3.10.5 Accessory crashes

Some versions of TOS (from 1.4 to ?1.62) contain a bug which causes desk accessories to crash after a resolution change if the 'fastload bit' is set in the program header of the first accessory to be loaded (this problem does not normally occur if only one accessory is loaded). If you encounter this problem, you should arrange your accessories so that the smallest accessory (or one you always use) is first, with its fastload bit cleared. There are PD and shareware programs which can be used to set or clear the fastload bit,[1] or change the order in which accessories are loaded.[2] You can also change the order in which accessories are loaded by the following method:

1. Copy accessories from your boot disk/drive to a second disk/drive and delete them from the boot drive (or 'move' them from the boot drive to a second drive).

2. Copy them back to the boot drive in the order in which you want them to be loaded.

3.10.6 Window crashes

Falcon versions of TOS may crash if you try to display more than 15 images on screen. Use Imagecopy's 'system preferences' dialog to limit Imagecopy to 15 windows.

3.10.7 NVDI

Some versions of NVDI have minor bugs which affect the way Imagecopy works. The most recent version (2.50) causes the vertical lines in Imagecopy's copying outline to be drawn incorrectly in Falcon true colour. Imagecopy will not work correctly if you disable 'Line A' with NVDI's configuration program.

3.10.8 DEGAS files

See § A.3 for problems in using DEGAS files with other programs.

3.10.9 IMG files

See § A.7 for problems in using IMG files with other programs.

3.10.10 TIFF files

See § A.21 for problems in using TIFF files with other programs.

---

[1]   E.g. Prgflags on disk UTI.265 from The FaST Club.

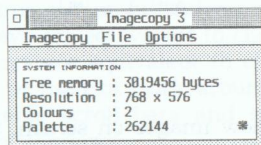[2]   E.g. Autosort on disk UTI.267 from The FaST Club.

Chapter 4

Imagecopy : Reference

4.1 Image formats

Imagecopy can read images in any of the following formats, and can write images in any format which is preceded by an asterisk. See § 4.3.3.3.1.1 and appendix § A for further details on specific formats.

1.	Art Director	*.ART
2.	Calamus Raster Graphic	*.CRG
3.	*DEGAS	*.PI{123578}, *.PC{123578}
4.	DR Doodle	*.DOO
5.	*GIF	*.GIF
6.	*IFF	*.IFF, *.LBM
7.	*IMG	*.IMG
8.	*JFIF (JPEG)	*.JPG
9.	MacPaint	*.MAC
10.	Neochrome	*.NEO
11.	OS/2 bitmap	*.BMP
12.	*PC Paintbrush	*.PCX
13.	PIC	*.PIC
14.	Pictor (PC Paint)	*.PIC
15.	Pixart	*.PIX
16.	Portable Bitmap	*.PBM, *.PGM, *.PPM
17.	*Prism Paint	*.PNT
18.	*RSC free image	*.RSC
19.	Spectrum	*.SPU, *.SPC
20.	*Targa	*.TGA
21.	*TIFF	*.TIF, *.TI{CHMP}
22.	Tiny	*.TNY, *.TN{123}
23.	*True Paint	*.TPI
24.	*Windows bitmap	*.BMP, *.RLE

4.2 System information


```
┌──────────────────────────────┐
│ □ ▨▨▨▨   Imagecopy 3  ▨▨▨▨   │
│ Imagecopy  File  Options     │
│ ┌──────────────────────────┐ │
│ │ SYSTEM INFORMATION       │ │
│ │ Free memory : 3819456 bytes│
│ │ Resolution  : 768 x 576  │ │
│ │ Colours     : 2          │ │
│ │ Palette     : 262144   ✱ │ │
│ └──────────────────────────┘ │
└──────────────────────────────┘
```

Imagecopy's menu window displays system information that may be helpful

in using Imagecopy: free RAM (the largest available block of memory), screen resolution, how many screen colours are available in the current video mode (2 = monochrome), and how many palette colours are available (in total). In true-colour video modes and ST monochrome there is no palette;[1] in other modes, a limited number of screen colours is chosen from a larger palette selection.
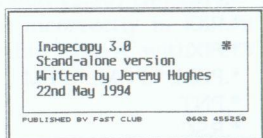
4.3 Menu options

Imagecopy provides the following options in a window menu which works in the same way as standard GEM menus except that you must click on the menu bar (in the window) before it is activated.

4.3.1 Imagecopy menu

```
Imagecopy
Information    I
```

4.3.1.1 Information

This option displays a box containing program information, such as which version of Imagecopy you are using. This can be removed by pressing a key or clicking the mouse.

```
Imagecopy 3.0                    ✳
Stand-alone version
Written by Jeremy Hughes
22nd May 1994

PUBLISHED BY FAST CLUB      0602 455250
```

4.3.2 File menu

```
File
View          V
Print         P
Convert       X
Slideshow     L
Select        ◊

Copy image    C
Print screen  D
Save image    S

Quit          ^Q
```

4.3.2.1 View

This option allows you to view images on screen. See § 4.1 for a list of image

---

[1]   The current version of NVDI incorrectly reports a palette of 262,144 colours.

formats which Imagecopy can display. Monochrome and colour images can be displayed in any video mode (from monochrome to true-colour). Colour images are automatically dithered on monochrome monitors, and colour mapping and dithering is used to display colour images in colour video modes with fewer colours.
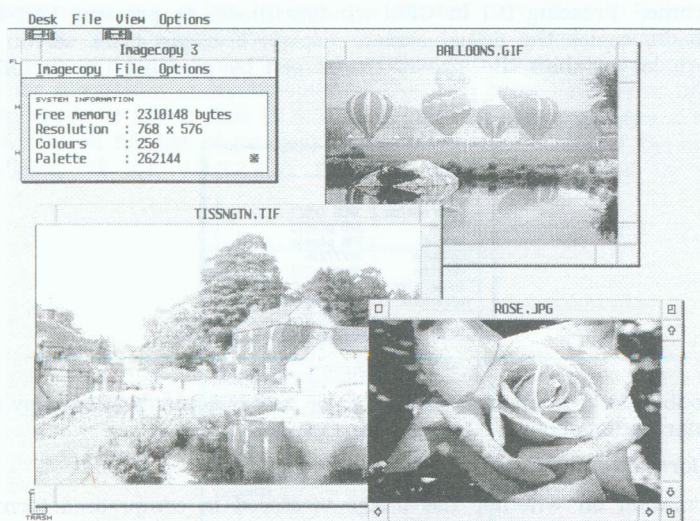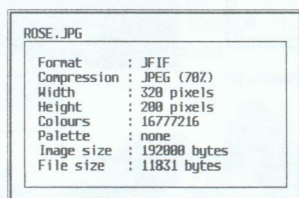

Images are displayed within a standard GEM window which can be resized or moved. Very small images are displayed in windows that are larger than the size of the image (with a border of white space) to prevent window elements being jumbled together. If you view an image which is larger than screen size you can scroll around it using scroll arrows and bars. You can also switch to a full-screen display (and back again) by clicking the right mouse button or pressing [Esc]; this removes window borders (etc.) to use all available screen space. Images can be scrolled in full-screen mode by moving the mouse cursor to the edge of the screen. Under recent versions of TOS (MultiTOS, Falcon TOS), and some TOS replacements or enhancements (Mag!x, WinX), Imagecopy can display up to twenty images at one time; other versions of TOS impose a maximum limit of seven windows, which limits you to six images on screen (the seventh window is needed for Imagecopy's menu). You can switch between different images (in windows or full screen) by pressing [Tab].

Another way of scrolling images (in full-screen or window mode) is to use cursor keys. Plain cursor keys are equivalent to clicking on a scroll arrow (line scrolling); shifted cursor keys are equivalent to clicking on a scroll bar (page scrolling). This feature can be used to work around a bug in some versions of TOS (>= 2.06) which prevents scroll bars and scroll arrows from working properly with desk accessory windows.

You can crop images by displaying them on screen and using 'copy image' (or a keyboard equivalent) to recopy the entire image or part of the image. In

full-screen mode, the keyboard shortcut [C] can be used to copy screen images which are larger than the size of the screen. The image scrolls automatically as the cursor approaches the edge of the physical screen, and the snapshot outline is confined by the borders of the image rather than the borders of the physical screen. Images which are copied in this way are saved in the current screen resolution, except that monochrome images are always saved in monochrome.[1] Pressing [C] in GEM-window mode, or pressing [Alt-Help] in either mode, copies the actual screen display. You can print screen images which are larger than the size of the screen by pressing [D] in full-screen mode.

```
ROSE.JPG

Format       : JFIF
Compression  : JPEG (70%)
Width        : 320 pixels
Height       : 200 pixels
Colours      : 16777216
Palette      : none
Image size   : 192000 bytes
File size    : 11831 bytes
```

If you double-click on an image window (or press [Return]) Imagecopy displays useful information about the image. This includes:

1   The format of the image.

2   Information on whether the image is stored in compressed format, and what type of compression has been used (none, RLE, LZW, JPEG).[2] Imagecopy does not check to see how efficiently a compression scheme has been implemented: there are some IMG files which make inefficient use of RLE compression, but these are still described as RLE-compressed since RLE-compression is built into the IMG format. The quality-setting at which a JPEG image was saved is displayed in parentheses.

3   The width of the image in pixels.

4   The height of the image in pixels.

5   The (maximum) number of different colours which may have been used (not necessarily how many colours have actually been used). 2 colours = monochrome.

6   The number of palette colours from which actual colours have been selected (none in true-colour and greyscale images).

7   The amount of memory needed to display an image in its original form

---

[1]   This allows monochrome images to be cropped and saved as monochrome images in colour video modes.
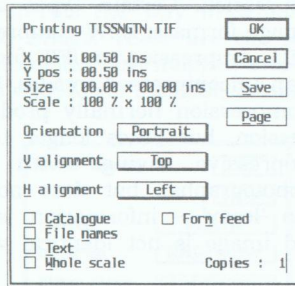
[2]   See § 2.10 for discussion of different types of compression.

(not including palette information).[1]

8   The file size of an image.

4.3.2.2 Print

This option allows you to print images. See § 4.1 for a list of image formats which Imagecopy can print. Images are printed according to print options selected from the Options menu (§ 4.3.3.2) - the 'print layout' dialog is displayed before printing so you can make any final adjustments (see § 4.3.3.2.4 for discussion of layout options). You can print batches of images by using wildcards or batch files (§ 4.5), and you can also catalogue a folder of images (or batch-file list of images) by selecting the 'catalogue' option in the layout dialog (§§ 3.4, 4.3.3.2.4.8). Printing can be interrupted by pressing [Undo].

```
┌─────────────────────────────────────────┐
│  Printing TISSNGTN.TIF        ┌─────┐    │
│                               │  OK │    │
│  X pos : 00.50 ins            └─────┘    │
│  Y pos : 00.50 ins           ┌────────┐  │
│  Size  : 00.00 x 00.00 ins   │ Cancel │  │
│  Scale : 100 % x 100 %       └────────┘  │
│                               ┌──────┐   │
│  Orientation    Portrait      │ Save │   │
│                               └──────┘   │
│  V alignment     Top          ┌──────┐   │
│                               │ Page │   │
│  H alignment     Left         └──────┘   │
│                                          │
│  □ Catalogue    □ Form feed              │
│  □ File names                            │
│  □ Text                                  │
│  □ Whole scale        Copies :  1        │
└─────────────────────────────────────────┘
```
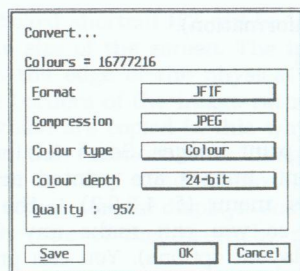
4.3.2.3 Convert

This is a general-purpose option which allows you to convert images to different formats (e.g. IMG to TIFF, or different compression schemes (e.g. uncompressed to RLE-compressed), or different colour types (e.g. colour to greyscale or monochrome), or different colour depths (e.g. 24-bit true-colour to 8-bit palette colour). When you have selected an image (or set of images) to convert, Imagecopy displays a dialog with the following options:

4.3.2.3.1 Format

This is the format which you wish to convert to. Some formats impose their own restrictions on colour depth (e.g. 8-bit maximum with DEGAS and GIF) and other settings. Images which are converted to DEGAS format are cropped or padded to standard ST/TT screen sizes. See Appendix § A and § 4.3.3.3.1.1 for discussion of different formats. § 4.1 contains a list of image formats which Imagecopy can read and write.

---

[1]   It is possible for this figure to be greater than the file size of an uncompressed image; this is caused by the fact that some images have to be padded with extra memory to comply with memory-alignment requirements when they are displayed.

```
┌─────────────────────────────────┐
│  Convert...                     │
│                                 │
│  Colours = 16777216             │
│                                 │
│  Format          │    JFIF    │ │
│                                 │
│  Compression     │    JPEG    │ │
│                                 │
│  Colour type     │   Colour   │ │
│                                 │
│  Colour depth    │   24-bit   │ │
│                                 │
│  Quality :  95%                 │
│                                 │
│  Save            │ OK │ Cancel ││
└─────────────────────────────────┘
```

4.3.2.3.2 Compression

This option controls whether an image is uncompressed or compressed using RLE, LZW, or JPEG compression. Certain types of compression are only available with particular image formats: LZW compression is restricted to GIF and TIFF formats, and JPEG compression to JFIF format. Compressed images take up less disk space than uncompressed images, but they also take longer to load and save. LZW compression normally produces higher compression savings than RLE compression, but takes longer to read and write. JPEG compression produces impressive savings with realistic greyscale and true-colour images (e.g. photographs), but does not work well with non-realistic images. It is also 'lossy' - information is lost in the conversion process, so the compressed image is not identical with the original uncompressed image.

4.3.2.3.3 Colour type

This controls whether an image is saved as a monochrome, greyscale, or colour image. There is no default setting: Imagecopy changes this option to match the type of image which you are converting from, so you can leave this setting unchanged unless you specifically want to convert a colour image to greyscale or monochrome (or vice versa). Please note that if you convert from greyscale (or monochrome) to colour, Imagecopy cannot add colours which are not present in the original image: it merely changes the way the image is saved to a format that is normally used for colour images. If you convert a batch of images, Imagecopy initially sets this option to 'match', meaning that the colour type of each individual image is matched (preserved) when the image is converted.

The colour type of an image is related to its colour depth: monochrome images have 1-bit colour depth (2 colours), greyscale images have from 2 to 8 bits (4 to 256 colours), and colour images have from 2 to 24 bits (4 to 16.7 million colours).
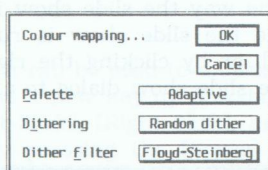
4.3.2.3.4 Colour depth

The colour depth of an image is the number of bits which are used to represent each pixel. If 1 bit is used, each pixel may be one of two colours (black or white). 2 bits gives a choice of 4 colours, 4 bits produces 16 colours, and 24 bits gives a choice of 16.7 million colours. Imagecopy displays the number of colours which are available with the current setting at the top of

the dialog. There is no default setting: Imagecopy changes this option to match the type of image which you are converting from, so you can leave this setting unchanged unless you specifically want to change the colour depth of an image. If you convert a batch of images, Imagecopy initially sets this option to 'match', meaning that the colour depth of each individual image is matched (preserved) when the image is converted.

☞ *If you select TIFF format with LZW compression LZW TIFF, the colour depth of a true-colour image is the number of significant colour bits rather than the total number of colour bits. LZW-compressed true-colour TIFF images are always saved as 24-bit images in Imagecopy, but unused colour bits are zeroed to allow greater compression ratios. These images can be used with any program which can read 24-bit LZW-compressed TIFF images.*

If you reduce the colour depth of an image to 8 bits or less, Imagecopy displays a second dialog which controls the way in which colours are mapped and dithered in the converted image. These are the same as the options which control the way in which colours are mapped and dithered when images are displayed in screen modes with fewer available colours (§ 4.3.3.1.2).

```
Colour mapping...          [    OK    ]
                           [  Cancel  ]
Palette              [     Adaptive     ]
Dithering            [  Random dither   ]
Dither filter     [ Floyd-Steinberg ]
```

4.3.2.3.5 Quality

This option controls the quality at which JFIF (JPEG-compressed) images are saved (see § 2.10.3). According to JPEG literature, a value of 50% produces 'good' quality images, and 75% produces 'very good' images. My own impression, from viewing images in 16-bit true-colour on a Falcon 030 computer with a 15-inch SVGA monitor, is that 25% quality (the minimum setting) produces poor-quality images, 50% is acceptable, 75% is fairly good, 85% is good, and 95% is very good. I can see very little difference in quality between 95%-quality images and 100%-quality images, although the latter take up twice as much disk space. 85%-quality images take up about half as much disk space as 95%-quality images, and 50%-quality images take up about half as much space as 85%-quality images.

The 'quality' option is hidden if you select a format other than JFIF.
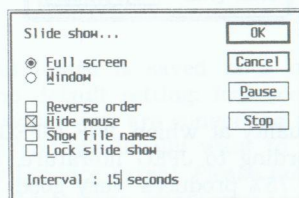
4.3.2.3.6 Match palette

This option allows the order of colours in a palette-colour image to be matched with the standard order of colours in the ST or Falcon palette. You might want to select this option if an image causes the screen display to become negative or difficult to read when it is loaded into another program (such as True Paint).

This option is hidden if the converted image does not have a colour palette (it is monochrome or greyscale or true-colour).

4.3.2.4 Slide show

This option can be used to display a sequence of images (slide show) in any resolution. Images can be displayed in a GEM window or on the full screen (you can switch between these display modes while the slide show is running). If you display images in a window, you can use Imagecopy to view or print or convert images while the slide show is running.

When the slide-show option is first selected, Imagecopy displays a file selector for you to select the directory from which images will be displayed. The default mask (*.*) causes all images in the directory to be displayed (non-image files are ignored), but you can change this if you want, e.g. by using *.TIF to display only TIFF images. File masks can be entered on the directory line (in place of the current mask) or on the filename line if this is easier. You may also select a batch file which contains a list of images (§ 4.5); the advantage of using doing this is that images may be taken from a number of different directories and do not have to be displayed in alphabetical order. When you have selected a directory or batch file, Imagecopy displays a dialog allowing you to configure the way the slide show is run. You can also select the slide-show option while the slide show is running (either as a menu option, or by pressing [Esc], or by clicking the right mouse button). In this case, Imagecopy displays the slide-show dialog to allow you to reconfigure, or stop, the slide show.

```
Slide show...                    ┌──── OK ────┐
                                 └────────────┘
  ⦿ Full screen                  ┌── Cancel ──┐
  ○ Window                       └────────────┘
                                 ┌── Pause ───┐
  ☐ Reverse order                └────────────┘
  ☒ Hide mouse                   ┌─── Stop ───┐
  ☐ Show file names              └────────────┘
  ☐ Lock slide show

Interval : 15 seconds
```

The slide-show dialog offers the following options:

4.3.2.4.1 Full screen

This causes the slide show to run on the full screen. Images which are larger than the screen can be scrolled by moving the mouse to the edge of the screen, or by pressing a cursor key.

4.3.2.4.2 Window

This causes the slide show to run in a window. The window is normally set to maximum size, but you can adjust it to match the size of the current image by clicking on the full box while pressing [Shift], or by pressing [Shift-Clr/Home]. The file name of the current image is displayed in brackets at the top of the window, to distinguish the slide-show window from normal viewing windows.

4.3.2.4.3 Reverse order

This reverses the order in which images are displayed. This is useful if you want to go back and look at an image which has gone past.

4.3.2.4.4 Hide mouse

This causes the mouse cursor to be hidden if the slide show is run in full-screen mode.

4.3.2.4.5 Show file names

This causes image filenames to be displayed at the top left of the screen when the slide show is run in full-screen mode. This option has no effect when the slide show is run in window mode, since file names are always displayed on the window's title bar.

4.3.2.4.6 Lock slide show

This causes the slide show to be locked in its current state until you press the key which is defined by the following option. This prevents other people from interfering with the slide show once you have started it. This option has no effect unless the slide show is run in full-screen mode.

4.3.2.4.7 Unlock

This designates a key which can be used to unlock the slide show after it has been locked. You can choose a new key by pressing any key on its own or in combination with the [Left-Shift], [Right-Shift], and [Control] keys. You can also disable this option by pressing the [Space] key to delete the current selection. If you lock the slide show without having an unlock key, this will prevent anyone (including yourself) from stopping the slide show, except by resetting the computer. This may be useful if the slide show is used for display purposes. If you want to prevent anyone getting into your system by resetting it, you can put *password.prg* in an auto folder on your hard disk (§ 5.4).

4.3.2.4.8 Interval

This determines the interval at which images are displayed (as long as they can be loaded fast enough). The shortest interval is 1 second, and the longest is 99 seconds. Typing 0 creates an indefinite interval, during which Imagecopy waits for the [Space] bar to be pressed before displaying a new image - this is useful for looking through a folder of images, when you don't want an image to be moved on before you have finished looking at it.

☞ *Images which contain more colours than the current video mode take longer to display because the colours must be remapped to match the number of available colours. If you want to avoid this delay, you can convert images to match the current video mode before you display them with the slide-show option.*

4.3.2.4.9 Stop

This stops the slide show. You can also do this by closing the slide-show window or pressing [Undo].

4.3.2.4.10 Pause

This pauses the slide show until you reselect this option or press [Space]. The slide show is also paused if the slide-show window is 'hidden' (§ 4.3.3.4). The slide show can be paused temporarily by holding a [Shift] key.

The following keys have special functions while the slide show is running: [Esc] (or a right mouse click) causes the slide-show dialog to be displayed, [Undo] stops the slide show, and [Space] causes the next image to be displayed. [Return] causes information about the image to be displayed (as happens with normal image windows).

4.3.2.5 Select

This option displays a submenu which allows you to select an image which has previously been displayed. This is useful for selecting windows which are covered by other windows or have been hidden from view (§ 4.3.3.4).

4.3.2.6 Copy image

This option is used to copy images from screen. You can either select this as a menu option or press [Alt-Help] (or [Control-Alt-Help] or [Shift-Alt-Help], depending on how you have configured the 'Alt-help keys' option). Using [Alt-Help] allows you to copy menus and dialog boxes, and you can also use this method to copy images from programs which do not provide access to desk accessories.[1] If the autosave feature is selected (§ 4.3.3.3.3.1), you may occasionally need to press [Alt-Help] more than once before it has any effect; if nothing happens after several attempts you may need to disable the autosave option before you can copy images. This is most likely to happen with non-GEM programs: see the footnote on page 63 for an explanation of why this is so.

If you select 'copy image' as a menu option, but wish to have Imagecopy's *menu removed from screen, you can hold down one of the [Shift] keys while* selecting the menu option. Release the [Shift] key once all traces of the menu have been removed.

When you have selected this option, Imagecopy displays a pointing hand and waits for you to draw a box outline on screen; this may be any size from 6x6 pixels up to full screen size except that DEGAS images cannot be larger than a standard ST or TT screen,[2] and RSC images cannot be larger than 128x128 pixels. If you want to copy the entire screen you should click the right mouse button or press [Clr/Home] to set the box to its maximum size. Once you have drawn a box outline you can resize it or move it to a different position before copying the enclosed image. The box can be moved by holding the left mouse button down while the mouse cursor is over the box in the shape of a flat hand. An alternative method is to use cursor keys. These move the box by 8 pixels at a time, having first aligned the box's left or upper edge on an 8-pixel

---

[1]   Some programs (normally games) disable the [Alt-Help] key combination, making it impossible to copy images or print screen dumps.

[2]   Imagecopy selects a TT screen size such as TT high-resolution or TT medium resolution if you attempt to copy an image which is larger than an ST screen in DEGAS format.

boundary. You can also move the box 1 pixel at a time by pressing the cursor keys in conjunction with the [Shift] key.

You can resize the box by holding the left mouse button down while the cursor is near one of the corners of the box, when it will be in the form of a pointing hand. Alternatively, you can use cursor keys in conjunction with the Control key: cursor left and right keys move the right edge of the box, and cursor up and down keys move its bottom edge; pressing [Shift] at the same time causes the box to be resized in single-pixel steps instead of 8-pixel steps.[1] To toggle between the current box size and the maximum image size you can either click the right mouse button while the cursor is displayed as a pointing finger, or you can press the [Clr/Home] button. In some cases you may want to set the box outline to a fixed size. You can do this by pressing [Insert]. This displays a dialog giving the current width and height of the box, and these can be edited by typing in new figures.

```
Copy size...

  Width : 320_ pixels
  Height: 200_ pixels

      [ OK ]  [ Cancel ]
```
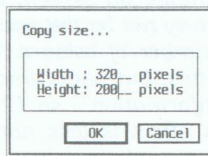
Once you have selected the area you wish to copy, you can copy an image by pressing [Return] or clicking the right mouse button while the cursor is inside the box. You can also abort the copy process by clicking the left button outside the outline box (or anywhere on screen if you have not yet drawn an outline box) or by pressing [Undo]. If you selected 'copy image' as a menu option or by pressing [C], Imagecopy will display a GEM file selector for you to select the name under which the image will be saved to disk. Alternatively, if you copy an image by pressing [Alt-Help], and the autosave option (in the 'image format' dialog) is selected, Imagecopy will display a filename dialog for you to type a filename under which the image will be saved.[2] In the second case, the file will be saved in the 'images' directory shown in the 'paths' dialog (§ 4.3.3.5.4.2). You can omit the file extender when saving images: Imagecopy will add it automatically for you.

```
Save TIFF image...

  Filename : 0001   .TIF

      [ OK ]  [ Cancel ]
```

---
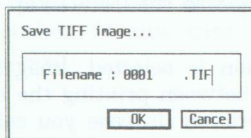
[1]   Cursor key options are useful for making fine adjustments to the size and position of the outline box: it can be fiddly to make single-pixel adjustments by moving the mouse.

[2]   The reason Imagecopy does not display a GEM file selector after [Alt-Help] is pressed is explained in § 4.3.3.5.4.2.

Imagecopy has an automatic naming facility which may be useful if you are taking a series of screenshots. If the file name which you assign to the first screen shot ends in a number before the extension (e.g. IMG01.TIF), success-ive screen shots will be given the same file name with the number incre-mented by 1 (IMG02.TIF). You can change this before saving an image if you want.

You can copy an image which is larger (or smaller) than the size of the screen by displaying it in full-screen mode and pressing [C] (not [Alt-Help]). In this case, the image scrolls automatically as the cursor approaches the edge of the physical screen, and the snapshot outline is confined by the borders of the image rather than the borders of the physical screen (so [Clr/Home] toggles between the current outline and an image-sized outline). Pressing [C] in GEM-window mode, or pressing [Alt-Help] in either mode, copies the actual screen display.

☞ *If you display a colour image on screen, and recopy it with the 'copy' option, the copied image may not be the same as the original image, even if it contains the same number of colours. This is because STs and TTs have 9-bit or 12-bit palettes, but some images contain palettes with 24 (or more) bits of colour information - so 12 or 15 bits of information are lost for each colour This effect is less noticeable with the Falcon 030, which has 18-bit colour in palette-colour modes and 16-bit colour in true-colour mode.*

4.3.2.7 Print screen

This option allows you to print screen dumps in accordance with the print options selected in the 'printer type' and 'print options' dialogs. Another way of selecting this option is by pressing [Control-Alt-Help] or [(Shift-)Alt-Help], depending on how you have configured the 'Alt-help keys' option.

If you press an [Alt-Help] sequence which is listed as 'not used' in the 'Alt-help keys' dialog ([Shift-Alt-Help] in the default configuration) you will normally get the TOS screendump routine. This produces draft-quality printouts on 9-pin printers, and ignores any settings which have been selected in Imagecopy.

If you select 'print screen' as a menu option, but wish to have Imagecopy's menu removed from screen, you can hold down one of the [Shift] keys while selecting the menu option. Release the [Shift] key once all traces of the menu have been removed.

When the print screen option is selected, Imagecopy displays an alert box which allows you to choose between printing the entire screen, or part of the screen, or cancelling the operation (in case you selected it by mistake). If you choose to print part of the screen, Imagecopy displays a pointing hand and waits for you to draw a box outline around the area you wish to print. The method for doing this is identical to the method used in copying images (see § 4.3.2.6).

☞ *Imagecopy needs more memory to print screen dumps than to copy images (the image data has to be processed to convert it to printer format). If you get a 'not enough memory' alert, you can try saving the image to disk and then printing it from there. This problem is most likely*

to occur if you use Imagecopy within programs that grab all available memory for their own use.

4.3.2.8 Save image

This menu option is usually disabled (greyed out) because images are normally saved automatically when they are copied or converted. However, if you copy an image by pressing [Alt-Help] and the autosave option is not selected, the image which you copy is stored in memory without being saved to disk. This can also happen if you select the Cancel button in the GEM file selector (or [Alt-Help] filename dialog). 'Save image' provides a way of saving these images.

You can omit the file extender when saving images: Imagecopy will add it automatically for you.

4.3.2.9 Quit

Use this option to exit from Imagecopy. If you have any image windows open, Imagecopy will display an alert to check that you wish to do this.

4.3.3 Options menu

```
Options
Screen      ◇
Printer     ◇
Copying     ◇
Windows     ◇
Preferences ◇
```
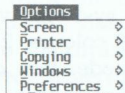
This menu contains options which can be used to configure the way Image-copy works. There are five submenus for screen, printer, copying, windows, and preferences options. Options dialogs contain a 'save' button which causes settings to be saved to disk so that they become the default settings whenever Imagecopy is loaded. Imagecopy looks for *imgcopy3.acc* or *imgcopy3.prg* (depending on which version you are currently using) in the directory which is specified in the 'paths' dialog. If this is unspecified, Imagecopy looks for *imgcopy3.acc* in the root directory of your boot drive, or for *imgcopy3.prg* in the current working directory. If the program file cannot be found in its expected place, Imagecopy will display a file selector for you to locate it.

Imagecopy will not be able to save default settings if you have compressed its program file with a file packer. In this case you should uncompress the program file before selecting 'save'.
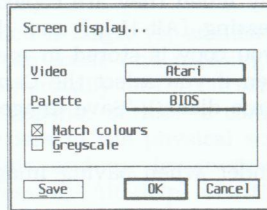
4.3.3.1 Screen

```
Screen    ◇  Display  ⌘D
             Mapping  ⌘M
             Colours  ⌘C
```
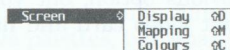
The Screen submenu configures the way images are displayed on screen. There are also two settings ('video' and 'palette' in the 'screen display' dialog) which affect the way data is copied from screen.

4.3.3.1.1 Display

This can be used to configure Imagecopy to work with non-standard video displays such as the Crazy Dots card, and to modify the way in which colour images are displayed on screen.

```
┌─────────────────────────────────────┐
│ Screen display...                   │
│                                     │
│  Video          ┌──── Atari ─────┐  │
│                 └────────────────┘  │
│  Palette        ┌──── BIOS ──────┐  │
│                 └────────────────┘  │
│  ⊠ Match colours                    │
│  □ Greyscale                        │
│                                     │
│  ┌──────┐    ┌────┐  ┌────────┐     │
│  │ Save │    │ OK │  │ Cancel │     │
│  └──────┘    └────┘  └────────┘     │
└─────────────────────────────────────┘
```

4.3.3.1.1.1 Video

This option configures Imagecopy to work with different video displays. If you have a Crazy Dots card you should select 'Crazy Dots 1' or 'Crazy Dots 2' instead of 'Atari'. The first of these options (Crazy Dots 1) is designed to work with older cards which have an unusual palette order in 256-colour modes. Imagecopy can display images on systems with Crazy Dots cards in all video modes (monochrome, 4 colours, 16 colours, 256 colours, and 32767 colours). It will also copy images in any mode, but colours are saved incorrectly in 4-colour and 16-colour modes.[1]

Changing the 'video' option from 'Atari' to one of the Crazy Dots options will also change the 'palette' option from 'BIOS' to 'VDI', since Crazy Dots does not support BIOS palette calls.

☞ *There are some minor problems which can occur with some Crazy Dots drivers and are caused by problems or omissions in low-level system support. Clicking the right mouse button to switch into full-screen display doesn't work with some drivers, and copying alerts may lose their text or contain garbled exclamation mark and question mark images. More recent NVDI drivers cause fewer problems than older drivers.*

4.3.3.1.1.2 Palette

Imagecopy normally uses BIOS (low-level) calls to copy or set the screen palette, but can be configured to use VDI (higher-level) calls if necessary. The BIOS option is normally better, since Imagecopy is unable to make VDI calls when copying images with [Alt-Help], but BIOS palette calls are not supported by Crazy Dots video drivers. This option is automatically reconfigured if you select Crazy Dots for the previous option, but you might also want to reconfigure it if you have a different video card and find that images are displayed with the wrong colours.

If 'VDI palette' is selected, Imagecopy checks the VDI palette at 5-second intervals and keeps its own updated copy to use when copying images with

---

[1]   I don't have the information to support these modes correctly.

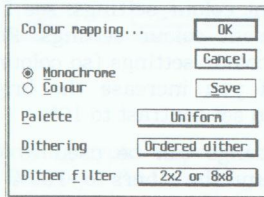[Alt-Help].

4.3.3.1.1.3 Match colours

If this option is selected, Imagecopy will rearrange the palette of colour images so that it matches the order in which colours occur in the default screen palette (as far as possible). This creates a tidier display - window borders etc. normally keep their original colours and you can avoid problems such as negative screen colours and window borders with dark lines on a dark background. A minor disadvantage is that images take slightly longer to load. This option has no effect in monochrome or true-colour video modes.

4.3.3.1.1.4 Greyscale

This option causes colour images to be displayed in greyscale. This gives a better representation of image tones at the expense of colour, and is a useful alternative to colour display in palette-colour video modes (with 4, 16, or 256 colours). If you have a greyscale monitor, you should select and save this as the default option.

4.3.3.1.2 Mapping

The 'colour mapping' dialog controls the way colour images are displayed in video modes with fewer colours than the original image. There are separate settings for monochrome and colour video modes. Which setting you use depends on whether you want to maximize speed or quality. For maximum speed, select '2x2 or 8x8' ordered dithering on a monochrome display and 'uniform' palette with 8x8 ordered dithering on a colour display. For quality, select Floyd-Steinberg random dithering in monochrome, or 'adaptive' palette with Floyd-Steinberg dithering in colour.

```
Colour mapping...          ┌───────┐
                           │  OK   │
                           └───────┘
                           ┌───────┐
  ⦿ Monochrome             │ Cancel│
  ○ Colour                 └───────┘
                           ┌───────┐
  Palette                  │ Save  │
                           └───────┘
  Dithering      │   Uniform        │
  Dither filter  │ Ordered dither   │
                 │   2x2 or 8x8     │
```

4.3.3.1.2.1 Palette

This option controls the way in which colours in the original image are mapped onto a palette containing fewer colours. An 'adaptive' palette uses a palette which has been adapted to match the colours in the original palette, whereas a 'uniform' palette uses the same fixed palette for all images. Image quality is better with adaptive palettes, but images display faster with uniform palettes. Uniform palette-matching also has the advantage of using the same palette for all images, so you can display several images in their correct colours on screen. A third option, 'screen' palette, causes images to be displayed using the default screen palette: this takes nearly as long as adaptive palette-matching, but produces results which are similar to uniform palette-matching. Greyscale images are always displayed with a uniform

palette, and monochrome images (or colour images on a monochrome display) are always displayed in black and white.

4.3.3.1.2.2 Dithering

This offers a choice between different dithering methods for dithering images on screen. Random dithering gives better results with continuous-tone (realistic) images, but is slower than halftoning and ordered dithering. Halftoning is less suited to screen displays than printed output (because of the lower resolution of screen devices).

4.3.3.1.2.3 Dither filter

This lets you select different dither filters for each type of dithering. With ordered dithering, 2x2 filters usually give better results with solid-colour pictures, while 8x8 filters give better results with continuous-tone pictures. '2x2 or 8x8' selects 2x2 matrixes for pictures with up to 16 colours, and 8x8 matrixes for pictures with more than 16 colours: this usually works well. For random dithering, Imagecopy offers a choice of five filters: Quick Floyd, Floyd-Steinberg, Burkes, Stucki, and Talya. Quick Floyd is the fastest option (except on 68030 machines where Floyd-Steinberg dithering is faster), and Talya gives the best results - images are more clearly focused, and dither patterns are more random. The other options lie somewhere in the middle. The Floyd-Steinberg option is usually a good compromise between speed and quality.

4.3.3.1.3 Colours

This allows you to adjust the colour settings of images which are displayed on screen. These settings are also relevant if you have a monochrome screen, since changes to colour settings affect the way images are dithered. A similar dialog is used to adjust print colour settings: see § 4.3.3.2.3, which contains a detailed discussion of different colour settings. For screen display, you can normally use the standard colour settings (so colours are unchanged), but dark images may look better if you increase the brightness setting, and some images may look better if you set contrast to 10%.

CMY and CMYK colour settings can be used to view colour separations on screen: set one colour to 0% and the others to -100%.
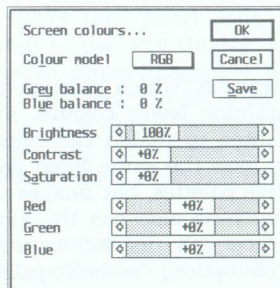
☞   *Changes which are made to screen colour settings do not affect images
    which are currently displayed. If you change the settings and reload an
    image you will be able to compare the image as it is displayed with the
    new settings with the image as it was originally displayed. (Use [Tab] to
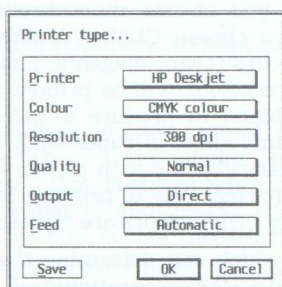   flip between images.)*

4.3.3.2 Printer

```
Printer    ◇  Printer type   ^T
              Dithering       ^D
              Colours         ^C
              Print layout    ^L
              Page size       ^S
```

The Printer submenu configures the way images are printed.

4.3.3.2.1 Printer type

This can be used to configure Imagecopy for different printers and select
different output options.

```
Printer type...

Printer      HP Deskjet
Colour       CMYK colour
Resolution   300 dpi
Quality      Normal
Output       Direct
Feed         Automatic

Save          OK    Cancel
```

4.3.3.2.1.1 Printer

Imagecopy supports the following types of printer: Epson 9-pin, Epson 24-pin,
NEC 24-pin, Epson inkjet, Bubblejet IBM, Bubblejet LQ, Deskjet, and Laserjet.
This includes compatible printers: most dot-matrix printers are Epson-
compatible, and most laser printers are Laserjet-compatible; inkjet printers
can normally be used with one of the inkjet, Bubblejet, or Deskjet options.

Configuring Imagecopy to work with bubblejet printers is complicated by the
number of different emulation modes and by differences between different
models. The following guidelines for specific printers are based on feedback
from Imagecopy users (additional information is always welcome).

Canon BJ130 with IBM emulation: contact the FaST Club for a specially
configured version of Imagecopy, and use with the Bubblejet IBM option.

Canon BJ130 with NEC emulation: contact the FaST Club for a specially
configured version of Imagecopy, and use with the Bubblejet LQ option or with
the NEC 24-pin option. 360-dpi graphics should give best results with the LQ
option.

Canon BJ10e: use the Bubblejet IBM option.

Canon BJ10ex: use the Bubblejet IBM option if your printer is set to work in IBM mode, or the Epson 24-pin option if your printer is configured to work in LQ mode. The Bubblejet LQ option will also work in LQ mode up to 180 dpi. 360-dpi graphics will print best in IBM mode.

Star SJ48: use the Bubblejet IBM option if your printer is configured to work in IBM mode, or the Bubblejet LQ option in LQ mode, but note that 360 dpi graphics are not possible in IBM mode. You can also use the Epson 24-pin option in LQ mode, in which case 360-dpi graphics will be printed in multiple passes (which is slower and less accurate).

The Atari laser option is not yet implemented.

4.3.3.2.1.2 Colour

This option allows you to select between monochrome, CMY colour, CMYK colour, CMY separation, CMYK separation, and CMY+K separation. CMY stands for Cyan, Magenta, and Yellow, which are the three primary printing colours, and K stands for blacK (to avoid confusion with B for Blue). If you have a monochrome printer, you must choose between monochrome, CMY separation, and CMYK separation. If you choose monochrome, colour images will be printed in greyscale; if you choose CMY or CMYK separation, they will be separated into primary colours (cyan, magenta, and yellow; or cyan, magenta, yellow, and black), and each colour will be printed as a separate image. These separations can be recombined to produce a full-colour image: one way of doing this is to feed the same sheet of paper back into the printer, and use a different colour ribbon or cartridge for each primary colour (see appendix § B). With a colour printer, the normal way of printing in colour is to select CMY or CMYK colour, so the primary print colours are combined in a single printout.

There are several factors which can determine the choice between CMY and CMYK colour (or CMY and CMYK separations). If your printer is capable of printing black with other colours, you will find that CMYK colour usually produces cleaner colours, and also has the advantage of using less ink. If black is not available as a primary colour, it has to be created by mixing the three other primary colours (this is sometimes referred to as 'composite black'), and often ends up as a muddy shade of grey or brown. Saving ink - CMYK prints probably use half as much ink as CMY printouts - also improves print quality (the paper gets less saturated) as well as cutting costs. However, there are also reasons for using CMY colour:

1   Some printers, such as the Deskjet 500C, cannot print with black and other colours at the same time (but see below on CMY+K separation).

2   The Deskjet 550C *does* allow you to mix black with other colours, but the inks have different chemical compositions. This causes black ink to bleed into colour ink if the two inks come into contact. You can reduce this effect by selecting 'best' quality output, and there are also many images which will print without any obvious problem. But bleeding can be an obvious problem when you print images in which sharp black edges are in direct contact with other saturated (deep) colours. One way of avoiding

this problem is to select CMY colour in Imagecopy.[1]

3   Using CMY colour with a dot-matrix printer can be useful if you have a colour ribbon in which the black ink has been worn away by printing text.

CMY+K separation allows you to print images in two passes: CMY on the first pass and black on the second. If you have a printer which is unable to mix CMY with black (such as a Deskjet 500C printer), this provides a way of getting full CMYK output (as on a Deskjet 550C printer).

4.3.3.2.1.3 Resolution

This allows you to select different output resolutions: higher resolutions use smaller (or more closely-spaced) dots. For colour printing, you should normally select the highest resolution that your printer is capable of. Some resolutions may be incompatible with certain printers. In particular:

1   Some 24-pin printers are unable to print at 360 dpi.

2   Bubblejet printers may need to be in a particular emulation mode to print at 360 dpi.

3   The 200 and 600 dpi laserjet settings require a Laserjet 4 printer or compatible printer.

4   The 400-dpi laserjet setting requires a 400-dpi laserjet-compatible printer.

4.3.3.2.1.4 Quality

This option allows you to select different output qualities, such as 'draft' or 'normal'. Imagecopy offers two or three quality options for different types of printer: 'draft' and 'normal' (for bubblejet and laser printers), and 'draft', 'normal', and 'best' (for dot-matrix and deskjet printers). 'Draft' prints fewer dots than 'normal' quality, but is not necessarily faster. Some bubblejet printers have a dip-switch or control-panel setting which selects draft print: this should be set to high-quality (or 'high-density') if you don't want to lose detail at high resolutions.

☞ *'Best' quality uses an extra print-head pass on dot-matrix printers - this produces a darker image, but you should avoid doing this with a fresh ribbon since it may cause lighter ribbon colours to be contaminated with darker colours.*

With deskjet printers, 'normal' quality prints bidirectionally and uses two passes for colour (or one pass for black), while 'best' quality prints unidirectionally and uses four passes for colour (or two passes for black). Despite differences in the number of passes, both of these qualities print the same number of dots: best quality prints fewer dots in each pass and dots have more time to dry before adjacent dots are printed. This helps to reduce problems from ink bleeding.

---

[1]   This is not an ideal solution. Apart from the problem of bleeding, the colours produced with with a CMYK palette are much better than those produced with a CMY palette. HP may eventually sort out the problem by producing compatible inks.

4.3.3.2.1.5 Output

Imagecopy offers two ways of sending data to a printer: 'direct' output is faster, but you should select BIOS output if you want it to be intercepted by print spoolers or other software. The 'file' option allows you to redirect printed output to a disk file which can be printed from the desktop (with TOS 1.4 or higher),[1] or from another program. Binary print files normally have a PRN extension. You may wish to switch off Imagecopy's 'X pos' and 'Y pos' options when saving print files that will be printed by another program (§ 4.3.3.2.4.1-2).

A fourth option ('IMG file') saves print output as IMG files which can be loaded into other programs. This allows halftone images and colour separations to be printed from any program which can print monochrome IMG files. If colour output is selected, Imagecopy saves each separation as a separate IMG file. Colour separations can be printed from monochrome DTP programs by placing each separation on a separate page and overlaying them at print time. You should normally avoid scaling IMG print files when they are loaded into other programs (this looks ugly).

4.3.3.2.1.6 Feed

Select manual feed if you want Imagecopy to pause for a new page to be inserted. If this option is not selected, some printers with manual sheet feeders - such as the Citizen Swift 24e - can lose data while waiting for a new sheet to be inserted.

4.3.3.2.2 Dithering

This controls the way in which colour images and greyscale images are dithered when they are printed.

```
┌─────────────────────────────────────────┐
│  Print dithering...        [    OK    ]  │
│                                          │
│  Greyscales = 145          [  Cancel  ]  │
│  Colours    = 3848625                    │
│  Frequency  = 100 lpi      [   Save   ]  │
│                                          │
│  Dither type        [ 45° halftones  ]   │
│                                          │
│  Dither filter      [  12x12 [3x3]   ]   │
└─────────────────────────────────────────┘
```
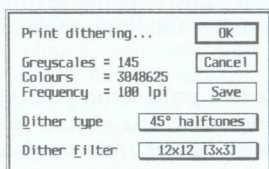
4.3.3.2.2.1 Dither type

This allows you to select different types of dithering. 45-degree halftones normally give the best results. These create diagonal lines of halftones which are generally more pleasing than the horizontal pattern of 90-degree halftones. For colour printing, the '45-degree' halftone option actually selects differently angled patterns (technically known as 'screens') for different CMYK print colours (this is common practice in commercial colour printing).

4.3.3.2.2.2 Dither filter

This allows you to select different dither filters. Larger dither matrixes give

---

[1]   Earlier versions of TOS are unable to print binary files.

greater greyscale or colour depth (they provide a greater number of greyscales or colour tones), but they can also reduce the effective resolution at which an image is printed. In fact, the effective resolution of an image is not directly related to the size of the halftone matrix, but to the (maximum) size of the halftone dots within the matrix. Imagecopy's pop-up menu for 45-degree halftone matrixes specifies the size of the matrix followed in brackets by the size of the halftones within the matrix (e.g. 16x16 [4x4]). With 90-degree halftones the (maximum) halftone size is the same as the size of the matrix. Imagecopy displays the number of colours or greyscales available with the current dither filter near the top of the dialog.

The effective resolution (or 'frequency', § 2.9) of a halftone image can be calculated by dividing the actual resolution by the halftone size. At 300 dpi, 3x3 halftones have an effective resolution of 100 lines per inch (lpi, where 'lines' refers to rows of halftones), and 4x4 halftones have an effective resolution of 75 lpi. Imagecopy displays the halftone 'frequency' of the current dither filter (at the current print resolution) near the top of the dialog.

For halftone output, 45-degree halftones with a '12x12 [3x3]' matrix are normally a good compromise between resolution and colour depth, although the '16x16 [4x4]' matrix may be a better choice with high-resolution devices (600 dpi or greater). You can experiment to see which setting you prefer: small halftone matrixes (such as 2x2) sometimes work quite well with cartoon-style images, but give poor results with continuous-tone images.

4.3.3.2.3 Colours

This allows you to adjust the colour settings of printed images. These settings are also relevant if you have a monochrome printer, since changes to colour settings affect the way images are dithered.

```
Print colours...                    [ OK ]

Colour model    [ CMYK ]           [ Cancel ]

Grey balance :    0 %              [ Save ]
Blue balance :    0 %

Brightness    [◇]▒▒▒▒ 300% ▒▒▒▒▒▒▒[◇]
Contrast      [◇]▒▒▒▒ +30% ▒▒▒▒▒▒▒[◇]
Saturation    [◇]▒▒▒▒ +30% ▒▒▒▒▒▒▒[◇]

Cyan          [◇]▒▒▒▒ +0% ▒▒▒▒▒▒▒▒[◇]
Magenta       [◇]▒▒▒▒ +0% ▒▒▒▒▒▒▒▒[◇]
Yellow        [◇]▒▒▒▒ +0% ▒▒▒▒▒▒▒▒[◇]
Black         [◇]▒▒▒▒ +0% ▒▒▒▒▒▒▒▒[◇]
```
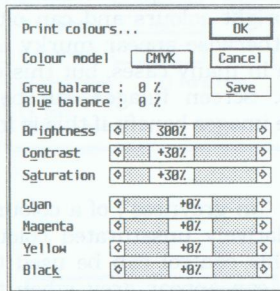
4.3.3.2.3.1 Colour model

This allows you to select a colour model for adjusting primary colours (RGB, CMY, or CMYK). See § 4.3.3.2.3.7 below.

4.3.3.2.3.2 Grey balance

This control can be used to compensate for the fact that colour printers sometimes print grey (or black) with a green or cyan tinge. Grey balance compensates for this by reducing the amount of cyan that is used to print grey

colours. Try using a greyness setting of 30% if you have are printing in CMY colour with a deskjet printer, but reduce this if you find that grey colours take on a pink tinge. This problem is more or less the opposite of the purple blue problem described below. It occurs with HP colour cartridges when these are used to create 'composite black' from cyan, magenta, and yellow (§ 4.3.3.2.1.3), but does not occur with inks and ribbons which produce the blueness problem.

4.3.3.2.3.3 Blue balance

This control can be used to compensate for the fact that colour printers sometimes print blue with a purple tinge (this is not a problem with HP colour inks, but sometimes happens with colour-kit inks and dot-matrix ribbons). If you increase this control (by clicking on the 'blue' button and typing a new value), this has the effect of reducing the amount of magenta that is used to print blue colours (it has no effect on other colours).

4.3.3.2.3.4 Brightness

This is the most important colour control. Images normally print darker than they are displayed on screen, so you can use the brightness setting to compensate for this. Higher settings create lighter images using a technique known as gamma correction. My own experience is that a value of 300% gives good results in many cases, but the optimum setting is dependent on a variety of factors: these include the type of ink that is used, the quality of the paper, output resolution, and the image itself. HP glossy paper requires lower brightness settings of around 100%. You may also want to choose a higher (lighter) setting for dark images and a lower (darker) setting for light images.[1]

4.3.3.2.3.5 Contrast

This increases the contrast between light and dark colours. Contrast normally increases the intensity of bright colours and can often have a beneficial effect on printed images which otherwise appear murky or washed-out. For printed images 30% is a good value in many cases, but this can be increased to 40% or higher with some images. Screen images can be displayed with 0% (unchanged) contrast, but some images benefit if this is increased to 10%.

4.3.3.2.3.6 Saturation

This controls the purity (or 'un-greyness') of a colour. Bright red is a saturated colour, while pink is a relatively unsaturated colour; black, white, and grey are unsaturated colours. This control can be used to compensate for the fact that natural-colour images can appear grey when they are printed. 30% is a good value in many cases, but this can be increased to 40% with some images.

The saturation option is not normally needed for screen images, and has no effect on images which are printed or displayed in greyscale.

---

[1]   If your printer information specifies a 'gamma correction value' you can convert this to a brightness setting with the following formula: brightness = 100 / gamma correction (a brightness value of 200% is equivalent to a gamma value of 0.5). But it is worth experimenting to find which values give the best results.

☞ *Adjusting saturation can be slow with true-colour images (since it is computationally intensive and affects thousands of pixels), but it is fast enough with palette-colour images (where only the palette is affected). Set this control to zero if you want faster printing of true-colour images and the output quality is not so important. The saturation option is ignored when images are displayed or printed in greyscale.*

4.3.3.2.3.7 RGB/CMY/CMYK adjustments

The RGB, CMY, and CMYK sliders can be used to adjust the relative strength of these primary colours. Colours can be adjusted according to any of these models, regardless of the actual method used to display or print colour (click on the button next to 'Cyan' to choose between different colour models). One use for these controls is to correct imbalances caused by poorly-matched printing inks (some printers use too much magenta, for example).

4.3.3.2.4 Print layout

This dialog allows you to control the way images are printed, especially their size and position. Some of these options have their own sub-dialogs which work in the same way as normal dialogs.

☞ *According to standard convention, horizontal dimensions precede vertical dimensions: 200% x 100% scaling indicates that an image is scaled to twice its original width.*

```
Print layout...                    [    OK    ]

X pos : 00.50 ins                  [  Cancel  ]
Y pos : 00.50 ins
Size  : 01.00 x 01.00 ins          [   Save   ]
Scale : 100 % x 100 %
                                   [   Page   ]
Orientation   [  Portrait  ]
                                   [  Column  ]
V alignment   [    Top     ]

H alignment   [    Left    ]

⊠ Catalogue          □ Form feed
□ File names
□ Text
□ Whole scale              Copies :  1|
```

4.3.3.2.4.1 X pos

```
X pos...                    [    OK    ]

00.50 ins                   [  Cancel  ]

○ 0.0 ins       ○ 2 ins
◉ 0.5 ins       ○ 3 ins
○ 1.0 ins       ○ Other
```
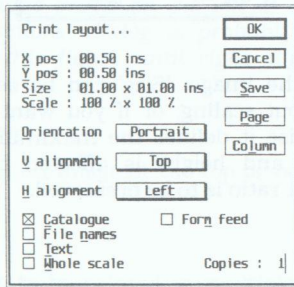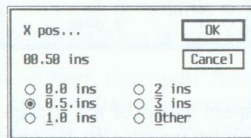
This defines the position of the left edge of a left-aligned image, or the right edge of a right-aligned image (it has no effect on horizontally centred images). Setting this parameter to zero causes an image to be printed at the current horizontal print position. One reason for selecting a zero position is if you are

printing an image to a disk file which will be incorporated into another document (such as a Protext text file).

The horizontal position of an image cannot be less than the 'left offset' defined in the 'page size' dialog (§ 4.3.3.2.5.2), or it will be ignored.

4.3.3.2.4.2 Y pos

This defines the position of the top edge of a top-aligned image, or the bottom edge of a bottom-aligned image (it has no effect on vertically centred images). Setting this parameter to zero causes an image to be printed at the current vertical print position. One reason for doing this is if you are printing an image to a disk file which will be incorporated into another document (such as a Protext text file).

The vertical position of an image cannot be less than the 'top offset' defined in the 'page size' dialog (§ 4.3.3.2.5.3).

4.3.3.2.4.3 Size

```
Image size...              [   OK   ]
00.00 x 00.00 ins          [ Cancel ]

● Unscaled      ○ 6  ins
○ 1 ins         ○ 7  ins
○ 2 ins         ○ 8  ins
○ 3 ins         ○ 9  ins
○ 4 ins         ○ 10 ins
○ 5 ins         ○ Other
```
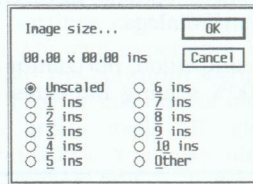
This defines the size of the image. 'Size' can be set to zero if you want an image to be printed without scaling, or if you want to use percentage-scaling (see next option). Otherwise it defines the maximum width and height of an image: the actual width and height is affected by other factors, such as whether the original aspect ratio is to be preserved.

4.3.3.2.4.4 Scale

```
Image scale...             [   OK   ]
100% x 100%                [ Cancel ]

○ Unscaled      ○ 3x
● 1x            ○ 4x
○ 1x2 (a)       ○ 5x
○ 2x1 (b)       ○ 6x
○ 2x            ○ Other
```
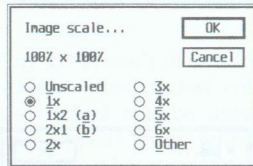
This normally defines the aspect ratio of an image which is scaled by size (see last option): 100% x 100% causes images to be printed with no change to their aspect ratio, while 200% x 100% causes the width of an image to be doubled in relation to the height (this can be useful if the image is designed to be viewed in video modes with non-square aspect ratio). If you set this option to zero, the aspect ratio of an image is disregarded and images are scaled to the exact size defined by the previous option.

If an image is not scaled by size (the 'image size' parameter is set to zero), this option defines an exact percentage by which images are scaled: 100% x 100% causes images to be printed at their original size, while 200% x 200% causes them to be printed at double their original width and height. 'Original size' means the size an image is printed if each pixel is printed with a single dot. Obviously, this varies according to printer resolution; unless you have a particular reason for wanting to scale images in this way, it is normally easier to scale by size using the previous option.

4.3.3.2.4.5 Orientation

Images can be printed in portrait or landscape orientation. Landscape orientation causes images to be printed sideways on the page, and is useful for printing large images which are too wide to be printed in portrait orientation. If you select landscape orientation, images are positioned according to the way the page appears when it is viewed in this orientation,[1] so left-aligned images print at the bottom of the physical page (this is the left of the page when it is turned on its side). If you want an image to be printed in landscape orientation at the top of the physical page, you should select right alignment at the same time as landscape orientation.

4.3.3.2.4.6 Horizontal alignment

This option is used to align an image on the left or right of a page or centre it horizontally.

☞ *If a right-aligned image prints on the left of a page, the page width in Imagecopy's 'print options' dialog is probably wider than your printer will accept. Reduce this figure until right-aligned images print on the right of a page.*[2]

4.3.3.2.4.7 Vertical alignment

This option is used to align an image at the top or bottom of a page or centre it vertically.

4.3.3.2.4.8 Catalogue

This option causes images to be printed in multiple columns. With line-based printers (such as dot-matrix printers and inkjets), Imagecopy pauses at the end of each column and displays an alert asking you to reinsert the page for successive columns. With page-based printers (laser printers), the entire page should print without being re-fed. Imagecopy stores separate layout settings for cataloguing images and normal printing. This allows you to catalogue images at a small print size, while using a larger size for normal printing.

☞ *It is important for this option that you have configured the 'page size' dialog so that images are positioned correctly on the page (§ 4.3.3.2.5). You should also be careful to use Imagecopy's 'page feed' option to*

---

[1]   The only exception to this is that print offsets relate to the physical page.

[2]   If this fails to work, there may be a printer bug which prevents graphics from being right-aligned correctly; this seems to be the case with the Citizen Swift 24e.

perform page feeds (§ 4.3.3.2.4.13).

4.3.3.2.4.9 File names

This option causes the file name of each image to be printed beneath the image. You would normally want to have this option selected for cataloguing images.

4.3.3.2.4.10 Text

This option allows up to three lines of text to be printed before an image (or batch of images). If you use this with the catalogue option you should take care that the text is not wider than a column of images (allow 12 characters per inch).

```
Print text...              [    OK    ]

⊠ Underline                 [ Cancel ]

Snapshots for_____
Imagecopy 3_____
manual|_____
              '         '         '
```
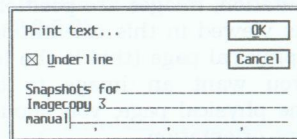
4.3.3.2.4.11 Whole scale

Whole scaling causes images to be scaled by round numbers (this has no effect if an image is scaled down in size). This can be used to avoid a tartan (moiré) effect in images which contain monochrome patterns (e.g. screen shots with windows and desktop backgrounds). Leave this option off if you are printing normal colour images and want these to print at a particular size which is not rounded down to the nearest whole multiple.

4.3.3.2.4.12 Form feed

If this option is selected Imagecopy sends a form feed to eject a page after printing an image (or batch of images). You may prefer to leave this option unselected and use the following option after an image is printed.

4.3.3.2.4.13 Page

```
Form feed...               [    OK    ]
                            [ Cancel ]
○ Whole
⦿ Partial : 00.50| ins
```
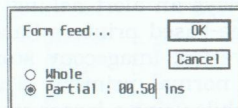
This option ejects the current page. An alternative way of doing this is to press F1 when the 'print options' dialog is not selected.

☞ *Be careful to use Imagecopy's 'page feed' option, rather than a printer button, to perform page feeds. If you use a printer button, Imagecopy will be unaware of this, and print output will not be formatted correctly.*

4.3.3.2.4.14 Column

This option can be used to start a new column in catalogue mode.

4.3.3.8.15 Copies

This option can be used to print multiple copies of an image. If you change this after selecting the 'print' option (when the 'print layout' dialog is displayed with a title saying 'Printing ‹filename›...'), the previous value will be reinstated automatically after the image has printed; but if you change it after selecting 'print options' it will remain in effect until you alter it a second time.

4.3.3.2.5 Page size

This allows you to set the size of paper which you are using, and to adjust page offsets which correct the position at which images are printed.

☞ *According to standard convention, horizontal dimensions precede vertical dimensions: an 8x11 inch page is 8 inches wide by 11 inches high.*

```
┌─────────────────────────────────────────┐
│  Page size...              ┌──────────┐  │
│                            │    OK    │  │
│  08.25 x 11.70 ins         ├──────────┤  │
│                            │  Cancel  │  │
│  ○ A3     ○ US Legal       ├──────────┤  │
│  ◉ A4     ○ US Letter      │   Save   │  │
│  ○ A5     ○ Other          └──────────┘  │
│                                          │
│  Left offset  : 00.13 ins                │
│  Top offset   : 00.15 ins                │
└─────────────────────────────────────────┘
```
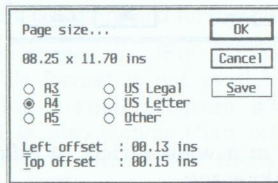
4.3.3.2.5.1 Page size

This should match the size of the paper you are currently using. Imagecopy uses this information to calculate the correct position of images on the page.

4.3.3.2.5.2 Left offset

This option specifies a horizontal offset which can be used to compensate for the fact that some printers leave automatic margins at the side of each page. 'Left offset' causes an image to be offset towards the left of the page. See § 3.3.2 for advice on altering this setting.

4.3.3.2.5.3 Top offset

This option specifies a vertical offset which can be used to compensate for the fact that some printers leave automatic margins at the top and bottom of each page. 'Top offset' causes an image to be offset towards the top of the page. See § 3.3.2 for advice on altering this setting.

4.3.3.3 Copying

```
 Copying  ◇  Format    ⌘F
             Keys      ⌘K
             Settings  ⌘S
```
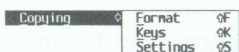
The Copying submenu configures the way images are copied.

4.3.3.3.1 Format

This allows you to select between different image formats for saving images. See § 4.1 for a list of formats which Imagecopy can write.

```
┌─────────────────────────────────────┐
│  Image format...                     │
│                                      │
│  Format      [      TIFF      ]      │
│  Compression [      LZW       ]      │
│  True colour [  Screen depth  ]      │
│                                      │
│  [ Save ]        [ OK ] [Cancel]     │
└─────────────────────────────────────┘
```
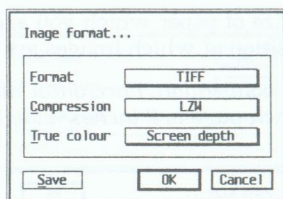
4.3.3.3.1.1 Format

Imagecopy can save images in a wide variety of different formats. These have their own strengths and weaknesses:

1. DEGAS (§ A.3) is an old ST format with serious limitations. It should normally be avoided unless you need to load an image into a program which does not support more advanced formats. If you use this format, images which are larger than an ST screen are saved in TT format (where possible), and images that are larger than an ST or TT screen are cropped to the size of an ST or TT screen. Images which are smaller than an ST or TT screen are padded with white space. Other programs may be unable to handle images which contain more than 16 colours or are larger than a standard ST screen. ST DEGAS images can be recognized by their file extension; this ends in a number between 1 and 3.

2. GIF (§ A.5) is a standard format which can be used to store images with up to 256 colours.

3. IFF (§ A.6) is a standard Amiga format which is also supported by a number of PC and ST programs.

4. IMG (§ A.7) is a standard ST format which is also supported by some PC programs. It works well as a monochrome format, but is less good as a colour format. Some programs (such as Calamus and PageStream) will crash if you try to load colour IMG files; others (such as Timeworks Publisher) can load colour IMG files but ignore any palette information in the extended header.

5. PC Paintbrush (§ A.12) is a standard PC format which is also supported by some ST programs.

6. Prism Paint (§ A.17) is a simple but capable format which is supported by a number of ST programs.

7. RSC images (§ A.18) are monochrome images with a maximum size of 128x128 pixels. These can be incorporated into resource files with a resource-file editor such as Wercs. They can also be loaded into Fontkit Plus. If you save a colour image in RSC format, Imagecopy converts it to monochrome by changing light colours to white and dark colours to black.

8. Targa (§ A.20) is a standard format which is mainly used to store true-colour images. It can also be used for monochrome and 8-bit palette-colour images, although these are less widely supported.

9. TIFF (§ A.21) is a standard format on PCs and Macs and is increasingly supported by ST programs. Unfortunately, some ST TIFF support is badly implemented. Some ST programs are unable to load LZW-compressed images or palette-colour images with less than 8-bit colour depth. For compatibility with (most) other programs, select 'baseline TIFF' in the 'image preferences' dialog (§ 4.3.3.5.1.1). As a last resort (if compatibility problems persist), save TIFF files in uncompressed format.

10. Windows Bitmap (§ A.24 is a standard format for PC Windows programs.

Imagecopy can also save images in JFIF (JPEG) format when converting images (§ 4.3.2.3.1), but this format is not available for copying images, since it is unsuitable for copying normal program screens (it was designed for photographic images) and is also slower than other formats. If you want to copy images in this format you can convert them after they have been saved in a different format such as TIFF.

☞ *If you select a format which does not support the current screen depth, images are saved in the next available colour depth. Where an image format is unable to save images with more than 256 colours (e.g. DEGAS or GIF), Imagecopy uses an alternative format (the most recently selected compatible format). For example, 4-bit images are saved as 8-bit images if you select Targa format, and 16-bit images are saved as TIFF images if you change the format from TIFF to GIF.*

4.3.3.3.1.2 Compression

This option controls whether an image is uncompressed or compressed using RLE or LZW compression. Certain types of compression are only available with particular image formats: LZW compression is restricted to GIF and TIFF formats. Compressed images (normally) take up less disk space than uncompressed images, but they also take longer to load and save. LZW compression produces significantly better compression ratios than RLE compression, but is slower.

4.3.3.3.1.3 True Colour

This controls the number of colour bits per pixel which will be used to save *true-colour* images (it has no effect on other images). True-colour images normally have 15, 16 or 24 bits per pixel. If you select 'screen depth' Imagecopy matches the current screen depth (if possible). 16-bit images take up less disk space than 24-bit images, but 24-bit images are more widely supported by other programs.

4.3.3.3.2 Keys

```
Alt-Help keys...            [ Reinstall ]

Alt-Help                    [ Copy image  ]
Ctrl-Alt-Help               [ Print screen ]
Shift-Alt-Help              [ Not used    ]

[ Save ]           [ OK ]  [ Cancel ]
```
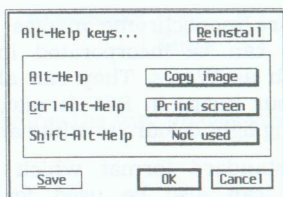
Imagecopy allows you to use [Alt-Help], [Control-Alt-Help], and [Shift-Alt-Help] key combinations to copy screen images or print screen dumps. This is quicker than selecting Imagecopy from the desk menu, and can also be used in situations where the desk menu is inaccessible (such as in non-GEM programs, or when menus or dialog boxes are displayed in GEM programs). The Alt-help keys dialog allows you to configure these key combinations by clicking on the buttons next to 'Alt-Help', 'Ctrl-Alt-Help', and 'Shift-Alt-Help'. This offers three choices for each keystroke: 'Copy image', 'Print screen', or 'Not used' - with the last option, Imagecopy passes control to the standard [Alt-Help] routine (giving draft-quality screendumps on 9-pin printers), or to an alternative routine which has been installed from an auto folder.

☞ *Under TOS 1.0, [Control-Alt-Help] keypresses cannot be intercepted and the 'Ctrl-Alt-Help' option is therefore disabled. In this case, you can configure the [Shift-Alt-Help] button to perform screen dumps.[1]*

The 'reinstall' button reinstalls [Alt-Help] routines in case they have been disabled by another program (such as Didot). This has the effect of disabling any [Alt-Help] routine which was installed after Imagecopy's routine.

4.3.3.3.3 Settings

These options affect the way in which images are copied or screen dumps printed.

```
Copy settings...           [ OK ]
                           [ Cancel ]
⊠ Auto save
⊠ Hide mouse               [ Save ]
☐ Screen buffer
☐ Copy physical screen
☐ Invert mono
```
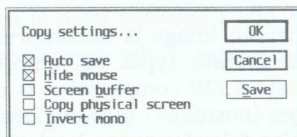
4.3.3.3.3.1 Auto save

This option determines whether an image is automatically saved to disk

---

[1] Select 'Not used' for [Shift-Alt-Help] if you have a memory-resident debugger which uses this keystroke to break into programs. This is not necessary if you use a debugger which is started from the GEM desktop or a command shell.

when you press [Alt-Help]. If this option is not selected, the image is kept in
memory until you select 'save image' from Imagecopy's menu (so long as the
memory used to store the image is not released by TOS; see below). This is
normally less convenient, but there are a few programs in which you may be
unable to grab images while autosave is selected.[1] If you wish to copy an
image from a non-GEM program and save it after returning to the desktop,
you will have to configure Imagecopy so that it reserves its own screen buffer
when it is first started (see next paragraph).[2]

4.3.3.3.3.2 Hide mouse

This option allows you to choose whether the mouse will be hidden or
displayed when copying images or printing screen dumps. If the mouse is not
hidden it will be restored to its original shape and position before it is copied –
you can use the mouse to define an image boundary without having to move
it back before the image is copied.

4.3.3.3.3.3 Screen buffer

If this option is selected, Imagecopy reserves one screen-size buffer for copying
and displaying images (etc.) This can be used to avoid problems which can
occur if the accessory version of Imagecopy is used inside programs which grab
all available memory for their own use. However, you should normally be able
to copy images without using this option: Imagecopy 3 will save images
directly from the screen if it cannot allocate additional memory, so long as the
'auto save' option is selected.

☞ *If you use Imagecopy within another program (or a replacement desktop
such as Neodesk) instead of from the GEM desktop this option is disabled.
This is because memory which is allocated by a desk accessory is
automatically freed by TOS when the current application terminates.
Imagecopy needs to have a screen buffer which is not lost in this way.
Changing buffers from the GEM desktop is OK because the desktop does
not terminate unless you change resolution or reset your computer.*

☞ *If you change the 'screen buffer' option repeatedly, the memory in your
computer may become fragmented (i.e. split into a number of smaller
blocks) as a consequence of the way that TOS allocates memory.
Fragmented memory can still be used by programs, so long as these do
not require memory blocks that are larger than the largest remaining
block. If you are curious, you can use Freemem (§ 5.3) to display your*

---

[1]   The reason for this is that Imagecopy tries to avoid making disk accesses
during a GEMDOS routine (this would cause a system crash). If a program uses
GEMDOS routines to receive keyboard input, [Alt-Help] keypresses are likely
to occur in the middle of a GEMDOS routine, and Imagecopy will pass control
back to GEMDOS if the autosave option has been selected. There is no problem
in copying images during a GEMDOS routine if the autosave option is not
selected.

[2]   Images which are stored in memory are discarded if the memory is
released by TOS before they have been saved; this normally happens when a
main program is started or finished, unless the image is stored in a screen
buffer which has previously been reserved by Imagecopy. See § 3.10.1.

current memory situation.

4.3.3.3.3.4 Copy physical screen

This option causes Imagecopy to copy (or print) the physical screen instead of the logical screen. In most cases these are identical, but some programs (such as debuggers) maintain separate physical and logical screens. In this case you might want to copy or print the physical screen (which is the screen you can actually see) rather than the logical screen. One problem with selecting the physical screen as the default option is that Imagecopy has no way of determining its size and layout. If these are not the same as the logical screen's size and layout (as is the case with some virtual large screen programs), Imagecopy will produce a garbled image (or crash!).

4.3.3.3.3.5 Invert mono

The 'invert mono' option can be used to correct systems which reverse the monochrome palette (this seems to happen with some video cards): select this option if monochrome screen shots taken with Imagecopy appear in reverse video when they are displayed with the 'view' option.

4.3.3.4 Windows

```
Windows      ◇  Overlapping ⌂^O
                Tiled       ⌂^T
                Full        ⌂^F
                Hide        ⌂^H
                Show        ⌂^S
```

The windows option allows you to arrange windows on screen. The 'over-lapping', 'tiled', and 'full' options cause windows to be positioned so that they overlap with their title bars showing, or are tiled side by side, or displayed at full size. The 'hide' option causes windows to be (temporarily) hidden. This may be useful if you are using Imagecopy as an accessory or running it with other programs in a multitasking environment (Imagecopy's windows can be hidden to make room for other programs). Hidden windows can be redis-played with the 'show' option.

4.3.3.5 Preferences

```
Preferences  ◇  Image       ^I
                Menu keys   ^K
                Measurements ^M
                Paths       ^P
                System      ^Y
```

4.3.3.5.1 Image
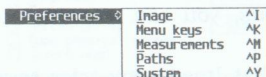
```
Image preferences...            ┌──────┐
                                │  OK  │
                                └──────┘
                                ┌──────┐
                                │Cancel│
                                └──────┘
  ☒ Baseline TIFF               ┌──────┐
  ☐ Word-align 24-bit IMG       │ Save │
                                └──────┘
```
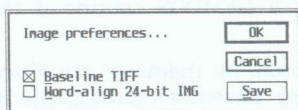
4.3.3.5.1.1 Baseline TIFF

This option causes Imagecopy to save TIFF files with colour depths that are specified as part of the baseline TIFF standard (for increased compatibility with other programs). Baseline TIFF colour depths are: 1-bit (monochrome), 4-bit and 8-bit (palette-colour and greyscale), and 24-bit (true-colour). Otherwise, Imagecopy uses a wider range of colour depths: 1-bit (monochrome), 2/3/4/5/6/7/8-bit (palette-colour and greyscale), and 15/16/24-bit (true-colour). If LZW compression is selected, Imagecopy offers a choice of 12, 15, 16, 18, 21, or 24-bit true-colour depths, but saves images with an actual colour depth of 24 bits after masking off the unused colour bits: '15-bit' LZW-compressed images are read by other programs as 24-bit images but take up less disk space than full 24-bit images.

One consequence of selecting 'baseline TIFF' is that ST medium-resolution images (2-bit images) are saved as 16-colour (4-bit) images, since 2-bit colour depth is not supported by baseline TIFF.

LZW compression is, strictly speaking, not part of baseline TIFF, but most baseline TIFF programs can read LZW-compressed images.

4.3.3.5.1.2 Word-align 24-bit IMG

This option causes Imagecopy to read and write 24-bit (true-colour) IMG files in word-aligned format. Palette-colour IMG files are always byte-aligned, but some programs (such as Pixart) expect true-colour IMG files to be word-aligned, while others (such as True Paint) require byte-aligned images.

☞ *Byte-aligned and word-aligned images are identical if the image width is divisible by 16 (or if it is divisible by 16 when it is rounded up to the next multiple of 8).*

4.3.3.5.2 Menu keys

'Menu keys' allows you to reconfigure Imagecopy to use a different set of single-key shortcuts. Any standard key or [Control] key combination can be used for this purpose. [Alternate] key combinations are used by Imagecopy for multi-key shortcuts and dialog shortcuts.

```
Set Menu Keys...              [    OK    ]

Press a normal or control     [ Cancel  ]
key equivalent (SPACE to
clear).                       [  Save   ]

Menu    : Options                  [↑]
Item    : Printer
Subitem : Print layout             [↓]

Key     : ^L
```
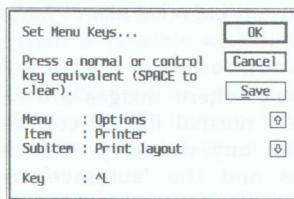
Keyboard shortcuts are reconfigured by scrolling through menu items and pressing any alphanumeric key as a keyboard equivalent for that item. Keys may be combined with [Shift] and/or [Control]: [A], [Shift-A], [Control-A], and [Shift-Control-A] can be used to select four different items. The [Space] key can be used to clear a keyboard shortcut; other keys are ignored. Imagecopy displays an alert if you press a key which has already been assigned to a

different item. To scroll through menu items you can either click on the arrow buttons or use [Uparrow] and [Downarrow] keys; press [Shift] at the same time if you want to select the next or previous menu rather than the next or previous item.

4.3.3.5.3 Measurements

```
Measurements...        [    OK    ]
                       [ Cancel ]
 ⦿ Inches
 ○ Centimetres         [   Save   ]
```
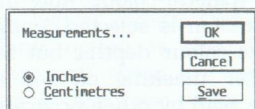
This allows you to select inches or centimetres as the basic unit of measurement. Select whichever unit you are most comfortable in using and then use the Save button to save it as the default option.

4.3.3.5.4 Paths

'Paths' allows you to define default program and image directories. This is normally done by selecting the path which you wish to change and using the file selector to select a new path, but you can also edit a path by hand if you hold down a [Shift] key while you select it.

```
Paths...

Program:
D:\IMGCOPY_____

Images:
D:\IMGCOPY\IMAGES_____

[ Save ]        [    OK    ] [ Cancel ]
```
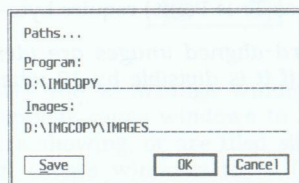
4.3.3.5.4.1 Program

This is the directory which Imagecopy use to locate its own program file (for saving preferences) or when writing a log file.

4.3.3.5.4.2 Images

This is the default directory where images are saved and loaded. In cases where Imagecopy displays a normal file selector before saving files, you can use this to save images in any directory. This is not possible if you use [Alt-Help] to copy images and the 'autosave' option is selected. In this situation, Imagecopy cannot display a GEM file selector (it is not possible to access GEM from an [Alt-Help] interrupt), so it displays a filename dialog (which looks like a GEM dialog but isn't), and the image file is saved under this filename in the default directory.

When loading images, this option affects only the first image to be loaded. Otherwise, Imagecopy looks in the last directory which was used to save or load images (this makes it easy to view any image which has just been saved).

4.3.3.5.5 System

```
System Preferences...          [  OK  ]
                               [Cancel]
Submenu delay:  30_ msecs
Max windows  :  21             [ Save ]

⊠ Center dialogs
⊠ External JFIF loader
⊠ Log file
```
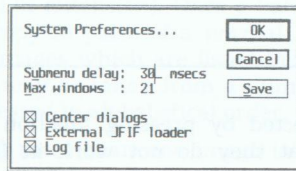
This allows you to configure basic system preferences which affect the way Imagecopy works.

4.3.3.5.5.1 Submenu delay

This is the delay (in milliseconds) before submenus are displayed. Long delays may be irritating, but too small a delay will cause submenus to flash onto the screen as the mouse moves down a main menu. The default value is 30 milliseconds.

4.3.3.5.5.2 Max windows

This specifies a maximum number of windows which Imagecopy may use. Falcon versions of TOS may crash if you try to open more than 15 windows from within a single application. Limiting Imagecopy to 15 windows prevents this happening. Pre-Falcon versions of TOS have a built-in limit of 7 windows, and Imagecopy has a built-in limit of 21 windows.

4.3.3.5.5.3 Centre dialogs

This causes dialogs to be centred. Deselect this option if you would prefer dialogs to be displayed at the mouse cursor position (in the same way that alerts are positioned).

4.3.3.5.5.4 External JFIF loader

If you have a Falcon computer, Imagecopy can use an external program (*jpeg.prg*) to load JFIF images. This is loaded from an auto folder at boot time, and uses the DSP (Data Signal Processor) chip inside the Falcon to decompress JFIF images more quickly than is possible with non-DSP routines (about four times as fast). If you display images in monochrome or a palette-colour mode (2, 4, 16, or 256 colours), the difference in speed may be less noticeable: using a DSP program to decompress JFIF images makes no difference to the subsequent time needed to process the image so that it can be displayed with fewer colours.

This option is disabled (greyed out) if Imagecopy is not running on a Falcon or if *jpeg.prg* has not been loaded from an auto folder.

4.3.3.5.5.5 Log file

Imagecopy normally records batch conversion and print operations in a log file, so you can leave it to work unattended and check the log file at a later time to see if any problems occurred. If you do not have a hard disk you may prefer to disable this feature to prevent unwanted log files from being written

to floppy disks containing your image files. Imagecopy creates a new log file (and deletes any previous log file) for each working session (§ 4.5).

4.4 Function key options

These options can be selected by pressing function keys (at the top of the keyboard). Please note that they do not work in full-screen mode, only in window mode.

4.4.1 F1 : Eject page

This option causes a form feed to be sent to the printer so that the current page is ejected. Imagecopy displays an alert to check that you want to do this (in case you hit the key by accident).

4.4.2 F2 : Invert image

This option inverts an image so that it is converted from positive to negative and vice versa. This affects the top window on screen (other image windows are unaffected). If you select this option by accident you can reverse it by selecting it a second time.

4.4.3 F3 : Restore palette

This causes Imagecopy to restore the default palette. In contrast to earlier versions of Imagecopy, Imagecopy 3 does not change the screen palette when the menu window is topped, or when dialogs are displayed, unless text would be unreadable with the current palette (in which case it reinstates the default screen palette before displaying dialogs and alerts). If you select 'match colours' in the 'screen display' dialog, this should hardly ever happen. If the screen does become unreadable, you can press F3 to reinstate the default palette (until the top window is redrawn).

4.4.4 F10 : Close windows

This option closes all image windows which are currently open on screen. This is useful if you want to display a new set of images without having to close existing windows by hand. Imagecopy displays an alert to confirm that you want to do this.

4.5 Batch operations

Imagecopy 3 allows some operations (including printing, viewing, and converting images) to be automated so that they process batches of images. One way of doing this is to select a folder of images instead of a single image. In this case Imagecopy works through the folder, ignoring any non-image files. You can also use wildcards such as '*.TIF' to process all the TIFF files in a folder, or 'A*.TIF' to process all TIFF files beginning with 'A'. Wildcards may be entered on the directory line of the file selector (in place of the current mask), or on the filename line if this is easier.

Another way of processing a batch of images is to use a batch file which contains a list of images. A program called Filelist (§ 5.2) can be used to create batch files (these have a .LIS extension). Once a batch file has been created, it can be selected in Imagecopy in place of a normal image file, and Imagecopy will then process all the images which are listed in it. One advantage of using batch files is that images may be taken from a number of different directories and do not have to be processed in alphabetical order.

A third way of processing more than one image is to use the shareware file selector Selectric, which can be used to select more than one file at a time (this only works with programs that are designed to co-operate with Selectric).

When printing or converting more than one image, Imagecopy opens a log window to report on progress and on any problems which occur. It also (normally) records the same information in a log file (called *imgcopy3.log*), so you can leave it to work unattended and check the log file after it has finished. This is a simple ASCII file which can be loaded into a text editor or wordprocessor, or viewed from the desktop by double-clicking on it. Image-copy creates a new log file (and deletes any previous log file) on the first occasion in which a log window is opened during a work session. The log file is normally saved in the same directory as Imagecopy itself (this can be configured using the 'paths' option, § 4.3.3.5.4.1). If you have do not have a hard disk you may want to disable the log-file option to prevent unwanted log files from being written to floppy disks containing image files.

Imagecopy

0	Imagecopy Log	8
	May-18-1994 18:36:26	
	Converting H:\PHOTOS\BRESSING.TIF Saved as I:\JPEG\BRESSING.JPG	
	Converting H:\PHOTOS\DOVEDALE.TIF Saved as I:\JPEG\DOVEDALE.JPG	
	Converting H:\PHOTOS\GARDEN.TGA Saved as I:\JPEG\GARDEN.JPG	
	Converting H:\PHOTOS\JESSICA.TIF Saved as I:\JPEG\JESSICA.JPG	
	Converting H:\PHOTOS\TISSNGTN.TIF Saved as I:\JPEG\TISSNGTN.JPG	
	5 files converted	
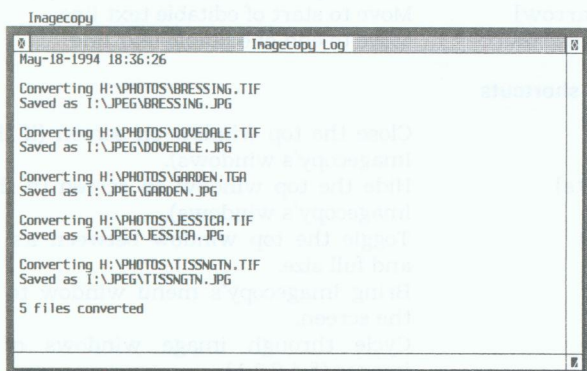
Batch operations can be interrupted by pressing [Undo].

4.6 Keyboard shortcuts

Imagecopy provides an extensive range of keyboard shortcuts, which cover

almost every aspect of the program.

4.6.1 Menu shortcuts

4.6.1.1 Single-key shortcuts

Single-key shortcuts are indicated by a letter after the menu option and are performed using standard or control keys. They can be reconfigured with the 'menu keys' option (§ 4.3.3.5.2).

4.6.1.2 Multi-key shortcuts

Multi-key menu shortcuts are indicated by underlined letters and performed using [Alternate] keys. These are a useful alternative to single-key shortcuts in situations where you cannot remember a particular single-key shortcut.

4.6.2 Dialog shortcuts

4.6.2.1 Alternate-key shortcuts

Alternate-key shortcuts are indicated by underlined letters (like multi-key menu shortcuts).

4.6.2.2 Other dialog shortcuts

1.	[Undo]	Cancel
2.	[Return]	Select the default exit button in a dialog or alert.
3.	[Shift-Tab]	Move to previous editable text line (= [Uparrow])
4.	[Shift-Leftarrow]	Move to start of editable text line
5.	[Shift-Rightarrow]	Move to end of editable text line

4.6.3 Window shortcuts

1.	[Delete]	Close the top window on screen (if this is one of Imagecopy's windows).
2.	[Shift-Delete]	Hide the top window on screen (if this is one of Imagecopy's windows).
3.	[Clr/Home]	Toggle the top window between its current size and full size.
4.	[Insert]	Bring Imagecopy's menu window to the front of the screen.
5.	[Tab]	Cycle through image windows or full-screen images (§ 4.3.2.1).
6.	[Esc]	Switch between displaying an image within a GEM window (with scroll bars etc.), or on a full screen (§ 4.3.2.1). Display 'slide show' dialog (§ 4.3.2.4.10).
7.	[Space]	Display next slide-show image (§ 4.3.2.4.10).
8.	[Return]	Display information about an image in the current window (§ 4.3.2.1).
9.	[Arrow]	Scroll images in line-sized units (§ 4.3.2.1).
10.	[Shift-Arrow]	Scroll images in page-sized units (§ 4.3.2.1).

4.6.4 Copying shortcuts

1. [Clr/Home]   Toggle the outline box used for copying images between its current size and full screen (or maximum) size (§ 4.3.2.6).
2. [Undo]   Abandon an image-copying operation (§ 4.3.2.6).
3. [Return]   Copy a selected image (§ 4.3.2.6).
4. [Insert]   Display/edit the width and height of the outline copying box (§ 4.3.2.6).
5. [Arrow]   Move the outline copying box in 8-pixel increments (§ 4.3.2.6).
6. [Shift-Arrow]   Move the outline copying box in 8-pixel increments (§ 4.3.2.6).
7. [Control-Arrow]   Resize the outline copying box in 8-pixel increments (§ 4.3.2.6).
8. [Shift-Control-Arrow]   Resize the outline copying box in 8-pixel increments (§ 4.3.2.6).

4.6.5 Other shortcuts

1. [Undo]   Abort printing or batch processing (§§ 4.3.2.2, 4.5). End slide show (§ 4.3.2.4.9).

Chapter 5
Other programs

5.1 Fastprint

Fastprint (*fastprnt.prg*) is a small auto-folder program which intercepts system printer calls and replaces them with (fast) direct output routines. This speeds up print output from GDOS programs and some non-GDOS programs (Imagecopy already contains its own fast output routines). If you use this program you should normally make sure that it is copied into your auto folder in front of other print programs: these may fail to work if Fastprint intercepts printer output first.

5.2 Filelist

```
 Filelist  File  Edit
┌─────────────────────── G:\IMGCOPY3\SLIDES.LIS ───────────────────────┐
│ H:\BMP\BGIRL.BMP                                                      │
│ H:\BMP\BIKES.BMP                                                      │
│ H:\BMP\GIRL3.BMP                                                      │
│ H:\PCX\HUMBIRD.PCX                                                    │
│ H:\LBM\CELTIC.LBM                                                     │
│ H:\LBM\CLOWN.LBM                                                      │
│ H:\TIFF\QUEEN256.TIF                                                  │
│ H:\BMP\LITEHOUS.BMP                                                   │
│ H:\BMP\PARROT.BMP                                                     │
│ H:\BMP\PLANE.BMP                                                      │
│ H:\BMP\RAFT.BMP                                                       │
│ H:\PHOTOS\BRESSING.TIF                                                │
│ H:\PHOTOS\DOVEDALE.TIF                                                │
│ H:\PHOTOS\GARDEN.TGA                                                  │
│ H:\PHOTOS\JESSICA.TIF                                                 │
│ H:\PHOTOS\JOSHUA1.TIF                                                 │
│ H:\PHOTOS\JOSHUA2.TIF                                                 │
│ H:\PHOTOS\TISSNGTN.TIF                                                │
└──────────────────────────────────────────────────────────────────────┘
```
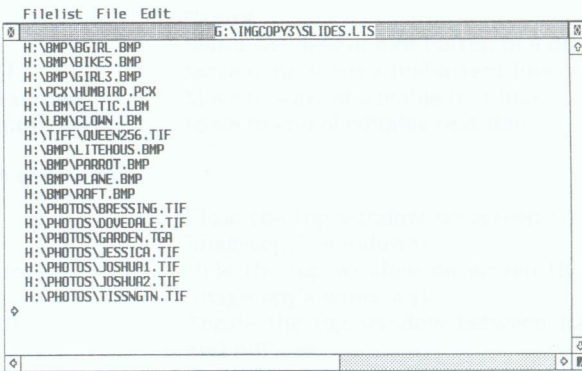
This is a simple file list editor which allows you to create or edit batch files containing lists of file names. If you load a list file into an ASCII editor, you will see that it is a plain list of file names with full directory paths such as c:*images**butrfish.jpg*. List files have a LIS file extension.

Filelist displays a small arrow to indicate the position at which new file names will be inserted or deleted. This can be moved using cursor keys or by clicking at a different point in the list.

5.2.1 File menu

5.2.1.1 New

This opens a new list window.

5.2.1.2 Open

This opens a list file in a new window.

5.2.1.3 Insert

This inserts a second list file into the file which you are currently editing (at the current arrow position).

5.2.1.4 Close

This closes a list window.

5.2.1.5 Save

This saves the list file which you are currently editing.

5.2.1.6 Quit

This quits the program.

5.2.2 Edit menu

5.2.2.1 Delete

This removes a file name.

5.2.2.2 Undelete

This reinserts a file name which has been deleted. This can be used with the previous option to change the order in which filenames are listed.

5.2.2.3 Add

This displays a file selector from which you can select a new file name to add to the list.

5.2.2.4 Clear

This clears the current window.

5.3 Freemem

This is a small memory utility which reports on how much free memory (RAM) is currently available. Most programs of this type report how much memory is in the largest free memory block.[1] By contrast, Freemem reports how much memory is available in each free block, how much total free memory is available, how much memory is in use (by TOS and other programs), and the total amount of RAM in your computer. Freemem adds its own (small amount of) memory to the largest free block, so it effectively reports how much memory was available before it was loaded.

On a TT, Freemem reports ST and TT memory separately. If you find that

---

[1]   This is also true of the free memory report in Imagecopy's menu window.

some of this information scrolls off the top of the screen, you can use [Control-S] to pause the screen display and [Control-Q] to continue.

5.4 Password

```
╔══════════════════════════════════════╗
║ ✳  Password 1.0              ┌────────┐║
║ Written by Jeremy Hughes     │   OK   │║
║ 18th May 1994                └────────┘║
║                              ┌────────┐║
║ PUBLISHED BY FaST CLUB 0602 455250 │Cancel│║
║                              └────────┘║
║ Password: !@**%_____ ║
║                                        ║
║ Retries : 8    ☐ Echo password         ║
╚══════════════════════════════════════╝
```
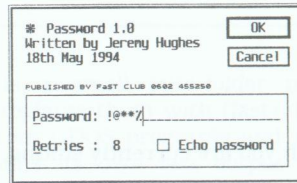
If you have a hard disk, Password can be placed in an auto folder of the hard disk to prevent other people from having access to your computer. You can configure Password by double-clicking on it. This allows you to change the password, set a maximum number of permitted retries (to allow for typing mistakes), and control whether the password is echoed to the screen when it is typed. The password may contain up to 20 characters, including all printable characters (ASCII 32-126 and 128-255). Deselecting 'echo password' makes it more difficult for someone to learn the password by watching you type. If the maximum number of permitted retries is exceeded, Password emits a continuous bleep, which can only be stopped by resetting the computer. Password does not give absolute security: you can bypass it if you bypass your hard disk driver (press [Alternate] if you have an Atari hard disk driver (AHDI), or a combination of [Shift], [Control], and [Alternate] with other drivers) and then boot from a floppy disk containing a copy of your hard disk driver. This is useful if you forget your password.

[Shift-Insert] toggles 'echo text' off and on while a password is being typed.

☞   *Before using Password, make sure you know how to bypass your hard disk driver. Password should be one of the first programs in your auto folder and should definitely come before any resident debugger which could be used to bypass it.*

☞   *Choose a password that is easy for you to remember, but hard for someone else to guess (don't use 'God' or 'Boss'). Use non-alphabetic characters or a mixture of upper and lower case if you want the password to be difficult to guess. But don't get carried away: anyone who is really determined can get into your system by using hard disk utilities on a floppy disk.*

Appendix A
Image file formats

This appendix describes image file formats which can be used with Imagecopy. Formats which Imagecopy uses to save images are indicated by an asterisk. Other formats can be read but not written. For general purposes, TIFF is probably the best format to use, but some ST programs have poorly implemented TIFF support (§ A.21). Targa is a useful alternative to TIFF for true-colour and greyscale images (§ A.20). IMG is probably the most widely supported format on Atari systems, but has problems as a colour format (§ A.7). Other useful formats (especially for transfer to non-Atari systems) include GIF (§ A.5), IFF (§ A.6), PC Paintbrush (§ A.12), and Windows Bitmap (§ A.24). Finally, JFIF provides high compression ratios with photographic and other continuous tone images, but is not suitable for standard screen shots (§ A.8).

A.1 Art Director

This ST-specific format was developed for use with the Art Director paint program. It can only represent ST low-resolution screen-sized images with 16 colours from an ST(E) palette of 512 or 4096 colours. Images are always uncompressed.

Image size:	ST low-res (320x200).
Colour type:	colour (4-bit).
Compression:	none.
File extension:	ART.

A.2 Calamus Raster Graphic

This is format is used by Calamus to store monochrome image files.

Image size:	variable.
Colour type:	monochrome.
Compression:	RLE.
File extension:	CRG.

A.3 *DEGAS

This ST-specific format was originally developed as a proprietary format for the DEGAS art program (later upgraded to DEGAS Elite), but has since become a common image format on ST computers. Most ST art programs read DEGAS images in addition to other formats.

In spite of its popularity, the DEGAS format has a number of serious limita-

tions which reduce its usefulness:

1. It is a fixed-size format which cannot display images which are larger (or smaller) than an ST (or TT) screen.

2. Support for TT resolutions is an addition to the original format, and there are different varieties of TT DEGAS images.[1] ST programs which read normal DEGAS files may be unable to read TT DEGAS files.

3. The colour palette was originally limited to 16 colours, although this has been extended to 256 colours in TT-resolution images.

4. The colour palette is stored in ST(E) (or TT) hardware format, which uses a maximum of 12 bits for each colour (giving a palette with 4096 possible colours). The Falcon 030 palette contains 262,144 possible colours, and 24-bit palettes can distinguish over 16 million different colours.

DEGAS files may be uncompressed, in which case they have a PI? extension, or RLE-compressed, with a PC? extension. The third character of the extension is a number indicating the image resolution: 1 = ST low resolution (320x200 with 16 colours), 2 = ST medium resolution (640x200 with 4 colours, 3 = ST high resolution (640x400 with 2 colours), 5 = TT medium resolution (640x480 with 16 colours), 7 = TT high resolution (1280x960 with 2 colours), and 8 = TT low resolution (320x480 with 256 colours).

Imagecopy can save monochrome and palette-colour images in DEGAS format. Images which are larger than an ST screen are saved in a TT format (where possible) and images which are larger than an ST or TT screen are cropped to the size of an ST or TT screen. Images which are smaller than an ST or TT screen are padded with white space. Given the limitations of this format, you should normally avoid using it to save images, unless you need to import them into a program which does not support more advanced formats. Imagecopy makes no attempt to understand strange versions of TT DEGAS images.

Image size:	ST/TT screen sizes.
Colour type:	monochrome, colour (1/2/4/8-bit).
Compression:	none/RLE.
File extension:	PI{123578} (uncompressed) or PC{123578} (compressed).

A.4 Doodle

This format is used by DR Doodle (a simple monochrome paint program) to store ST high-resolution screen images. It is identical with the PIC format.

Image size:	ST hi-res (640x400).
Colour type:	monochrome.
Compression:	none.
File extension:	DOO.

---

[1] Following the example of ST DEGAS images (with 16-colour ST-format palettes for all resolutions), TT DEGAS images should contain a 256-colour TT palette for any resolution, and this should be stored in TT-specific format (without bit-rotation).

A.5 *GIF (Graphics Interchange Format)

GIF (pronounced *jif*) was developed by CompuServe Inc as a format for on-line transmission of graphic images. It is capable of representing images containing up to 256 colours from a 24-bit palette. GIF images are always compressed using LZW compression, which gives good compression ratios but takes longer to decode than RLE compression. The GIF format was not originally intended to be used as a format for storing images, but its usefulness in transmitting images on-line has ensured that large numbers of GIF images have been downloaded to bulletin boards and are now widely available from PD sources. The main limitation of the GIF format is that it cannot represent images containing more than 256 colours.

We are required to state that:

The Graphics Interchange Format(c) is the Copyright property of CompuServe Incorporated. GIF(sm) is a Service Mark property of CompuServe Incorporated.

Image size: variable.
Colour type: monochrome, colour (1/2/3/4/5/6/7/8-bit).
Compression: LZW.
File extension: GIF.

A.6 *IFF (Interchange Format Files)

This format was originally used on the Amiga, where it was developed by Electronic Arts as a format for the transfer of images, text, sound, and other data, but it has since spread to other systems as Deluxe Paint was ported from the Amiga to the PC and ST. It has fewer limitations than ST-specific formats, and is capable of representing palette images with up to 256 colours, Amiga hardware formats, and 24-bit true-colour images. Images may be stored in uncompressed format, or compressed using RLE compression. IFF RLE compression can give good results with true-colour images (which are normally difficult to compress), since it compresses each bit-plane separately.

Imagecopy reads several different varieties of IFF images: standard IFF, HAM (Hold and Modify - an Amiga hardware format), Packed bitmap (a PC Deluxe Paint format), and DPST (Deluxe Paint ST). It always writes standard IFF files. These formats are identified in Imagecopy's 'image information' dialog as IFF, IFF (HAM), IFF (PBM), and IFF (DPST).

Image size: variable.
Colour type: monochrome, colour (1/2/3/4/5/6/7/8/15/16/24-bit).
Compression: none/RLE.
File extension: IFF or LBM (Interleaved Bit Map).

A.7 *IMG

The IMG format was developed by Digital Research for use by GEM programs and is one of the most widely supported image formats on Atari computers. It

works well as a monochrome format, but has a serious defect as a colour format since the original specification made no allowance for colour palettes. A second problem is that there is no way of distinguishing between colour images and greyscale images.

There have been several attempts to correct the omission of a colour palette. Atari's Hyperpaint program extended the IMG header to include a copy of the ST(E) hardware palette. More recently, an alternative format has originated in Germany. This format, which is sometimes known as XIMG (the first four bytes of the extended header contain the string 'XIMG') extends the IMG header to include a copy of the VDI (virtual) palette.

Imagecopy 1 used the Hyperpaint format to save colour images, but this goes against the spirit of GEM by using a hardware palette instead of the VDI palette, and cannot easily be adapted to TT and Falcon video modes. Imagecopy 3 can read Hyperpaint IMG files, but it writes IMG files using either the plain IMG format for monochrome and greyscale images or the extended (XIMG) format for colour images. Any IMG file which contains between 2 and 8 colour planes and no palette is interpreted as a greyscale image; if it isn't, you can at least get some idea of what it is intended to represent, and the results are usually better (or no worse) than the results of applying a different palette such as the current screen palette.

The XIMG format can also be used for true-colour images, but its usefulness for this purpose is diminished by the fact that there are several incompatible varieties of true-colour XIMG format: RGB or interleaved, word-aligned or byte-aligned. Imagecopy reads and saves the most common formats, which are RGB byte-aligned and RGB word-aligned (an 'image preferences' option allows you to choose between these: § 4.3.3.5.1.2). Palette-colour images are normally byte-aligned, but some programs (such as Pixart) expect true-colour images to be word-aligned, while others (such as True Paint) expect them to be byte-aligned. (Word-aligned and byte-aligned images are identical if the width of the image is divisible by 16 after it has been rounded up to the next multiple of 8.) True Paint normally saves 16-bit true-colour IMG files, which most other programs cannot read. Imagecopy reads these but converts them to 24-bit images before resaving them.

Imagecopy can also read an alternative true-colour format produced by Ventura Publisher on the PC.

☞ *Some programs which read IMG files are unable to cope with extended IMG files, and will crash if you try to load these files. PageStream and Calamus are notorious in this respect: you can use (plain) IMG for any monochrome images which you want to load into these programs, but you should use a different format for colour images. Other programs (such as Timeworks Publisher) can load extended IMG files but ignore the palette information in the extended part of the image header. IMG is best treated as a monochrome format for DTP purposes, although it is a useful colour format with some paint programs.*

IMG files are normally compressed using RLE compression, although some programs write IMG files without compressing them properly. Badly compressed images can be reduced considerably in size by using Imagecopy's 'convert' option to resave them. Some programs (such as Notator) write truncated IMG

files which other programs may be unable to read. Imagecopy reads them but displays a warning that they are incorrect. Once again, you can use Imagecopy's 'convert' option to resave them as normal IMG files: the truncated part of the image is normally white space which Imagecopy adds.

The different varieties of IMG format are identified in Imagecopy's 'image information' dialog as: IMG, IMG (extended), IMG (Hyperpaint), and IMG (Ventura).

Image size:	variable.
Colour type:	monochrome, greyscale (2/3/4/5/6/7/8-bit), colour (1/2/3/4/5/6/7/8/16/24-bit).
Compression:	RLE.
File extension:	IMG.

A.8 *JFIF (JPEG File Interchange Format)

The JFIF format was developed to store images which are compressed using JPEG compression (developed by the Joint Photographic Experts Group). Standard JPEG compression is a 'lossy' compression scheme: the compressed image is not identical with the original uncompressed image, but the information which is lost is information which the human eye is normally less sensitive in detecting. High-quality JPEG images are hard to distinguish from original images, with compression ratios of around 8:1, and low-quality images (with more information lost) give even better compression. JPEG compression was designed to be used with photographic or realistic images, and does not cope well with non-realistic images (such as program screen shots). JFIF images may be greyscale or true-colour: palette-colour images must be converted to true-colour before they can be compressed.

See § 2.10.3 for a general discussion of JPEG compression, and § 4.3.2.3.5 for discussion of quality settings.

We are required to state that:

This software is based in part on the work of the Independent JPEG Group.

Image size:	variable.
Colour type:	greyscale (8-bit), colour (24-bit).
Compression:	JPEG.
File extension:	JPG.

A.9 MacPaint

This format was used by an early Mac program of the same name. It is limited to monochrome images with a fixed size of 576x720 pixels (smaller images are padded with white space). Images are (always) compressed using RLE compression. MacPaint images are now quite widely available from non-Mac sources.

Image size:	576x720.
Colour type:	monochrome.

Compression: RLE.
File extension: MAC (on non-Mac systems).

A.10 Neochrome

This ST-specific format was originally developed for use with the Neochrome
art program. It is limited in that it can only represent ST screen-sized images
with 2, 4, or 16 colours from an ST(E) palette of 512 or 4096 colours. Images
are always uncompressed.

Image size: ST screen resolutions.
Colour type: monochrome, colour (1/2/4-bit).
Compression: none.
File extension: NEO.

A.11 OS/2 Bitmap

This is the OS/2 equivalent (and precursor) of the Windows bitmap format (§
A.24). It supports monochrome, 16-colour, 256-colour, and 24-bit true-colour
images.

Image size: variable.
Colour type: monochrome, colour (4/8/24-bit).
Compression: none.
File extension: BMP.

A.12 *PC Paintbrush (PCX)

This format was originally developed as a proprietary format for PC Paint-
brush (a PC paint program), and is now commonly used by other PC programs.
It supports monochrome images, palette-colour images with up to 256 colours,
and 24-bit true-colour images. Images are (always) compressed using RLE
compression. Some PC programs write illegal PCX files which compress across
plane boundaries. Imagecopy can usually read these correctly, but other
programs may not.

Image size: variable.
Colour type: monochrome, colour (1/2/3/4/8/24-bit).
Compression: RLE.
File extension: PCX.

A.13 PIC

This format is used to store ST high-resolution screen images. It is identical
with the DR Doodle format (§ A.4).

Image size: ST hi-res (640x400).

Colour type: monochrome.
Compression: none.
File extension: PIC.

A.14 Pictor (PC Paint)

This is the proprietary format of a PC art program which was originally called PC Paint and later renamed as Pictor. It is also used by a number of PC animation programs. Images are compressed using RLE compression.

Image size: variable.
Colour type: monochrome, colour (1/4/8-bit).
Compression: RLE.
File extension: PIC.

☞   *The PIC extension is also used for ST high-resolution screen images (§ A.13), as well as for graphs produced by Lotus 1-2-3 (which Imagecopy does not read).*

A.15 Pixart

This format is used by Pixart (which can also read and save images in a variety of other formats). It is capable of storing images with up to 16.7 million colours (24-bit true-colour), and is primarily intended for temporary storage - images are uncompressed so they can be accessed quickly.

Image size: variable.
Colour type: monochrome, colour (1/2/4/8/16/24-bit)
Compression: none.
File extension: PIX.

A.16 Portable Bitmap

Portable Bitmap files are commonly found on UNIX systems. They are commonly used as an intermediate format which is used to convert between different types of image file. Image data is saved in uncompressed ASCII or binary format.

Image size: variable.
Colour type: monochrome, greyscale (8-bit), colour (24-bit)
Compression: none.
File extensions: PBM (monochrome), PGM (greyscale), PPM (colour).

A.17 *Prism Paint

This format is used by Prism Paint and has also been adopted by some other art programs such as True Paint. It is capable of storing images with up to 16.7

million colours (24-bit true-colour), and may be either uncompressed or compressed using RLE compression.

Image size: variable.
Colour type: monochrome, colour (1/2/3/4/5/6/7/8/15/16/24-bit).
Compression: none.
File extension: PNT.

A.18 *RSC free image

RSC free images are monochrome images which can be incorporated into GEM resource (RSC) files. This format is primarily of use to programmers. RSC images can also be imported into Fontkit Plus.

Image size: 128x128 (max).
Colour type: monochrome.
Compression: none.
File extension: RSC.

A.19 Spectrum

This is an ST-specific format which incorporates multiple palettes to allow images with more than 16 colours to be displayed on an ST low-resolution monitor using palette-switching techniques. It was originally developed as a proprietary format for the Spectrum 512 art program, but has since been adopted by other programs. Spectrum images may contain a theoretical maximum of 512 colours, but few images contain more than 256 different colours and some contain no more than 32 colours. This is understandable, since palette-switching imposes limitations on how many different colours can be displayed on the same line and where they can be placed within the line. Other limitations in this format are that images cannot be larger or smaller than an ST low-resolution screen (minus the top line, which cannot be displayed using this technique), and the palette from which colours are chosen does not normally contain more than 512 colours. Spectrum images may be stored in uncompressed format, or compressed using RLE compression.

Imagecopy does not contain any palette-switching code for displaying Spectrum images. If you have a system which is capable of displaying 256 colours (or more), Imagecopy will display Spectrum images with all their original colours; otherwise it remaps and dithers them to display them in up to 16 colours.

Image size: 320x199.
Colour type: colour (512 colours max).
Compression: none/RLE.
File extension: SPU (uncompressed) or SPC (compressed).

A.20 *Targa (Truevision)

The Targa format was originally developed to support Targa video boards for the PC, and has since become a widely-used format for true-colour images. Most Targa images are 24-bit true-colour images, but the Targa format also supports 32-bit true-colour images (with 8 bits of attribute data), 15/16-bit true-colour images, 8-bit greyscale images, 8-bit palette-colour images, and monochrome images. 15 and 16-bit images could become common on Atari systems because they match the 15/16-bit true-colour capability of the Falcon 030.

16-bit Targa images normally contain 15 bits of colour data and one bit of attribute data (which is usually ignored). This means that one bit of a 16-bit true-colour image is normally lost if it is saved in this format - the least significant green bit is discarded. Imagecopy avoids this problem by using the attribute bit to save the sixteenth bit and sets a flag in the (optional) extension area to let other programs know about this. Programs which ignore the extension area or are unable to interpret the attribute flag will simply read the image in as a 15-bit image.

Targa images can be compressed using RLE compression, but they are often uncompressed.

The Targa format is a useful alternative to TIFF for true-colour and greyscale images in cases where you have problems using TIFF files.

Image size: variable.
Colour type: monochrome, greyscale (8-bit), colour (8/15/16/24/32-bit)
Compression: none/RLE.
File extension: TGA.

A.21 *TIFF (Tagged Image File Format)

TIFF is the standard format for bitmapped images on other computer systems, and should also become the standard format on Atari systems, although it has not been widely used by ST programs to date. TIFF caters for a wide range of image types, from monochrome to true-colour (and beyond). The current specification (TIFF 6.0) distinguishes between 'baseline TIFF' (core features) and 'extended TIFF' (containing optional extras). Baseline TIFF images can be read by most TIFF programs.

Imagecopy supports all features of baseline TIFF apart from Huffman compression (which is rare, and only used with monochrome images), and includes common extensions such as the ability to read LZW-compressed files. It will also read non-standard TIFF images which are produced by ST programs such as Retouche, but will display an alert to warn you that other programs may be unable to read these correctly. Typical problems include missing image fields and incorrect LZW compression. You can use the 'convert' option to resave these as normal TIFF images.

Problems in using TIFF images can occur where programs have only partial support for baseline TIFF. Calamus S(L) is reported to have problems in this

area. There is a bug in PageStream which causes monochrome compressed images to be loaded as negatives.

TIFF images can be compressed using RLE or LZW compression (there are also other less common compression schemes). True-colour images can be larger if they are compressed with RLE compression than if they are uncompressed. LZW compression gives better compression ratios but takes longer to read and save. A recent TIFF extension allows JPEG compression to be used with TIFF files, but this is uncommon.

☞ *Use LZW compression for efficient storage of colour images (especially 256-colour and true-colour images).*

☞ *Select 'baseline TIFF' in Imagecopy for compatibility with (most) baseline TIFF programs (§ 4.3.3.5.1.1). If compatibility problems persist, save images in uncompressed format and convert palette-colour images to 8-bit format (§ 4.3.2.3.4).*

Image size:	variable.
Colour type:	baseline TIFF: monochrome, greyscale (4/8-bit), colour (4/8/24-bit).
	non-baseline TIFF: monochrome, greyscale (2-bit to 8-bit), colour (1-bit to 32-bit)
Compression:	none/RLE/LZW.
File extension:	normally TIF, but Retouche uses TIC, TIH, TIM, and TIP extensions for TIFF colour, TIFF halftone, TIFF monochrome, and TIFF palette-colour.

A.22 Tiny

This is an ST-specific format which is limited to ST screen-sized images with 2, 4, or 16 colours from an ST(E) palette of 512 or 4096 colours. Images are compressed using RLE compression. The Tiny format was developed for use with Tinyview (a PD slide-show program) and is a popular format for ST PD images.

Image size:	ST screen sizes.
Colour type:	monochrome, colour (2/4-bit).
Compression:	RLE.
File extension:	TNY or TN{123} (for ST low, medium, or high resolution).

A.23 *True Paint

This format is used by True Paint. It is capable of storing images with up to 16.7 million colours (24-bit true-colour), and is primarily intended for temporary storage - images are uncompressed so they can be accessed quickly. The True Paint format is identical with the uncompressed Prism Paint format.

Image size:	variable.
Colour type:	monochrome, colour (1/2/3/4/5/6/7/8/16/24-bit)
Compression:	none.

File extension: TPI.

A.24 *Windows Bitmap

This is the standard bitmap format for Windows applications on PC computers.
It supports monochrome, 16-colour, 256-colour, and 24-bit true-colour images.
16-colour and 256-colour images may be compressed using RLE compression.

Image size:	variable.
Colour type:	monochrome, colour (4/8/24-bit)
Compression:	none/RLE.
File extension:	BMP or RLE (for compressed images).

Appendix B
Colour separation printing

If you have a monochrome printer, you can produce full-colour prints by using Imagecopy's colour-separation facility with separate ink cartridges or printer ribbons for each colour. I have used this method with a Deskjet 500 printer and got good results. Cyan, magenta, and yellow inks for deskjet and bubblejet printers are available from the sources listed at the end of this appendix. I have not tried this method of printing with dot-matrix printers, but it should work OK if your printer is capable of feeding single sheets accurately. You will need to find a source of cyan, magenta, and yellow printer ribbons. Some monochrome dot-matrix printers can be upgraded to full-colour printers, which offer an easier way of printing colour images.

There are several drawbacks to printing colour separations on inkjet printers. You normally have to be prepared to fill your own cartridges. This can be be time-consuming - you have to clean the original cartridge before you can fill it (unless you are filling it with the same colour), and it is potentially messy if you are not careful. *It should also be noted that that printer manufacturers including Hewlett-Packard and Canon disclaim responsibility for any problems which may occur as a result of using refilled ink cartridges.* A second problem is that cartridges tend to dry out if they are not being used. One way of dealing with this is to store cartridges in plastic bags with a piece of damp tissue whenever they are not in the printer.

If you have an HP Deskjet printer, it is possible that you can avoid problems with refilled cartridges by using Paintjet XL cartridges. These *may* be compatible with Deskjet cartridges, but you should check with a Hewlett-Packard supplier to confirm that this is the case.

The actual print method is straightforward. Stand the cartridges or ribbons on their sides on a (protected) surface and insert them at the appropriate point. Imagecopy displays an alert saying which separation it will print next, and gives you the option of carrying on, stopping, or skipping the next separation. Skipping is useful if you made a mistake with a previous print, like printing one separation on the wrong piece of paper. You can also use this option if you want to print several images: it is less fiddly to print each image in one separation (skipping other separations) before moving on to the next separation. This also allows time for each separation to dry before you print the next separation: if you neglect to do this you will get problems with print smudging and paper handling.

Appendix C
Programming information

If Imagecopy is configured to print screen dumps when an Alt-help combination is pressed, it will also intercept calls made to the XBIOS Scrdmp() routine (XBIOS 20). In this case, Imagecopy does not display an alert allowing the operation to be cancelled, or part of the screen to be selected, unless the [Alternate] key is pressed when the Scrdmp() routine is called.

If you mix Scrdmp() calls with buffered print output, you must ensure that print buffers are flushed before the Scrdmp() routine is called. In C, you can do this by including a fflush(stdprt) command. If you use a programming language which does not have an equivalent command, you may be able to achieve the same effect by pausing the program for a half second.

Printer margins are normally reset to zero (or their default setting) after an image is printed, and character pitch is reset to Pica on dot-matrix and Bubblejet printers (this is necessary because margin settings are dependent on the current character pitch). You can prevent this happening by switching off print positioning in Imagecopy (§ 4.3.3.2.4.1-2).

Appendix D

New features in Imagecopy 3

This appendix lists new features in Imagecopy 3 for the benefit of users who have upgraded from earlier versions.

D.1 Imagecopy 3.0

☐ The following features are new in Imagecopy 3.0:

☐ New image formats. In addition to the large number of previously available formats, Imagecopy 3 can read and write the following file types (§§ 4.1, A).

  ☐ New read formats: Calamus Raster Graphic (CRG), Deluxe Paint ST, Doodle/PIC, JFIF (JPEG), Portable Bitmap, Pictor (PC Paint), Pixart, Prism Paint, RSC image, True Paint, compressed Windows Bitmap.

  ☐ New write formats: GIF, IFF/Deluxe Paint, JFIF (JPEG), PCX, Prism Paint, Targa monochrome/palette-colour, TIFF LZW-compressed, Windows Bitmap, XIMG true-colour.

☐ Improved user interface, with hierarchical menus and extensive menu/dialog shortcuts. Configurable single-key menu shortcuts (§ 1.4).

☐ Improved conversion option, with the ability to convert image colour depth as well as image format (§ 4.3.2.3).

☐ Batch processing: Imagecopy 3 can view, print, or convert batches of images. A log-file option allows you to leave it to work unattended (§ 4.5).

☐ Slide show option: create and display slide shows in any video mode (§ 4.3.2.4).

☐ Print catalogue option: catalogue your image collection in mono or colour, with up to 40 or more images on a single page (§§ 3.4, 4.3.3.2.4.8).

☐ Improved colour reduction, including adaptive palette matching for high-quality reproduction of 256-colour or true-colour images on 16-colour or 256-colour systems (§ 4.3.2.3).

☐ Improved dithering: Imagecopy 3 offers a choice of five random dithering options. Ordered colour dithering allows 256-colour and true-colour images to be displayed quickly on 16-colour and 256-colour systems (§ 4.3.3.1.2).

☐ Greyscale options for viewing and converting images (§§ 4.3.2.3.3, 4.3.3.1.1.4).

☐ Print-quality option: draft/normal or draft/normal/best on all printers. Best-quality print improves the print quality from dot-matrix printers with worn ribbons (§ 4.3.3.2.1.4).

☐ Increased range of halftone filters (§ 4.3.3.2.2.1).

☐ Crazy Dots compatibility (§ 4.3.3.1.1).

☐ Multiple file-loading with the Selectric file selector (§ 4.5).

☐ Falcon overscan: Imagecopy automatically uses Falcon overscan for full screen viewing on non-VGA monitors.

☐ 'Select' option (§ 4.3.2.5).

☐ Measurements in inches or centimetres (§ 4.3.3.5.3).

☐ Option to print file names underneath images (§ 4.3.3.2.4.9).

☐ Option to print text above images (§ 4.3.3.2.4.10).

☐ Printer automatic/manual feed option (§ 4.3.3.2.1.6).

☐ Improved file-naming for copied images (§ 4.3.2.6).

☐ Improved form-feed option (§ 4.3.3.2.4.13).

☐ 'Restore palette' option (§ 4.4.3).

☐ Filelist program (§ 5.2).

☐ Password program (§ 5.4).

D.1 Imagecopy 2.0

The following features are new in Imagecopy 2.0:

☐ Full Falcon and TT support: images can be copied and displayed in any ST/TT/Falcon video mode (from monochrome to true-colour).

☐ Colour-mapping and colour-dithering is used to display images in video modes which contain fewer colours (§ 4.3.3.1.2).

☐ Random or ordered dithering can be used to display colour pictures on monochrome screens (§ 4.3.3.1.2).

☐ 256-colour and true-colour printing: Imagecopy 2 will print images containing up to sixteen million colours (24-bit true-colour).

☐ Print scaling: Imagecopy 2 can scale images to any size (up to full page size) (§ 4.3.3.2.4.3-4).

☐ Variable-sized halftone matrixes (up to 16x16) for realistic colour depth (§ 4.3.3.2.2).

☐ New image formats: 1) read/write : TIFF (compressed or uncompressed), Targa (compressed or uncompressed), extended IMG (XIMG), TT-resolution DEGAS (compressed or uncompressed); 2) read only: GIF, Spectrum (compressed or uncompressed), IFF/Deluxe Paint, Windows bitmap, OS/2 bitmap, PC Paintbrush (PCX), MacPaint (§ 4.1).

☐ New user interface, with window menu bar and system information in menu window (§§ 1.4).

☐ New colour controls: colour saturation, RGB/CMY/CMYK adjustment, RGB order (§§ 4.3.3.1.3, 4.3.3.2.3).

☐ A 'print to IMG file' option allows full-colour separations to be loaded into

monochrome DTP programs (§ 4.3.3.2.1.5).

□ A 'match colours' option rearranges an image palette so that it matches the current screen palette (§ 4.3.3.1.3.3).

□ Up to 20 images (under new versions of TOS) or 6 images (with older versions) can be displayed on screen at the same time (§ 4.3.2.1).

□ A 'windows' option allows images to be arranged automatically on screen (§ 4.3.3.4).

□ Images can be copied directly from screen without needing additional memory buffers (§ 4.3.2.6).

□ There is an option to reinstall Alt-Help routines (§ 4.3.3.3.2).

□ The 'image information' dialog contains more information (§ 4.3.2.1).

□ More efficient IMG/DEGAS compression.

□ Dialog option to display and edit the size of an image which is being copied from screen (§ 4.3.2.6).

□ Eject page option (§§ 4.3.3.2.4.13, 4.4.1).

□ Invert image option (§ 4.4.2).

□ Close all windows option (§ 4.4.4).

D.2 Imagecopy 1.5

The following features were added in Imagecopy 1.5.

□ Colour printing and colour separations (§§ 4.3.3.2.1.3, B).

□ Colour adjustment controls for screen and printer (§§ 4.3.3.1.3, 4.3.3.2.3).

□ New print resolutions (§ 4.3.3.2.1.3).

□ The 'print layout' dialog is displayed before images are printed (§ 4.3.2.2).

□ New keyboard shortcuts.

□ Pop-up dialog menus (§ 1.4).

□ Direct print mode works with TTs and other 68030 machines.

□ Improved version of *imgc.prg* (§§ 1.2.3, 1.2.4).

Index

Imagecopy 3

❑ Copy images from screen in any ST/TT/Falcon video mode.

❑ Display images and slide shows in any ST/TT/Falcon video mode.

❑ Print images and screen dumps in black and white or colour on a wide range of printers: 9-pin, 24-pin, Bubblejet, Deskjet, and Laserjet.

❑ Catalogue images with up to 40 or more images on a single page.

❑ Create halftone images to use with other programs (wordprocessors etc.)

❑ Convert images between different formats or to different colour types (e.g. true-colour to 256-colour).

❑ Batch processing facility: convert or print batches of images.

❑ Extensive range of image formats. Imagecopy can read and write: DEGAS, GIF, IFF, IMG, JFIF (JPEG), PC Paintbrush, Prism Paint, RSC free image, Targa, TIFF, True Paint, and Windows Bitmap. Other read-only formats include: Art Director, Calamus Raster Graphic, DR Doodle, Macpaint, Neochrome, OS/2 Bitmap, Pictor, Pixart, Portable Bitmap, Spectrum, and Tiny.

❑ User-friendly GEM interface.

❑ Can be used as an accessory or stand-alone program.