The OCP Art Studio + Extended Art Studio

2004 OCRed by Wilko Schröter

SPECTRUM 48K

THE OCP
ART STUDIO

RAINBIRD

USER

MANUAL

THE ART STUDIO is supplied with an installation program to enable you to configure to your own needs.

Enter LOAD "" and play the tape.
Stop the tape when instructed.
Select from the options given to suit your system.
Play the tape to load the main program.

You will then be given the option to SAVE the configured program to a blank tape. The new tape will contain the full program and will save you configuring each time you load.

THE ART STUDIO is protected by LENSLOK and full instructions are enclosed.

WARRANTY

If this program is faulty or fails to load, please return it (without packaging) to the address below and it will be replaced free of charge. This offer does not affect your statutory consumer rights.

RAINBIRD SOFTWARE
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Upper St. Martin Lane
London
WC2H 9DL

WARNING

Program and documentation
written by James Hutchby
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THE OCP™ ART STUDIO

SPECTRUM 48K

FEATURES

- ❖ Windows – icons – pull-down menus – pointing devices
- ❖ All information on screen
- ❖ Works with keyboard and Kempston, cursor, Interface 2 joysticks
- ❖ Mouse option
- ❖ Dot matrix printer dumps – 5 sizes + grey-scale
- ❖ Supports 17 Centronics and RS232 interfaces
- ❖ Save and load pictures to cassette
- ❖ Full control over attributes
- ❖ 16 pens, 8 random sprays, 16 user-definable brushes
- ❖ Attribute grids
- ❖ 'Undo' facility
- ❖ Windows can be cleared, inverted, cut & pasted, enlarged, reduced, squashed, stretched, flipped, and rotated
- ❖ Solid fill
- ❖ Textured fill – 32 user-definable patterns include stipples, hatches, bricks, roof tiles etc.
- ❖ Wash texture facility
- ❖ 3 levels of magnification with pixel edit, pan and zoom
- ❖ Text-9 character sizes, 2 directions, sideways, bold
- ❖ Font editor – clear, invert, flip , rotate characters or whole font, copy ROM, capture font from window
- ❖ Save and load fonts to cassette
- ❖ Lines, rectangles, triangles, circles and rays
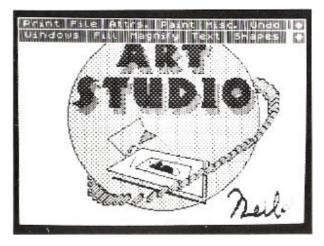- ❖ Snap + elastic shapes

CONTENTS

How to use this manual

This manual is designed to cover both the OXFORD COMPUTING ART STUDIO and the OXFORD COMPUTING EXTENDED ART STUDIO. The former is designed for users of cassette tapes, while the latter is designed for users of ZX Microdrives and Kempston interface disks and has a number of extra commands to make full use of these fast storage devices. The extra commands are dealt with in Appendix 1, but the bulk of this manual applies equally to both versions.

Before you can use the program you must produce a personalised copy which is configured to suit your particular hardware. Users of ART STUDIO should consult Appendix 4 to learn how to do this, while users of EXTENDED ART STUDIO should consult Appendix 5. Then read the Introduction immediately below, which explains the basics of the pro gram and how to control it. This will prepare you enough to enable you to load your personalised copy and begin using ART STUDIO. Explore the program at your own pace, aiming to get a 'feel' for its structure and workings. Don't be afraid to experiment. Read the rest of this manual to dear up specific points and for reference. You are not expected to read the manual all the way through before using the program for the first time.

Introduction

ART STUDIO is built upon the 'windows – icons – mouse – pointing device' concepts as pioneered by Xerox at Palo Alto and popularised by Apple with the Lisa and Macintosh computers. The guiding philosophy behind these developments is that a program should be easy for the first-time user to operate, with all relevant information 'on screen', and no complicated keyboard sequences to learn. Instead, commands are given by simply 'pointing' at options in screen menus.

When you first run ART STUDIO, you will be presented with a clear screen with a blue and white 'menu bar' at the top and a small black arrow in the centre. The arrow (known as the 'cursor') is the key to the program. It is controlled either by the keyboard, a joystick, or FI mouse (depending on the option selected when configuring the program). For example, when controlled by the cursor keys, pressing the '5' key moves it to the left, and pressing the '7' key moves it up The motion of the cursor is 'intelligent', in the sense that it speeds up the longer a key is held down.

The menu bar at the top of the screen contains a number of individual boxes with headings in them. Moving the cursor to within one of these boxes and pressing the 'select' button (the 'fire' button if using a joystick, or a designated key if using the keyboard), causes a subsidiary menu to be drawn on the screen partly overlaying the main menu bar. This process is known as 'pulling down' a menu. The subsidiary menu contains a number of entries or 'options', which may lead to further sub-menus, or cause certain actions or commands to be performed. An option is chosen by moving the cursor to it (it will 'highlight' if it's available) and pressing the select button. This process is known as 'clicking' an option. If the option is a command, then what usually happens is that the pull-down menu disappears and the arrow cursor changes into a small icon which bears some relation to the command selected. For example, a paint brush when painting on the screen. The icon here is acting as a reminder of the current 'mode'. This new cursor can then be moved about the screen using the same controls as the arrow cursor. The action of the select button depends on the particular icon. For example, with the brush icon, pressing select paints pixels on the screen.

If the icon cursor is moved into the menu bar at the top of the screen, it immediately reverts to its arrow form. However if it is moved back out again, then it returns to its icon form, unless another menu has been pulled down in the meantime. The program will continue to stay in the current mode (with the current icon) until another mode is selected. Note that for most commands, the screen can be scrolled by clicking the arrow boxes in the menu bar (see below) without losing the current mode.

As mentioned above, if an option in a pull-down menu is highlighted as the cursor is moved over it, then that option is available. Options in some menus will only be highlighted if certain conditions have been met. For example, consider the Windows menu. An action can only be performed on a window, say cleared, if the window has previously been defined. Consequently, when the Windows menu is pulled down for the first time, the 'Define window' option is highlighted, but the 'Clear window' option is not. After defining the window, and pulling down the Windows menu for the second time, the above condition is met, and so the 'Clear window' option becomes highlighted as the cursor is moved over it.
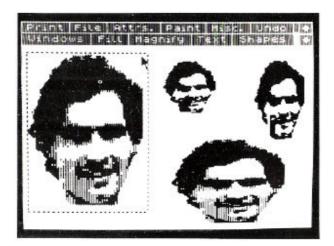
Some menus contain options which are neither commands nor lead to sub-menus. These are known as flags or 'switches' – devices which can be in one of two states, on or off. These switches generally modify the behaviour of other options in the same menu. For example, there is a switch in the Text menu which controls whether characters are printed sideways or not. The on state is represented by a tick, and the off state is represented by a cross. A switch can be changed state ('toggled') by moving the cursor to it and pressing select.

Often there is a choice in a menu between two or three ways of doing something. For example, there are three sizes in which characters can be printed, either 'Normal height', 'Double height', or 'Treble height'. These are shown as three separate options in the Text menu, only one of which is marked with a tick, the others being unmarked. The tick indicates which height currently applies. The height can be changed by moving the cursor to one of the unmarked options and pressing select.

A full Spectrum screen is 24 'lines', but the menu bar permanently occupies 3 of these lines. You may think then that you are limited to designing pictures that fit in the remaining 21 lines. However, this is not the case. The two boxes in the menu bar with arrows in them allow you to 'scroll' the visible part of the screen over a full 24 lines. Clicking one of the arrow boxes scrolls the screen by one line, clicking it three times scrolls it by the full amount. The small white bar immediately to the left of the arrow boxes shows which part of the whole screen is currently being displayed.

To remove or collapse a menu pulled down by mistake, just move the cursor outside of it and press select.
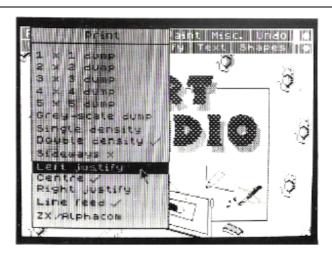
The rest of this manual is divided into sections, each section covering one of the options in the main menu bar. The sections logically follow the same order as this menu, reading from left to right, then top to bottom.

Definition of terms

A 'pixel' is a single dot on the screen – the smallest picture element. The screen is divided into blocks of 8 by 8 pixels – a block being known as an 'attributes square'. A pixel can either be 'set' (on) or 'reset' (off). A set pixel shows the 'ink' colour for the associated attributes square, and a reset pixel shows the 'paper' colour. Only two colours are allowed per attributes square (per 64 pixels). This limitation must be born continuously in mind when drawing pictures on the Spectrum's screen.

PRINT

This menu allows you to take a hard copy of your finished picture on a dot matrix printer capable of bit image graphics. Five sizes of printout are available, labelled in the menu '1 x 1 dump' to '5 x 5 dump'. These figures correspond to the number of dots on paper to one dot or pixel on the screen. Not all of these sizes of dumps will necessarily be available with the particular printer you are using, it depends on the total number of dots the printer is capable of resolving across a page. If a dump option is available, then it will be highlighted as the cursor is moved over it.

Note that none of the colour information in a picture is recorded in its hard copy by these first five options, but purely whether individual pixels are set or reset. It is important to bear in mind that this could lead to some discrepancies between what is seen on the screen and what is seen on paper. For example, a section of a picture could have attributes of white Ink on white Paper, then any pixels that were set within that section would not show up on the screen, but would be quite visible on the printout.

A 'grey-scale dump' is also available, which uses 'stipples' – arrangements of dots of varying density – to represent the different colours found on the Spectrum. Bright and Flashing attributes are not represented, and a grey-scale dump is equivalent in size to a 3 x 3 dump.

As each pixel is sent to the printer, it is echoed to the screen. A dump can be aborted at any time by pressing the CAPS SHIFT and SPACE keys. Note that your printer may need resetting (just turn it off and then back on again) if you stop it when it's in the middle of printing a line.

Most dot matrix printers capable of bit image graphics can operate in two different modes known as single density and double density. The resolution in the latter mode is generally greater than that in the former, i. e. more dots can be printed across the page. You can switch between these two modes via the Print menu. Some of the dumps not available in single density mode may become available in double density mode as a consequence of the increased resolution. Note that

there may be some distortion in double density mode with the picture appearing to be stretched out down the page.
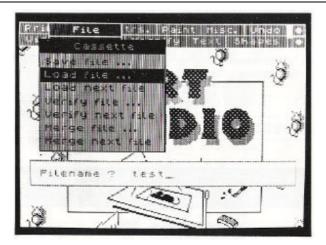
It is possible to print a picture sideways, from left to right, rather than from top to bottom. Because the Spectrum screen has a greater width than height, it may be possible to select one of the larger dumps in sideways mode that would not otherwise be available.

The three options 'Left justify', 'Centre' and 'Right justify' determine whereabouts across the page a dump is situated, either hard against the left-hand edge, in the centre with equally spaced margins, or hard against the right-hand edge. The tick indicates which option applies.

If your printer automatically generates a line feed after receiving a carriage return, then you must ensure that the 'Line feed' switch near the bottom of the menu is turned off (otherwise you will find your printout consists of alternate lines of dots and spaces). If it doesn't, then leave the switch turned on.

The last option in the Print menu will copy the screen to ZX and Alphacom 32-column printers. Again CAPS SHIFT + SPACE can be used to abort the printing.

FILE

ART STUDIO fully supports cassettes for the storage and retrieval of pictures (known as 'files') – it has facilities to save, load, verify and merge cassette files. For loading, verifying and merging, a filename can be specified, in which case the cassette tape is searched for the file in question. Alternatively, ART STUDIO can be instructed to load, verify or merge the next file it finds on a tape.

To save the current screen to cassette tape, pull down the File menu, then click the 'Save file …' option. A prompt will appear requesting a name to label the file with. Type in a filename using the keyboard (up to 10 characters), and then press ENTER (pressing ENTER on an empty line aborts the operation). The usual "Start tape, then press any key" message will be displayed. Insert a blank tape into your cassette player, press record, then press a key on the keyboard. When saving has been completed, ART STUDIO will return to the main menu. It is recommended that all saves are followed immediately by verifies – do this by rewinding the tape, clicking the 'Verify next file' option, and pressing play. No special message is displayed if the verification is successful, ART STUDIO just returns to the main menu.

Note that ART STUDIO will only load files of the CODE and SCREEN$ type, and will not load a file if its length is greater than 6 and 3/4 kilobytes. Saving or loading can be aborted by pressing the CAPS SHIFT and SPACE keys.

A cassette file can be 'merged' with the current screen contents, a process in which pairs of pixels are combined to produce a composite picture. If the Over switch (in the Attributes menu – see below) is currently off, the combination is on an OR basis. If the Over switch is on, the combination is on an XOR basis. Colours however are not merged, but taken directly from the original screen.
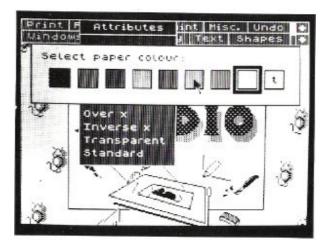
Note that the screen 'back-up store' is used during loading and merging, consequently 'Undo' (see below) is not available.

ATTRIBUTES

This menu controls the setting of colours and other attributes. These attributes apply to all painting and drawing that is done on the screen – to shapes, pens, brushes, fills, text etc.
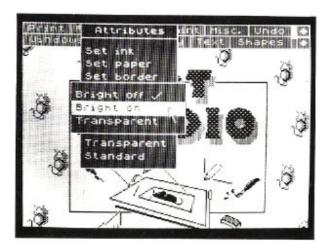
For example, to set the Ink colour to green. Move the cursor down the Attributes menu until the option marked 'Set ink' is highlighted, then press select to pull down a subsiduary menu containing 8 coloured boxes and one box marked with a 't'. Move the cursor to the green box within this menu and press select again. From then on, anything drawn on the screen will be in green ink. This operation has the same effect as the command INK 4 in BASIC. Note that the outline around a box indicates which colour is current.

The 't' in the last boxes in the Ink and Paper menus stands for transparent. A transparent attribute is one which is left unchanged when anything is drawn on the screen (equivalent to the commands INK 8, PAPER 8 etc. in BASIC).

The Border colour can be altered from the Attributes menu by moving the cursor to the 'Set border' option and pressing select. Note that there is no such thing as a transparent Border.
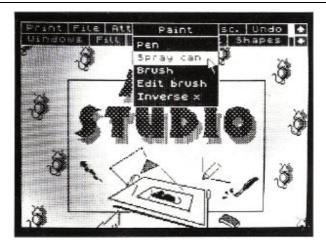
Bright and Flash attributes can also be controlled from this menu. Both can be set to on, off, or transparent.

The two switches 'Over' and 'Inverse' have an effect that is similar to their BASIC counterparts of the same name. Essentially 'Over' determines whether overprinting is to be done or not, and 'Inverse' determines whether pixels are to be set or reset. These options will be covered in greater detail in the sections that directly concern them.

The option marked 'Transparent' in this menu sets all the attributes to transparent.
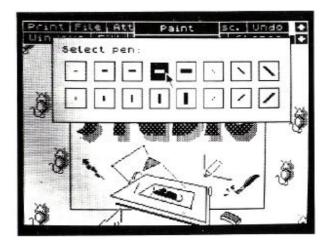
Finally, 'Standard' sets the attributes back to their default or initial values, specifically black Ink, white Paper, white Border, Bright off, Flash off, Over off, and Inverse off.
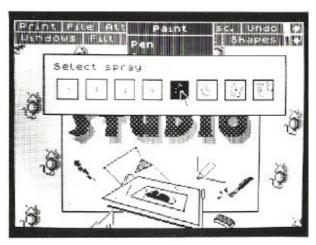
PAINT

This menu controls some of the main facilities for drawing on the screen. It provides access to three different 'tools' – a pen, a spray can and a brush. All of these tools paint in the current Ink and Paper colours, with regard to the current Bright and Flash settings. Inverse applies but Over does not.
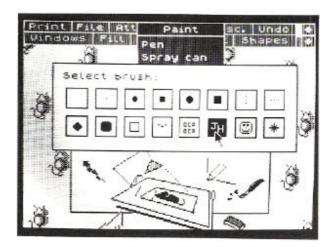
Sixteen pens of various shapes and sizes are available. To use a pen, move the cursor down the Paint menu until the 'Pen' option is highlighted, press select to pull down a menu containing the different pens, choose one by pointing at it with the cursor, then press select again. The arrow cursor will be replaced by a representation of a pen. This cursor can then be moved about the screen and pixels painted with it by pressing select. If the select button is held down as the cursor is moved, continuous lines can be painted.

If the 'Inverse' switch is off (this is the same Inverse as in the Attributes menu), the pens will set pixels in the current Ink colour. If the 'Inverse' switch is on, however, the pens will reset pixels. The latter make very effective erasers.
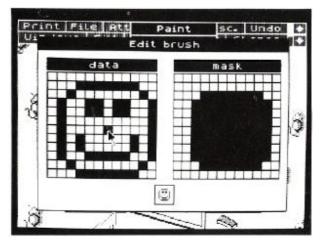

Eight spray cans with a range of diameters are available, each of which sprays a random pattern of dots on the screen. You can demonstrate this random nature by choosing one of the larger sprays, and holding down the select button while keeping the spray can in one place. Eventually a solid disc will be drawn. The spray may of course be moved as it is painting to produce graffiti-like effects.

Finally, sixteen brushes of various sizes and designs are available. Each brush has associated with it a 'mask', which has the same dimensions as the brush itself. When a brush is used to paint on the screen, first the pixels corresponding to the mask are reset, then the pixels corresponding to the brush itself are set (or vice versa if the Inverse switch is on). The advantage of having a mask is that it allows more complex designs to be painted, but for simple brush patterns it can just be ignored.

The first brush in the 'Select brush' menu is a null brush. This is a very useful brush as it can be moved over a picture changing the colour information without setting or resetting any pixels. You may find it convenient to design your pictures in black and white, and then add colour in the final stages using a brush such as this.

Each of the sixteen brushes can be edited to suit particular requirements. To edit a brush, move the cursor to the option marked 'Edit brush' in the Paint menu, and press select to pull down a menu containing large scale representations of the brush and its mask and a copy of the brush at normal size. Individual pixels in the brush and mask can then be toggled (changed state) with the cursor. The newly edited brush can be painted with by pointing the cursor at its normal size image and pressing select.

The 'Edit brush' option acts upon the current or last used brush. To edit a particular brush, you must first make it the current brush by choosing it from the 'Select brush' menu, then pulling down the Paint menu for a second time and clicking the 'Edit brush' option.

13

MISCELLANEOUS

The first option in this menu removes the menu bar from the top of the screen and allows you to view the entire 24 lines of your picture. Press the select button to return to the menu. Note that 'undo' (see below) does not function after viewing the screen, but remember that you can always scroll a picture by clicking the up-arrow and down-arrow boxes to see the extra three lines and still retain the 'undo' facility. The second option clears the whole screen and sets its attributes to the current colours. 'Undo' is available if you clear the screen by mistake.

The next three options concern grids of alternate bright and dark squares superimposed on the screen over a picture. These grids are useful aids in positioning the components of a drawing so as to cause the minimum clashes of attributes (a perennial problem with the Spectrum). 'Bright grid 1' places a grid of single attributes squares on the screen, 'Bright grid 2' places a grid of twice size, and 'Remove grid' removes the grids from the screen.

The 'Change colour' option is only highlighted if a window has previously been defined (see the section covering the Windows menu below). Its function is to change one colour into another over the whole, or part of, the screen. Two colours are defined via the Attributes menu, a source colour is specified as the Paper colour, and a destination colour is specified as the Ink colour. The option then converts all occurrences of the source colour to the destination colour within the defined window.

The final option in the Miscellaneous menu displays a copyright message and the release number of the particular version of ART STUDIO you are using.
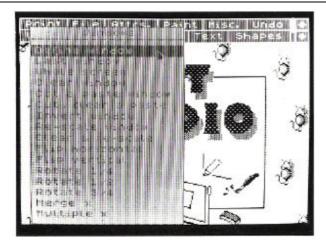
UNDO

This is one of the most useful facilities in ART STUDIO as it undoes the effects of the last command or operation.

When a command such as 'fill' is selected, the main screen is automatically copied to a special back-up store. The fill operation is then performed on the main screen. If the result is not what's required, then clicking the 'Undo' box causes the back-up store to be restored to the main screen.

It is important to realise that this facility only works immediately after any change to the screen.

WINDOWS

A window is a rectangular section of the screen, marked by a dotted outline, which can be acted upon as a whole. Windows can be cleared, inverted, moved, copied, re-scaled, flipped, and rotated. 'Undo' can be used after a window has been processed to reverse any effects.

Before any action can be performed on a window, it must first be defined. To define a window, pull down the menu from the 'Windows' box, move the cursor to the 'Define window' option and press select. The arrow cursor will be replaced by a small box cursor. Move this cursor about the screen and press the select button twice to define two opposite corners of the window. The outline of the window will be marked on the screen with a dotted line, and the cursor will turn back into an arrow. The Windows menu can then be pulled down for a second time and one of the window processing commands selected.

A window that is larger than the 21 visible lines of the screen can be defined by clicking the first corner, clicking one of the arrow boxes to scroll the screen, then clicking the second corner. The option 'Whole screen' defines the whole screen as a window. The option 'Last window' re-defines the last used window.

Clicking the option 'Clear window' resets all the pixels in a window and makes its attributes equal to the current Ink and Paper colours and current Bright and Flash settings.
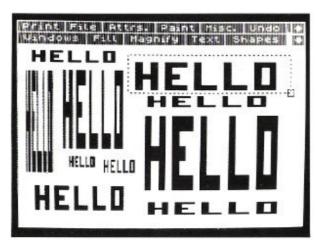
A window can be copied after being defined by clicking the 'Cut & paste window' option. A second window outline appears which moves as a whole with the cursor, and when the select button is pressed, the original window is copied to the new window. Attributes as well as pixels are copied across. Note that the second window is moved via the first corner defined in the original window.

The option 'Cut, clear and paste' is similar to the above with the addition of clearing the original window when copying it, i.e. it effectively moves a window.

Multiple copies of a window can be made by setting the 'Multiple' switch to on before selecting the 'Cut & paste' and 'Cut, clear & paste' options.

Normally a window overwrites the screen when pasted. A window can, however, be combined or merged with the existing screen by setting the 'Merge' switch to on. If the Over switch (in the Attributes menu) is currently off, pixels are combined on an OR basis. If the Over switch is on, pixels are combined on an XOR basis. Attributes are not merged, but taken directly from what is already on the screen.

Clicking the option 'Invert window' toggles all the pixels in a window, but doesn't change its attributes.

A window can be enlarged, reduced, squashed, or stretched – actions collectively known as 're-scaling'. A window is re-scaled by clicking the 'Re-scale window' option, which gives the box cursor again and allows a second window to be defined. The original window is then 'mapped' onto this second window, being re-scaled as necessary to fit into the new outline.

Re-scaling is a two stage process. A window is first re-scaled in the vertical direction to an internal buffer, and then re-scaled in the horizontal direction to the screen. There will be a short delay (depending on the size of the window) while the first stage is performed.

Note that there may be same loss of fine detail when a window is reduced in size. Also there may be overlapping and blurring of attributes.

The option 'Clear & re-scale' clears the original window when re-scaling it. 'Merge' and 'Multiple' apply to the re-scaling of windows in the same way that they apply to the cutting and pasting of windows.

Windows can be 'flipped' or mirrored about their horizontal and vertical axes, by clicking the 'Flip horizontal' and 'Flip vertical' options respectively. Attributes are also flipped.
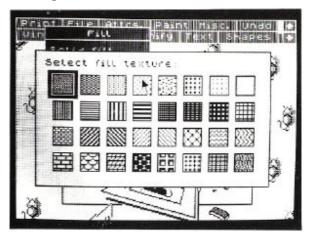
Finally, windows can be rotated clockwise by one-quarter, one-half, and three-quarters of a complete turn. These are equivalent to 90, 180 and 270 degrees respectively, Attributes are also rotated.

FILL

Filling is a technique for rapidly setting all the pixels within an object or shape on the screen. The object to be filled must have a continuous outline, but the outline can be quite complex. An object can be filled with solid colour or it can be filled with a pattern. A wide range of pre-defined patterns, or textures as they are known, is available. These include various stipples and hatches, and specialised patterns such as bricks and roof tiles. In addition, scratch patterns can be

designed to suit individual requirements.

To fill an object solidly, move the cursor down the Fill menu until the 'Solid fill' option is highlighted and press select. The arrow cursor will be replaced by a representation of a paint roller. Move this cursor about the screen to some point within the object you wish to fill, then press select again. The fill will proceed outwards in every direction from the chosen point (which must be are set pixel) until a set pixel or the border of the screen is encountered.

To fill an object with a pattern, move the cursor down the Fill menu until the 'Textured fill' option is highlighted, then press select to pull down a menu containing the 32 available textures. Click the desired texture, then click some point within the object to be filled. A textured fill is a two stage process. First an ordinary solid fill is done, then the chosen texture is 'mapped' onto all the pixels on the screen that have been set by the solid fill.

All fills are done in the current Ink and Paper colours, with regard to the current Bright and Flash settings. Inverse does not apply to solid fills, but does apply to textured fills (the textures are shown inverted in the menus if the Inverse switch is on). Over applies to neither fill.
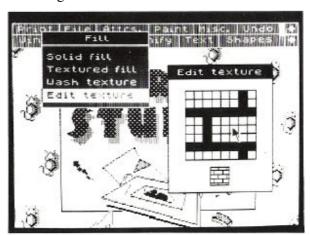
Note that fills take place over the whole screen including the three lines not visible at any one time. The results of a fill can be checked by clicking the up-arrow and down-arrow boxes in the main menu bar to see these extra lines. A fill can be aborted by pressing the CAPS SHIFT and SPACE keys. If a fill 'leaks' out of an object, or is in any way unsatisfactory, it can be removed by clicking the 'Undo' box.

The texture at the end of the first row is a null texture. This is useful for setting the attributes within a section of the screen without the net altering of any pixels.

You may like to know that the fill algorithm is structured around an internal stack which stores line segments for the object being filled. Approximately 6 kilobytes of memory are available to this stack, but it is possible that very convoluted shapes may cause the stack to overflow. If this happens, ART STUDIO will not crash, but it may leave some small holes in the object being filled. However, this is hardly ever likely to happen in practice.

'Wash texture' is a powerful feature that effectively allows you to paint directly with a pattern. It uses the same menu of 32 textures as the above, and works by 'mapping' a chosen texture onto any pixels on the screen that have been changed (set or reset) by a previous operation. This process is essentially an extension of the second stage of a textured fill. Note that it only works immediately after pixels have been altered.
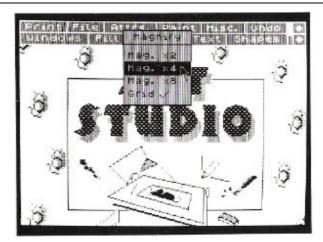
For example, you could draw a rectangle using the Shapes menu (see below), and then wash one of the stipple textures onto it to get a dotted outline. Or you could wash a stripped texture onto a line of text for distinctive lettering.

Each of the 32 textures can be edited to suit your particular requirements. To edit a texture, move the cursor down the Fill menu until the 'Edit texture' option is highlighted, then press select to pull down a menu containing a large scale representation of the texture and a sample of the texture at normal size (actually four copies of the texture so an idea of how it 'fits together' can be obtained). Again the normal size image is shown inverted if the Inverse switch is on, but the large scale representation is not. Individual pixels within the texture can then be toggled with the cursor. The newly edited texture can be used by clicking its normal size image.
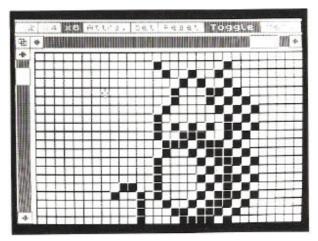
The 'Edit texture' option acts upon the current or last used texture. To edit a particular texture, you must first make it the current texture by choosing it from one of the 'Select texture' menus, then pulling down the Fill menu for a second time and clicking the 'Edit texture' option. Note that the current texture is marked with an outline.
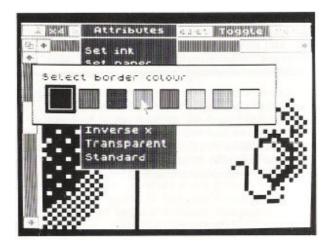
MAGNIFY

ART STUDIO allows areas of the screen to be magnified for detailed examination and alteration on a pixel by pixel basis. Three levels of magnification are available, with facilities to edit pixels and pan and zoom in each.

To magnify a section of the screen, pull down the Magnify menu from the main menu bar, then move the cursor down this menu until one of the options 'Mag. x2' 'Mag. x4' or 'Mag. x8' is highlighted, and press select: The arrow cursor will change into a representation of a magnifying glass. Move this cursor about the screen to the particular area you wish to magnify, then press select again. The main screen will be replaced by a magnified image of this section of your picture.

An individual pixel within the magnified section can be set, reset or toggled (set => reset, reset => set) by positioning the cross-hair cursor over it and pressing select. The specific pixel operation is chosen by clicking one of the 'Set', 'Reset' or 'Toggle' boxes in the menu bar at the top of the display. The current operation is shown highlighted. The cursor can be moved while the select button is held down to alter pixels more rapidly.

Pixels will be set and reset in the current Ink and Paper colours, with regard to the current Bright and Flash settings. Inverse and Over do not apply. The Attributes menu is available directly from the menu bar at the top of the display – this menu has already been discussed.
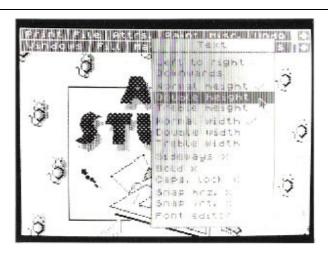
The area to be magnified can be scrolled over the whole screen by clicking the boxes with arrows in them, or 'homed' by clicking the box containing the linked squares symbol. The scrolling auto-repeats if the select button is held down. The white bars between the pairs of arrow boxes show which fraction of the whole screen is currently being magnified.

The magnification can be changed at any time by clicking one of the 'x2', 'x4', or 'x8' boxes in the top left-hand corner of the display. The current magnification is shown highlighted.

When editing is complete, a return to the main menu is made by moving the cursor to the box marked 'Menu' and pressing select. Note that 'Undo' is not available after magnifying the screen, as the back-up store is needed for workspace.

A grid is available in the x8 magnification mode – one square in the grid representing one pixel on the screen. This grid can be switched on or off from the initial Magnify menu.

TEXT

This menu controls the addition of text – letters, numbers, punctuation etc. – to a picture. Text can be printed in two directions, to read from left to right, or to read from top to bottom, and individual characters can be printed in one of nine different sizes. All characters are printed in the current Ink and Paper colours, with regard to the current Bright and Flash settings. Inverse and Over also apply.

To add text to a picture, move the cursor down the Text menu until the 'Left to right' or the 'Downwards' option is highlighted, and press select. The arrow cursor will change into a cursor which looks like a capital I. Move this cursor about the screen to the point at which you wish to add your text, then press select again. The I cursor will be replaced by an underscore character, which, is the text entry cursor. Type in your text using the keyboard. If you make a mistake, the last character can be deleted by pressing CAPS SHIFT and 0. All keys auto-repeat, and full cursor control (with wrap-around) is available using CAPS SHIFT'ed 5 to 8 (or the cursor keys on the Spectrum +).

As each character is printed; the text cursor is advanced to the next character position, either immediately to the right, or immediately below, depending on the direction chosen originally from the Text menu. Pressing ENTER terminates the input of text and re covers the I cursor.

Note that SYMBOL SHIFT gives the subsiduary red (Spectrum + users ignore this reference to colour) single-character legend on a key. For example, SYMBOL SHIFT'ed C gives a question mark, and SYMBOL SHIFT'ed D gives a backslash. The copyright symbol is obtainable from those keys without single characters on them, Q, W, E etc.

Three character widths are available, labelled 'Normal width' to 'Treble width', and three character heights are available, labelled 'Normal height' to 'Treble height'. The ticks in the Text menu indicate which options currently apply. Combination of these widths and heights leads to a total of nine possible character sizes, ranging from short, fat characters to tall, thin characters. Note that the size of each character is reflected in the size of the capital I cursor.

Individual characters can be printed at normal orientation or sideways. The latter helps with the annotation of diagrams etc. To print characters in this way, simply set the 'Sideways' switch in the Text menu to on before selecting 'Left to right' or 'Downwards'.
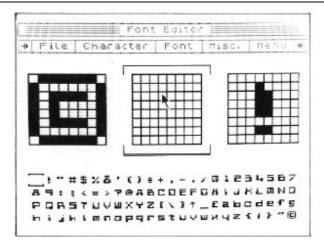
Text can also be in bold, where each character is printed twice, the second time one pixel to the right, and so appears to stand out. To print bold characters, set the 'Bold' switch to on.

Initially, unshifted keys give lower case letters and CAPS SHIFT'ed keys give upper case (capital) letters during the entry of text. However, if the 'Caps. lock' switch in the Text menu is turned on, this situation is reversed. Unshifted keys then give upper case letters and CAPS SHIFT'ed keys give lower case letters. Note that the top row of the keyboard always gives numbers if unshifted and cursor control if CAPS SHIFT'ed.

A useful facility in this menu is the ability to 'snap' characters to attributes squares so as to minimize attribute clashes (remember the grid options in the Miscellaneous menu). Snap is available independently in the horizontal and vertical directions. For example, if both snap switches were on, and normal width and height had been selected, then any characters printed on the screen would occupy exactly one attributes square each.

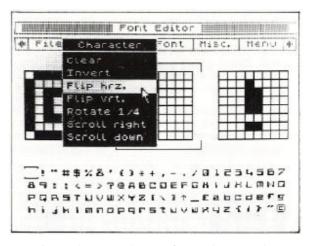Finally, the last option in the Text menu invokes a Font Editor.

FONT EDITOR

This menu allows you to edit the character set, or font as it is called, that the Text options use. There are 96 characters in a font, ranging from the space character to the copyright symbol (ASCII 32 to 127). Whole new fonts can be created using this menu, or existing fonts can be altered. Fonts can be stored on cassette, and loaded into memory as required.
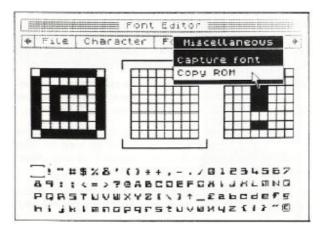
The 96 characters in a font are displayed at the bottom of the screen, each consisting of 8 by 8 pixels. One of these characters is the current character, this is marked by a top and tail cursor. The current character and the characters immediately to its left and right are shown in enlarged form above the font. The individual pixels in these three characters can be toggled with the arrow cursor.

A particular character can be made the current character by pointing at it in the font at the bottom of the screen and pressing select. Alternatively the current character can be scrolled through the entire font by clicking the boxes with arrows in them. The scrolling auto-repeats if the select button is held down.
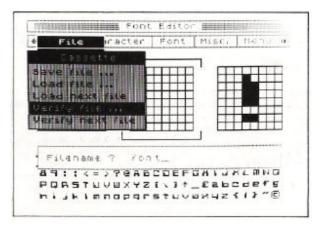

There are a number of operations that can be performed upon the current character by pulling down the menu from the 'Character' box. These operations are, clear character (reset all pixels), invert character (toggle all pixels), flip horizontal, flip vertical, rotate 1/4 (90 degrees clockwise), scroll right (1 pixel), and scroll down (1 pixel). A character can be rotated by more than 90 degrees by selecting the rotate option two or three times, or scrolled by more than one pixel by repeatedly selecting the last two options.

The same set of operations can be performed upon the font as a whole by pulling down the menu from the 'Font' box. The option to clear the font seeks confirmation before proceeding as it cannot be undone.

The character set contained in the Spectrum's ROM (the characters available in BASIC) can be loaded into ART STUDIO's font by selecting the 'Copy ROM' option in the Misc. menu.

The 'Capture font' option in the Misc. menu is only highlighted if a window has previously been defined (see the section covering the Windows menu above). Its function is to copy blocks of pixels from the defined window on the screen into the font. Copying starts at the current character and proceeds left to right across the window, from top to bottom, until all the pixels have been used.

Fonts can be saved to and loaded from cassette by pulling down the menu from the 'File' box. This is very similar to the file options menu (see above) except that merge is not available. Note that there are 768 bytes (96 x 8) in a font, and ART STUDIO will refuse to load a file it it's larger than this value (it can be smaller though).

When editing is complete, a return to the main menu can be made by moving the cursor to the box marked 'Menu' and pressing select. The font created or loaded is then available via the Text menu.

Note that this font editor doesn't have to be used exclusively for ordinary letters and numbers. It could just as well be used for the creation and editing of user defined graphics, or any other symbols that fit into 8 bytes.

Character sets that you have created using the font editor in ART STUDIO can be used in your own programs with the following BASIC routine: –

```
10 LET x=64000: REM you specify this value
20 CLEAR x-1: REM protect font
30 LOAD "filename"CODE x
40 POKE 23607,INT (x/256)-1: REM adjust system
50 POKE 23606,x-256*INT (x/256): REM variable
```
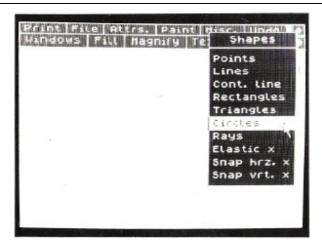
For microdrive users line 30 would read: –
LOAD *"m";1;"filename" CODE x

For disk users line 30 would read: –
PRINT #4; LOAD "filename" CODE x

SHAPES

This menu is used to draw various shapes on the screen. Seven different shapes are available, namely single points, lines, a continuous line, rectangles, triangles, circles, and rays. Each shape is composed of line segments of single pixel width. Shapes are drawn by moving the cursor about the screen and pressing select to define the vertices. All shapes are drawn in the current Ink and Paper colours, with regard to the current Bright and Flash settings. Inverse and Over also apply.

For example, to draw a triangle, pull down the Shapes menu, then click the 'Triangles' option. Move the cursor about the screen, and press the select button three times to define the three corners of the triangle.

A circle is drawn by pressing select once to define the centre, then pressing select a second time to define a point on the circumference. Note that circles are drawn over the whole screen, including the three lines not visible at any one time. An ellipse can be drawn by stretching a circle using the re-scale options in the Windows menu (see above).

Rays are line segments radiating out from a common centre point, the first point defined.

Multiple shapes can be drawn without needing to pull down the Shapes menu each time. ART STUDIO stays in 'shapes mode' until something else is selected.

Shapes can be drawn 'elastically'. An elastic shape moves with the cursor across the screen, expanding and contracting as necessary. Pressing select fixes the vertex of an elastic shape as before. This is helpful in getting a shape into the correct position before being committed to that position. To draw an elastic shape, set the 'Elastic' switch in the menu to on before selecting one of the shape options.

The vertices of shapes can be 'snapped' to each attributes square. This is useful for aligning components of a drawing. Snap is available independently in the horizontal and vertical directions. For example, setting both snap switches to on would result in the corners of any rectangles drawn being at the bottom left corners of attributes squares.

APPENDIX 1 – EXTENDED ART STUDIO ADDITIONAL COMMANDS

This appendix covers the extra commands which are available in EXTENDED ART STUDIO. All the facilities described above in ART STUDIO are available in EXTENDED ART STUDIO with the addition of commands to control ZX Microdrives and Kempston interface disks.

Overlays

EXTENDED ART STUDIO is too large a program to be held entirely in the Spectrum's memory all at once. Some of the lesser used functions are stored on cartridge or disk in the form of 'overlays' – transient modules that are only loaded into memory when required. For example, the menu to control printing is an overlay, it takes about 10 seconds to fetch from cartridge or 2 seconds to fetch from disk. Note that your EXTENDED ART STUDIO cartridge or disk must remain in drive 1 for these overlays to be accessed when required.

FILE

EXTENDED ART STUDIO fully supports cassettes, microdrives and Kempston interface disks for the storage and retrieval of pictures (known as 'files'), Each of these devices is controlled by a separate menu, which is accessed through a sub-menu by clicking the 'File' box on the main menu bar.

Note that the screen 'back-up store' is used during loading and merging, consequently 'Undo' is not available.

Microdrive users

EXTENDED ART STUDIO has the ability to maintain a RAM based catalogue, that is a catalogue that is stored permanently in memory and can be displayed and accessed without the need to actually read the cartridge each time. To generate the catalogue for a cartridge, move the cursor to the box alongside 'Catalogue cartridge' and press select. The drive motor will start, and after about 10 seconds the large white box on the left-hand side of the screen will fill with information. At the top of the box is the cartridge name, and below that the free space on the cartridge in kilobytes (this is the same information that is displayed by a CAT command from BASIC). In the rest of the box is a list of the files on the cartridge. These files can be highlighted by simply pointing the cursor at their filenames and pressing select. A highlighted file can then be saved, loaded or merged by moving the cursor to the box alongside the desired operation, and pressing select again. This is a considerably more convenient and elegant way of file handling than the typing of lengthy commands and filenames in at the keyboard.

The total capacity of the RAM catalogue is 50 entries, although only 8 can be displayed at any one time. The arrow boxes, however, allow you to scroll through the whole catalogue to find a particular entry. The box with the linked squares symbol (the 'home' symbol) moves you back to the start of the catalogue, and the bar between the two arrow boxes shows which part of the whole catalogue is currently being displayed.

A filename can be entered at the keyboard when a file is being saved for the first time (and hence doesn't appear in the catalogue) by moving the cursor to the box marked 'Enter filename' and pressing select. A prompt will appear requesting a filename. Type in the filename and then press ENTER. Pressing ENTER on an empty line aborts the operation.

EXTENDED ART STUDIO automatically verifies a file after it has been saved, and if the verification fails then the bad file is erased and another attempt is made at saving. This is repeated up to 5 times until a good copy is made. Note that a save or load can be aborted by pressing CAPS SHIFT + SPACE.

The 'Merge file' option works as described previously for cassette operation.

Note that files can be saved or loaded by first clicking the save or load boxes and then highlighting the filename. This is the recommended order as it removes the possibility of saving a file when loading was intended, and vice versa. A filename can be un-highlighted by selecting it for a second time.

EXTENDED ART STUDIO support up to 4 microdrives. Individual drives can be selected by clicking the associated numbered boxes at the top right of the menu.

Kempston disk interface users

EXTENDED ART STUDIO has the ability to maintain a RAM based catalogue, that is a catalogue that is stored permanently in memory and can be displayed and accessed without the need to actually read the disk each time (compare this with the normal operation of K-DOS). To generate the catalogue for a disk, move the cursor to the box alongside 'Catalogue disk' and press select. The drive motor will start, and after a few seconds the large white box on the left-hand side of the screen will fill with information. At the top of the box is the disk name, and below that the free space on the disk followed by the total capacity of the disk, both in kilobytes (this is the same information that is displayed by a PRINT #4: CAT command from BASIC). In the rest of the box is a list of filenames (assuming that you have a disk with some picture files on it). You may notice that only certain files are displayed in the RAM catalogue – specifically only those files that are of the CODE type and are 6 or 6 and 3/4 kilobytes in length, i. e. pictures. These files can be highlighted by simply pointing the cursor at their filenames and pressing select. A highlighted file can then be saved, loaded or merged by moving the cursor to the box alongside the desired operation, and pressing select again. This is a considerably more convenient and elegant way of file handling than the typing of lengthy commands and filenames in at the keyboard.

The total capacity of the RAM catalogue is 49 entries, although only 8 can be displayed at any one time. The up-arrow and down-arrow boxes, however, allow you to scroll through the whole catalogue to find a particular entry. The box with the linked squares symbol (the 'home' symbol) moves you back to the start of the catalogue, and the bar between the two arrow boxes shows which part of the whole catalogue is currently being displayed.

A filename can be entered at the keyboard when a file is being saved for the first time (and hence doesn't appear in the catalogue) by moving the cursor to the box marked 'Enter filename' and pressing select. A prompt will appear requesting a filename. Type in the filename and then press ENTER. Pressing ENTER on an empty line aborts the operation.
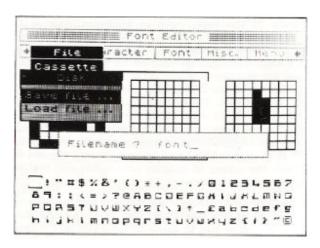
It is possible to load files which do not appear in the RAM catalogue because they are not exactly 6 or 6 and 3/4 kilobytes in length (for example part of a picture) by entering the filenames manually.

The 'Merge file' option works as described previously for cassette operation.

Note that files can be saved or loaded by first clicking the save or load boxes and then highlighting the filename. This is the recommended order as it removes the possibility of saving a file when loading was intended, and vice versa. A filename can be un-highlighted by selecting it for a second time.

The Kempston disk interface supports up to 4 drives. Individual drives can be selected by clicking the associated numbered boxes at the top right of the menu.

FONT EDITOR

Fonts can be saved to and loaded from cassette, microdrive and disk, by pulling down the menu from the 'File' box in the Font Editor. This is similar to the file options in EXTENDED ART STUDIO's main menu (see above) except that merge is not available. For microdrive or disk operation a filename must be specified, the drive number is set from the main microdrive or disk control menu. Note that there are 768 bytes (96 x 8) in a font, and EXTENDED ART STUDIO will refuse to load a file if it's larger than this value (it can be smaller though).

A number of sample fonts are provided on the supplied cassette tape. These fonts can be used in the design of your own pictures.

SHAPES

An extra shape is available in EXTENDED ART STUDIO, an arc, which is a fractional part of a circle (up to a semi-circle in fact). The first two points define the extremities of the arc, and the third point defines its curvature and direction. The arc joins up the first two points but doesn't necessarily go through the third point. Although it is possible to draw elastic arcs, it is a slow process and is not recommended.

APPENDIX 2 – SCREEN COMPRESSOR

Included on the EXTENDED ART STUDIO cassette tape is a special program to compress your pictures. The reduction of a picture will depend on its complexity, but typically it will save a third to a half of its original size. Several pictures can be compressed and stored in memory simultaneously.

The compressor is a stand-alone program which must be loaded separately from EXTENDED ART STUDIO. To do this, reset your Spectrum, enter LOAD "compressor", and start the supplied cassette tape (consult Appendix 3 below to see which side of the tape to use). The program will auto-run on loading and will present you with a menu of options. To select an option, type in the number associated with it and press ENTER.

The first three options control loading of pictures from cassette, microdrive (drive 1) and Kempston Interface disks (drive 1). The compressor will ask for the filename of the picture to be loaded (cassette users can specify the next file on a tape by entering a null filename). Once loaded, the picture will automatically be compressed, and its reduced size will be displayed at the top of the screen (remember that an uncompressed picture occupies 6912 bytes). Press any key to return to the menu.

Further pictures can be loaded, compressed and stored in your Spectrum – the number of pictures is limited only by the available memory. The compressor will tell you how much memory you have left, how much you have used, and how many pictures you currently have stored. Individual pictures can be displayed or deleted by selecting option 4 or 5 respectively.

The completed block of pictures can be saved to cassette, microdrive or disk by selecting one of the last three options. A filename must be specified. The compressed pictures can then be used in your own programs with the following BASIC routine: –

```
10 LET x=32768: REM you specify this value
20 CLEAR x-1: REM protect pictures
30 LOAD "filename"CODE x
40 INPUT "Which screen ?"; n
50 POKE 23681,n
60 RANDOMIZE USR x
70 PAUSE 0
80 GOTO 40
```

For microdrive users line 30 would read: –
LOAD *"m";1;"filename"CODE x

For disk users line 30 would read: –
PRINT #4: LOAD "filename"CODE x

The compressor can be transferred to microdrive or disk by first loading it as usual, breaking into it by pressing CAPS SHIFT and 6 simultaneously, then entering one of the pairs of commands below.

Microdrive: –
SAVE *"m";1;"compressor" LINE 9010:
SAVE *"m";1;"comp_mc"CODE 28672,768

Disk: –
PRINT #4: SAVE "compressor" LINE 9020: :
PRINT #4: SAVE "comp_mc"CODE 28672,768

APPENDIX 3 – TAPE CONTENTS

The contents of the supplied cassette tape are as fol1ows: –

ART STUDIO

Side 1
Cassette version installation program
Side 2
Sample pictures

EXTENDED ART STUDIO

Side 1
Microdrive version installation program
Screen compressor
Side 2
Disk version installation program
Character fonts
Sample pictures

APPENDIX 4 – INSTALLING ART STUDIO

CASSETTE USERS

Installing ART STUDIO takes the form of transferring files from the supplied cassette tape onto a fresh blank tape. The supplied tape is a master tape whose function in life is to produce a personalised copy of ART STUDIO – personalised in the sense of being configured for the particular hardware environment it is required to run under.

To install ART STUDIO on your system, insert the supplied cassette tape into your tape recorder, enter LOAD "", and press PLAY. Stop the tape when you are prompted to (but don't rewind it).

The first stage in the configuration process is to specify an input device for your copy of ART STUDIO. The options are, (1) your own choice of five keys from the keyboard, (2) Sinclair Interface 2 joystick (left or right socket), (3) Kempston type joystick, (4) cursor keys or cursor key type joystick (any other key acting as 'select'), or (5) mouse.

If you choose option (1), you will be asked to specify the five keys, in the order corresponding to 'left', 'right', 'up', 'down', and 'select'. For each, type in your choice of key and press ENTER. Note that you can't use CAPS SHIFT or SYMBOL SHIFT, and if you want to use ENTER itself for one of the keys, just press it on its own.

If you choose option (5), you will be asked to specify a mouse scaling factor. This relates to the mouse sensitivity, which is the physical distance the mouse must be moved to register as one pixel on the screen. The higher the number, the less sensitive the mouse. Note that any of the 'select' buttons on a mouse can be used to control ART STUDIO.

The rest of the configuration process concerns the printer and interface you are using. ART STUDIO includes comprehensive facilities to take hard copies of pictures on dot matrix printers capable of bit image graphics. If you don't have such a printer, or do not wish to take advantage of these facilities, then answer 'n' in response to the question "Are you using an 80-column dot matrix printer ?", and ignore the following paragraphs.

The information that ART STUDIO needs to know about your printer should be contained in its manual. The defaults to the various questions (pressing ENTER on its own) are for an Epson MX-80 printer, although these particular values are likely to work with many other dot matrix printers. So if you are not sure about the answer to a question, just press ENTER.

You will first be presented on screen with a menu of the different Centronics and RS232 interfaces that ART STUDIO supports. Simply type in the number alongside the interface you have and press ENTER.

If you select one of the RS232 interfaces, you will be asked some questions about the serial characteristics of your printer, specifically the baud rate, the number of data bits, the number of stop bits and whether the printer expects odd or even parity. If you can't find this information in your printer's manual, don't worry. The defaults are more than likely to work.

ART STUDIO will then ask you how many wires there are in the print head of your printer, i. e. the number of rows of dots it can print on each pass of the head. The choices are 7 or 8 wires, 8 being the more common. ART STUDIO also needs to know whether the top wire is controlled via the most significant bit (m. s. b.) or the least significant bit (l. s. b.) of data bytes sent to it. For most printers, it is the m. s. b.

The next question relates to control codes sent to the printer at the start of a screen dump. These control codes will typically be used to set the correct line spacing (7 or 8 dot spacing depending on the number of wires in the print head). You can enter up to 8 control codes, separated by commas. For example, on an Epson MX-80 printer, which has 8 wires in its print head, and where the distance between successive dots is 1/72", the codes to set line spacing at 8/72" would be 27,65,8.

Special control codes are needed by printers to switch from their normal text mode to graphics mode. In addition, most dot matrix printers can operate in two different graphics modes, known as single density and double density. The resolution in the latter mode is generally greater than that in the former, i. e. more dots can be printed across the page. Different control codes are needed for the two modes. ART STUDIO will ask how many dots your printer expects in single density, and the control codes to select that mode, and then it will ask for the same information for double density mode. If your printer has only one graphics mode, then enter 0 for the dots in double density. Again you can enter up to 8 control codes, separated by commas. Note that you can enter double byte parameters directly. For example, the responses for an Epson MX-80 printer would be 480 dots in single density, and control codes to select single density mode 27,75,480.

Finally you will be asked for the control codes that your printer recognises for carriage return and line feed. The defaults are 13 and 10 respectively. Note that automatic insertion of line feeds after carriage returns is handled from within ART STUDIO itself.

Before proceeding any further, ART STUDIO will list your parameters to the screen and will ask you if this information is correct. Enter 'n' and the above sequence of questions will be repeated, enter 'y' and you will be committed to your selection.

When the screen prompts you, start the supplied cassette tape again (from the point at which you stopped it). The rest of the installation program will load.

Finally, all that remains to be done is to save your personalised copy of ART STUDIO to tape. Insert a blank cassette tape into your tape recorder, remove the EAR plug, and press ENTER. Follow the prompts to save the individual ART STUDIO files, then rewind the tape for verification (remembering to put the EAR plug back).

This completes the installation process. Your personal copy of ART STUDIO can now be loaded by entering the command LOAD "" after resetting your Spectrum.

IMPORTANT NOTICE

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APPENDIX 5 – INSTALLING EXTENDED ART STUDIO

ZX MICRODRIVE AND KEMPSTON DISK INTERFACE USERS

The supplied cassette tape contains two versions of EXTENDED ART STUDIO; one designed for microdrive operation and the other for disk operation. Consult Appendix 3 to see which side of the tape you should use.

Installing EXTENDED ART STUDIO take the form of transferring files from the supplied cassette tape onto microdrive cartridge or floppy disk. The supplied tape is a master tape whose only function in life is to produce a personalised copy of EXTENDED ART STUDIO on cartridge or disk – personalised in the sense of being configured for the particular hardware environment it is required to run under.

Because of the size of EXTENDED ART STUDIO and the number of files involved, the installation process must be divided into two. The files are loaded from the master tape in two batches. The transference to cartridge or disk is fully automatic, all that is required of the user is to stop and start the tape when prompted, and to answer questions concerning the printer and interface in use.

To install EXTENDED ART STUDIO on your system, first make sure you have a formatted cartridge or disk at hand, then reset your Spectrum. Insert the supplied cassette tape into your tape recorder, enter LOAD "", and press PLAY. Stop the tape when you are prompted to (but don't rewind it).

The first stage in the configuration process is to specify an input device for your copy of EXTENDED ART STUDIO. The options are, (1) your own choice of five keys from the keyboard, (2) Sinclair Interface 2 joystick (left or right socket), (3) Kempston type joystick, (4) cursor keys or cursor key type joystick (any other key acting as 'select'), or (5) mouse.

If you choose option (1), you will be asked to specify the five keys, in the order corresponding to 'left', 'right', 'up', 'down, and 'select'. For each, type 8 in your choice of key and press ENTER. Note that you can't use CAPS SHIFT or SYMBOL SHIFT, and if you want to use ENTER itself for one of the keys, just press it on its own.

If you choose option (5), you will be asked to specify a mouse scaling factor. This relates to the mouse sensitivity, which is the physical distance the mouse must be moved to register as one pixel on the screen. The higher the number, the less sensitive the mouse. Note that any of the 'select' buttons on a mouse can be used to control EXTENDED ART STUDIO.

The rest of the configuration process concerns the printer and interface you are using. EXTENDED ART STUDIO includes comprehensive facilities to take hard copies of pictures on dot matrix printers capable of bit image graphics. If you don't have such a printer, or do not wish to take advantage of these facilities, then answer 'n' in response to the question "Are you using an 80-column dot matrix printer ?", and ignore the following paragraphs.

The information that EXTENDED ART STUDIO needs to know about your printer should be contained in its manual. The defaults to the various questions (pressing ENTER on its own) are for an Epson MX-80 printer, although these particular values are likely to work with many other dot matrix printers. So if you are not sure about the answer to a question, just press ENTER.

You will first be presented on screen with a menu of the different Centronics and RS232 interfaces that EXTENDED ART STUDIO supports. Simply type in the number alongside the interface you have and press ENTER.

If you select one of the RS232 interfaces, you will be asked some questions about the serial characteristics of your printer, specifically the baud rate, the number of data bits, the number of stop bits and whether the printer expects odd or even parity. If you can't find this information in your printer's manual, don't worry. The defaults are more than likely to work.

EXTENDED ART STUDIO will then ask you how many wires there are in the print head of your printer, i. e. the number of rows of dots it can print on each pass of the head. The choices are 7 or 8 wires, 8 being the more common. EXTENDED ART STUDIO also needs to know whether the top wire is controlled via the most significant bit (m. s. b.) or the least significant bit (l. s. b.) of data bytes sent to it. For most printers, it is the m. s. b.

The next question relates to control codes sent to the printer at the start of a screen dump. These control codes will typically be used to set the correct line spacing (7 or 8 dot spacing depending on the number of wires in the print head). You can enter up to 8 control codes, separated by commas. For example, on an Epson MX-80 printer, which has 8 wires in its print head, and where the distance between successive dots is 1/72", the codes to set line spacing at 8/72" would be 27,65,8.

Special control codes are needed by printers to switch from their normal text mode to graphics mode. In addition, most dot matrix printers can operate in two different graphics modes, known as single density and double density. The resolution in the latter mode is generally greater than that in the former, i. e. more dots can be printed across the page. Different control codes are needed for the two modes. EXTENDED ART STUDIO will ask how many dots your printer expects in single density, and the control codes to select that mode, and then it will ask for the same information for double density mode. If your printer has only one graphics mode, then enter 0 for the dots in double density. Again you can enter up to 8 control codes, separated by commas. Note that you can enter double byte parameters directly. For example, the responses for an Epson MX-80 printer would be 480 dots in single density, and control codes to select single density mode 27,75,480.

Finally you will be asked for the control codes that your printer recognises for carriage return and line feed. The defaults are 13 and 10 respectively. Note that automatic insertion of line feeds after

carriage returns is handled from within EXTENDED ART STUDIO itself.

Before proceeding any further, EXTENDED ART STUDIO will list your parameters to the screen and will ask you if this information is correct. Enter 'n' and the above sequence of questions will be repeated, enter 'y' and you will be committed to your selection.

You will then be given the option of making your copy of EXTENDED ART STUDIO auto-loading (i. e. it automatically loads whenever you press the reset button on your disk interface or enter RUN after NEW'ing your Spectrum in the case of microdrive users). If you don't wish to use this facility (you may already have a file called "run" on your cartridge or "AUTO" on your disk) then enter 'n' in response to the question "Do you wish the program to auto-boot?". In this case EXTENDED ART STUDIO can be loaded by entering the command LOAD *"m";1;"studio" for microdrive users or PRINT #4: LOAD "studio" for disk users.

This completes the configuration process. All that remains to be done is to save your personalised copy of EXTENDED ART STUDIO to microdrive cartridge or floppy disk. Insert your cartridge or disk into drive 1 and press ENTER. When the screen prompts you, start the supplied cassette tape again (from the point at which you stopped it). The second batch of files will load. Finally, when prompted, press ENTER again to save the second batch of files to cartridge or disk. This completes the installation process.

IMPORTANT NOTICE

Oxford Computer Publishing Limited licenses you to make copies of EXTENDED ART STUDIO FOR YOUR PERSONAL USE ONLY, subject to the following conditions: (1) that you destroy or erase the copies before parting with the original, (2) that you neither supply nor lend copies to another person. Legal action will be taken against anyone failing to observe these conditions.

APPENDIX 6 – CUSTOMISING FOR DIFFERENT INTERFACES

ART STUDIO has been designed to work with a wide range of Centronics and RS232 interfaces and contains all the software to drive these devices. But what if you have an interface that is not included in the screen menu – can you still use ART STUDIO? The answer is yes, but a guarded yes. You will need to write some short machine code routines (see below) which can control your particular interface, and POKE them into memory – consult your interface manual for technical details.

Three machine code routines are required: –

(i) the first routine initialises the interface. If your interface needs no special initialisation, this routine can just be a RET instruction.
(ii) the second routine checks the status of the printer. It returns with the zero flag set (Z) if the printer is ready, but with the zero flag reset (NZ) if the printer is busy.
(iii) the third routine is fed with an ASCII code in the accumulator, and outputs this code to the printer.

Note that each of these routines must be terminated with a RET instruction and that any of the registers AF, BC, DE and HL can be used within them. See below for examples of the sort of routines needed.

The interface 'driver' is completed by preceeding these routines with 5 'vectors'. These must contain, respectively, the start address of the driver, the entry address of the initialisation routine, the entry address of the 'busy' routine, the entry address of the 'print byte' routine and the length of the driver as a whole (length of the 3 routines plus 10 bytes for the 5 vectors). Assemble the routines with origin 08764H.

This may sound complicated, but study of the example below should clarify the construction of the driver.
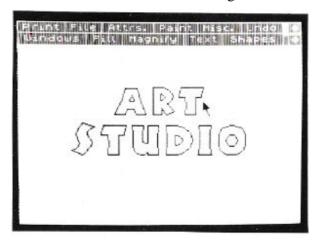
The procedure for entering your driver into memory is as follows: –

(a) Load the ART STUDIO master tape as usual.
(b) Break into the program by pressing the CAPS SHIFT and the 6 keys simultaneously.
(c) POKE your driver into memory from address 48000 decimal onwards. Please note that this is not the run-time location of your driver.
If you own an assembler this can be made easier by preparing an object code tape of the driver in advance and then loading it with a LOAD ""CODE 48000 command.
(d) Re-start ART STUDIO with a RUN command and enter 255 (user-own driver) in response to the select interface question.
(e) Proceed as above.
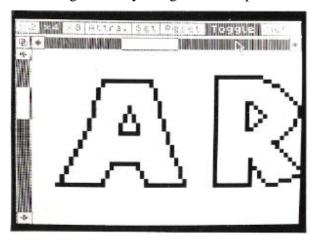
```
                 00010 ;
                 00020 ; DRIVER FOR THE KEMPSTON 'S' CENTRONICS INTERFACE.
                 00030 ;
8764             00040         ORG     08764H
                 00050 ;
8764             00060 START  EQU     $
                 00070 ;
                 00080 ; THE FIRST PART OF THE DRIVER CONSISTS OF 5 VECTORS.
                 00090 ;
8764 6487        00100         DEFW    START
8766 6E87        00110         DEFW    INIT
8768 7A87        00120         DEFW    BUSY
876A 8287        00130         DEFW    LPRINT
876C 2D00        00140         DEFW    LENGTH
                 00150 ;
                 00160 ;
876E             00170 INIT   EQU     $
                 00180 ;
                 00190 ; THIS ROUTINE INITIALISES THE INTERFACE.
                 00200 ;
876E 01BFE3      00210         LD      BC,0E3BFH
8771 3E81        00220         LD      A,81H
8773 ED79        00230         OUT     (C),A
8775 3E0F        00240         LD      A,0FH
8777 ED79        00250         OUT     (C),A
8779 C9          00260         RET
                 00270 ;
                 00280 ;
877A             00290 BUSY   EQU     $
                 00300 ;
                 00310 ; THIS ROUTINE CHECKS THE STATUS OF THE PRINTER.
                 00320 ; RETURNS WITH THE ZERO FLAG SET IF THE PRINTER IS READY.
                 00330 ;
877A 01BFE2      00340         LD      BC,0E2BFH
8770 ED78        00350         IN A,(C)
877F CB47        00360         BIT 0,A
8781 C9          00370         RET
                 00380 ;
                 00390 ;
8782             00400 LPRINT EQU     $
                 00410 ;
                 00420 ; THIS ROUTINE SENDS THE CHARACTER IN THE ACCUMULATOR
                 00430 ; TO THE PRINTER.
                 00440 ;
8782 01BFE0      00450         LD      BC,0E0BFH
8785 ED79        00460         OUT     (C),A
8787 06E3        00470         LD      B,0E3H
8789 3E0E        00480         LD      A,0EH
8788 E079        00490         OUT     (C),A
8780 3C          00500         INC     A
878E ED79        00510         OUT     (C),A
8790 C9          00520         RET
                 00530 ;
                 00540 ;
8791             00550 END    EQU     $
                 00560 ;
002D             00570 LENGTH EQU     END-START    ; LENGTH OF DRIVER
                 00580 ;
```

APPENDIX 7 – WORKED EXAMPLE

Finally we present a worked example showing the stages of construction of a picture and demonstrating some of the effects that can be achieved using the facilities of ART STUDIO.

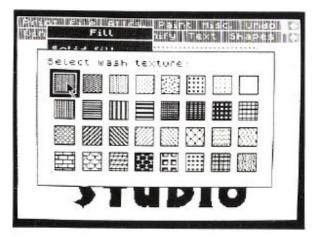We start with some outline lettering drawn by using the lines option in the Shapes menu.

The Magnify facility can be used to 'touch-up' the letters. Here we are using a x4 magnification, although a higher magnification is available if required. The cursor is used to alter the individual pixels that comprise the letters.

The letters can now be filled in using the paint roller icon.

A window has been put around the completed text and a copy of it made by clicking the 'Cut & paste' option in the Windows menu.
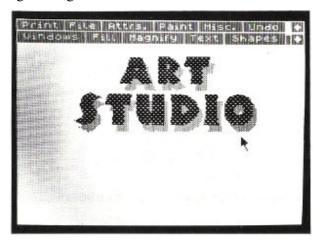
Immediately after this the 'Wash texture' menu has been pulled down, and one of the stipple patterns selected.
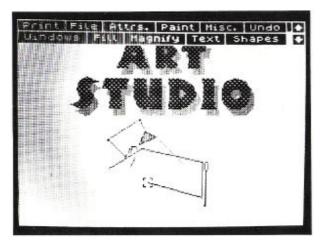
The effect of this operation is that the chosen texture is washed onto the top set of letters.
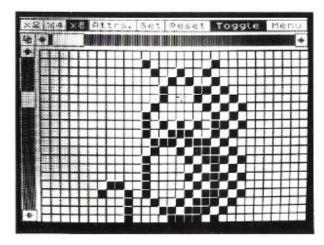
Again a window has been defined around the lettering, and the 'Cut & paste' option selected from the Windows menu (this time with the 'Merge' switch set to on). The second window outline is carefully positioned over the stippled lettering so as to slightly offset it and the select button pressed. The solid lettering is merged with its shadow.
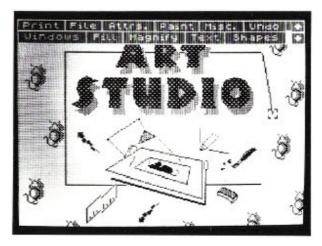
The 'Wash texture' facility has been employed for a second time to add a pattern to the top set of lettering, but this time a denser stipple has been used. This gives a pleasing three-dimensional appearance to the letters.

Some detail is being added to the picture with an elastic line from the Shapes menu.

Here the x8 magnification grid is being utilised to design a mouse character.
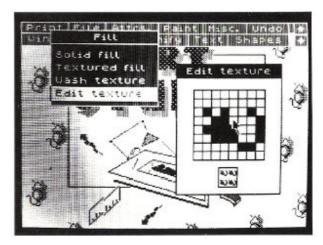
Back on the main screen, the mouse has been duplicated by placing a window around it, and cutting and pasting it with the 'Multiple' switch in the Windows menu set to on.

At this point we can try out a few possibilities. For example, using a spray can to add some random patterns to the outside of the picture.

If we decide we don't like this last move, we can simply click the 'Undo' box to remove it, and try something else. Like designing a new texture and then filling the screen with it.

Although many of the features of ART STUDIO are not covered in this short worked example, we hope it gives you some idea of the potential of the program.

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