Archimedes

'TV' Digitiser

Desktop Software

USER GUIDE

& Supplement to the Digitiser Manual

Watford Electronics

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'TV' Digitiser Desktop Software User Guide

and
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Watford Electronics
Jessa House
250 High Street
Watford WD1 2AN
England

Telephone 0923 37774
Telex 8956095
Fax 01 950 8989

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Contents

1 Introduction

This guide describes all the facilities available in the 'TV' desktop video digitiser software. The software is similar in many ways to other RISC OS applications, as many of the concepts of windows, menus, icons, file dragging etc. are the same. This documentation therefore concentrates mainly on the features specific to this program, and assumes some familiarity with RISC OS applications in general. If you can use the !Paint and !Draw packages which are supplied with RISC OS, then much of the TV software will already be familiar. If you are new to Risc OS, read the Archimedes Welcome guide first.

The 'TV' software provides a simple user interface to the video digitiser via the RISC OS desktop. Images may be grabbed and immideiately transferred into other RISC OS applications, such as DTP (desktop publishing), as well as art and drawing packages (e.g. !Paint,!Draw).

All the star commands and SWI calls in the old digitiser software (as described in the main manual) are also still supported, with several additions, which are described at the end of this guide.

2 Installation

The software requires the RISC OS operating system. If you still have the old Arthur ROMs in your machine, you will need to upgrade to RISC OS before installing the software.

This software is supplied as standard on new digitisers, and is available as an upgrade ROM for existing users. If you have received this guide with a digitiser, then the new ROM will already have been fitted, and you can proceed with the installation as described in the main digitiser manual.

If you are upgrading from the old version of the software, proceed as follows:

Switch on the machine (with the digitiser & old software still fitted), and type:
*Help Modules (Use f12 to get a * command prompt first if your machine starts up in the desktop.)
This will display a list of the Relocatable Modules (RMs) in the machine. You may need to press SHIFT to allow the full list to be displayed.

Switch off the machine, and remove the cover. Remove the digitiser, and place it on a firm, flat surface.

Remove the old ROM (The largest chip on the board, marked IC11) from its socket by inserting a small flat-bladed screwdriver between the chip and the socket at one end, and levering it up gently. To avoid damage to the socket, you should lift the chip out a small way at a time from each end alternately. Ensure that the pins on the new ROM chip are straight and parallel. Place it in the socket so that the pins rest correctly in the holes, ensuring that the orientation is correct - the notch faces the same way as on all the other chips on the board (towards IC14). Press it into the socket by pushing down on the centre, ensuring it goes in straight, and is properly seated in the socket. Now follow the same procedure and replace the PAL chip (IC6). When this has been done, reinstall the digitiser in the machine.

3 Using the software

The software provides some interactive help information via the RISC OS !Help utility (which is supplied on Applications Disc 1).

The following conventions are used in this guide :
SELECT, MENU, and ADJUST are the three mouse buttons (left,middle,right) UP, DOWN, RETURN, SHIFT, CTRL are the up/down arrow, return, shift and ctrl keys on the keyboard.

Several of the menu options allow numeric values to be entered (within white boxes)- these are used by clicking inside the box, and using the number keys, LEFT/RIGHT, DELETE and RETURN to enter the required values. Several of these boxes also have up/down arrow boxes, which can be used to increase or decrease the values. These will auto-repeat if the mouse button is held down, just like the keyboard keys, and in most cases, you can use SELECT for coarse adjustment, and ADJUST for fine.

When a menu is referred to as a submenu, it is accessed by moving the pointer over the arrow to the right of the main menu, not by clicking on the main menu item, which in some cases has a different effect.

Whenever the desktop is entered, a TV icon will appear on the icon bar, with a grey screen, to indicate that it is disabled and not using any application memory. If it does not appear, try typing '*RMReInit TVLoader' at the command line, and resetting the machine (CTRL-BREAK). Clicking on the icon with any mouse button loads the main program from the ROM chip on the digitiser, and then performs the action indicated by whichever mouse button was pressed. The 'screen' of the icon will change, and the little red 'light' will come on. (The icon may also move to the right if any other icons have appeared on the icon bar since the TV loader installed itself.) Note that there will be a slight delay after clicking on the 'switched off' icon as the main program is loaded in.

When active, the software uses 48K of application memory, plus 24K in the module area (RMA) for the digitiser module. This system provides the convenience of having the software always available, without the problem of memory being wasted when you're not using it. The TV software can be completely disabled using *UnPlug TVLoader, and re-enabled with *RMReinit TVLoader from the command line.

If you don't normally use the facilities of the digitiser module (* commands and SWIs) directly, you can save memory by typing '*Unplug Digitiser' at the command line prompt. The TV software will automatically re-enable the digitiser module when required, and *Unplug it again when it is exited, but note that it will only *Unplug it if TV is exited via its own menu, or by quitting the desktop - powering down or resetting will leave it enabled. When the digitiser module is *UnPlugged, the digitiser sign-on message no longer appears onscreen after reset or power-up. The *Unplug state is held in CMOS RAM, and so is preserved after power-down.

Click SELECT on the TV icon to open the TV display window. SHIFT-SELECT opens the TV window and freezes the image.

If the window had previously been opened, it will reappear at the same size and position, and the zoom, contrast and freeze settings will be as before.

Click ADJUST on the TV icon to grab a tiny picture into the TV icon screen (only when the main TV window is not on-screen).

Clicking MENU on the TV icon brings up a menu, which contains the following items :

Info
Displays an information window, giving information about the version number and date of the software. In case of any queries, please quote all the information that appears in the Version box in any correspondence.

Fullscreen
Continuously grabs fullscreen pictures until a keypress, mouse click or no video signal is present. This normally changes the screen to mode 9 for maximum speed, although you can force it to use the current screen mode by doing SHIFT-Fullscreen. The original screen mode is restored on exit. Fullscreen mode will exit immediately if there is no video signal present, or you use SHIFT-Fullscreen in a mode not supported by the *SEE command.

Grey Palette
Redefines the desktop palette in 16 colour modes to give 16 grey levels instead of the usual 8, giving improved picture quality for digitised images. This menu item is only selectable if the current screen mode is a 16 colour one, as there is no point using it in other modes (16 grey levels are always displayed in 256 colour modes). The normal palette can be restored using 'Default' in the Palette utility menu.

Tiny
Enables continuous grabbing of images to the 'screen' of TV icon on the Icon bar. The Speed, Zoom settings etc. are the same as those set for main TV window. The Tiny TV image will not have the correct grey levels in 2 or 4 colour modes, and may not in 256 colour modes if the palette has been redfined. Tiny is nonselectable when main TV window is onscreen. Selecting Tiny cancels freeze mode.

Switch off
Returns TV to the 'dormant' state, turning the TV icon grey, and freeing the application memory used. The digitiser module is also removed from memory if it was previously *UnPlugged. It may be re-enabled by clicking on the TV icon again.

Remove
Removes the TV icon from the icon bar, freeing application memory. It will reappear next time the desktop is entered.

Kill
As above, but the TV icon will not reappear until after the machine is reset (CTRL-BREAK or power-up). This option frees the small amount of memory used by the loader when TV is 'switched off'.

4 The TV window

When the main TV display window is displayed, the following actions can be performed by clicking inside it :

SELECT grabs a new picture if the display is frozen or in slow grabbing mode. This will auto-repeat in the same way as keyboard keys, so holding SELECT will continually grab images.

ADJUST adjusts the TV window size by dragging the bottom right-hand corner.

SHIFT-ADJUST adjusts the size as above, but preserves the correct aspect ratio of the window. The edge of the window nearest the pointer position is adjusted with the mouse, the other edge being calculated automatically from the aspect ratio.

CTRL-ADJUST is similar to SHIFT-ADJUST, except that it drags the window size preserving whatever aspect ratio it currently has.

MENU brings up the 'TV Controls' menu: (SHIFT-MENU puts the menu to the right of the TV window)

4.1 Freeze

Toggles continuous grabbing on or off. A tick appears to the left of 'Freeze' when the display is frozen. Note that the 'TV Controls' menu will always appear in a position that ensures that the pointer will be over the this item when MENU is pressed , so double clicking MENU effectively toggles freeze mode on or off. (SHIFT-MENU causes the mouse position to be moved to 'Freeze')

The Freeze submenu allows the grabbing speed to be adjusted, and delayed grabs to be performed. Four grabbing speeds are provided, Slow,Medium,Fast, and Fastest. Clicking on any of these menu items disables freeze mode if the image was frozen, and selects the new speed. You may want to slow down grabbing to reduce the amount that the 'live' TV window slows down other applications. A tick appears to show the current speed when the image is not frozen.

4.1.1 Delay

This allows the image to be frozen after a specified time. The Delay submenu allows the delay time to be specified. The delay period is started by clicking OK in the delay submenu, pressing RETURN after entering the delay time, or by clicking the 'Delay' item in the 'Freeze' submenu. During the delay period, images will be grabbed and displayed at the currently selected grabbing speed (useful to line up/focus a camera), and the title bar of the TV window will turn yellow, with a countdown indicating the time remaining. When the delay time expires, the image will be frozen, the title bar will return to grey, and a short bleep will be heard. Note that if the TV window is very small, the delay time may be extended by a second or two due to interrupts being disabled when grabbing. The delay will be cancelled by any operation that normally freezes the image (Freeze, Process, PicLoad etc.). The Delay function is useful when using a video camera without a tripod - the delay allows the camera to be pointed at the subject before the image is frozen.

4.2 Contrast

The contrast submenu allows the contrast and brightness of the displayed image to be adjusted. The two buttons on the left-hand slider select the lightest and darkest shades from the image, which will be displayed as the lightest and darkest colours onscreen. The settings are adjusted by dragging the buttons up and down the slider. The right-hand slider selects the lightest and darkest screen colours used to represent the lightest and darkest image colours.

When the image is frozen, dragging slider buttons with SELECT continuously updates the TV image with the new slider setting as the button is dragged. Dragging with ADJUST only updates the image when dragging stops (i.e. you release ADJUST), which is faster, especually if the TV window is large.

Clicking on the greyscale icon writes a greyscale test pattern to the digitiser, and freezes the display. This is useful to illustrate the effects of the contrast controls.

The Neg icon swaps the positions of the two left-hand slider buttons to produce a negative image.

The contrast can be reset to the default by clicking on the 'Reset' icon, or on 'Contrast' in the TV Controls menu.

The 'Auto' icon allows the contrast to be adjusted automatically, using the content of the image to determine the settings of the left-hand slider buttons to give an improved image. This function works by counting up the number of pixels in the image at each of the 64 possible intensities, 'cutting out' 5% of the pixels at the lightest and darkest ends of the intensity range, and then spreading the remaining pixels over the full brightness range. This process is often called 'histogram equalisation'. The percentage of pixels cut out can be changed by altering the figure in the box below the 'Auto' icon.

Note that when deciding the contrast values to use, the Auto function only 'looks' at the area visible in the TV window, so you can optimise the contrast for any particular area of the image simply by zooming in on it before using Auto.

The Auto function can also be performed by clicking on the 'Contrast' in the 'TV Controls' menu when the contrast is currently set to the default, i.e. there is no tick next to Contrast - when there is, clicking on Contrast resets the settings. Note that when you grab a new image, you need to use Auto again, as the settings depend on the image content, so using Auto when the image isn't frozen is not very useful.

4.3 Zoom

Zoom allows part of the image to be selected and magnified to the required size. The left slider sets the magnification, and is used in the same way as the contrast sliders. The box on the right indicates the part of the image currently being viewed - the outer grey box represents the total picture, while the orange box is the currently visible part of it. As the magnification is increased, the orange box shrinks. You can move (Pan) around the image by dragging the orange box. The right-hand slider allows the aspect ratio of the image to be stretched - the centre position represents a symmetrical magnification - dragging the slider towards 'tall' increases the vertical magnification, while 'fat' decreases it. As with the contrast sliders, when the image is frozen, dragging the sliders or the box with ADJUST allows quick setting of the required position, the screen being updated when dragging stops. The four arrows allow fine adjustment of the image position - use SELECT for coarse adjustment, ADJUST for fine. Clicking on the Reset icon, or on Zoom in the TV Controls menu resets the zoom settings to their defaults. A tick appears next to Zoom in the main menu when the settings are anything other than default.

4.4 Tweaks

This menu is divided into 3 sections, controlling different functions.

The window size may be set as an exact number of OS units by entering figures in the size boxes, or using the up/down arrows. Pressing RETURN or clicking OK after entering a size changes the window size. Note that the figures may change from what you enter due to contraints of pixel resolution or window size.

'Field' selects which video fields will be grabbed. Selecting 'Any' is faster, but can cause jitter. 'Line' adjusts the vertical position within the 312.5 line TV field from which grabbing starts. See the main digitiser manual for an explanation of frames, fields and interlacing.

'PicLoad options' select the action taken when a 'Picture' format file is double-clicked, or dragged to TV screen or icon. A tick appears by 'Tweaks' in the TV Controls menu when the option is other than 'Normal'. Clicking 'Tweaks' resets the PicLoad option to Normal. See the section on *PicLoad in the main digitiser manual for details of the functions of the various options.

For example, to mix (superimpose) two 'Picture' files, set the option to 'Normal', load the first by double clicking it or dragging into the TV window, set the option to 'Average', and load the second. The Greater, and LessThan operations also provide interesting ways of mixing two images.

4.5 Process

This menu provides various image processing functions. All these operations modify the image in the digitiser's memory, so when experimenting, it is a good idea to save the image first using the 'PicSave' function (e.g. to the RAM filing system for speed), so you can try different operations on the same image. All the 'Process' functions freeze the image.

4.5.1 Dither

This improves images which suffer from 'banding' effects, caused by the limited number (8 or 16) grey levels available on-screen. This is especially noticeable on images where the intensity changes slowly over a large area.

The extra grey levels available from the digitiser (up to 64) are simulated by mixing together pixels of the available greys to produce intermediate levels. To illustrate the effect, enter mode 12 or 20 (which usually show only 8 grey levels), use the greyscale button in the Contrast menu, and then click on 'Dither'.

The Dither submenu allows adjustment of the appearance of the dithered image. The 'Fuzz' value determines the amount of randomness used when dithering, ranging from 0, which can produce undesirable patterning effects on some images, to 100% which looks not unlike a very 'snowy' TV picture.

The 'Greys' box indicates the number of grey levels to be used in the final image. This is automatically set to the number of levels available with the default desktop palette in the current screen mode, but can be adjusted using the up/down arrows. The number of levels in 16 colour modes defaults to 8, but is set to 16 when the 'Grey Palette' function is used.

The dithering process takes the contrast settings into account when generating the dithered images, and resets the contrast sliders, because the contrast setting becomes 'embedded' in the image. Because of this, the sliders only have a very coarse effect on dithered images, as there are fewer grey levels to work from.

The Gamma Correction icon allows an adjustment to be applied to the image to improve the grey-level accuracy when the image is eventually printed. See the section describing the 'Print' function for an explanation of gamma correction.

4.5.2 Convolve

This performs a 3 by 3 convolution (filtering) operation on the image. This can produce effects such as smoothing, edge detection, edge enhancement etc., depending on the values used. A full explanation of this process is beyond the scope of this guide, but the following is a brief description of what it does, and how it can be used.

The convolution replaces each pixel in the image with a value calculated from the original intensity values of that pixel and its immediate neighbours according to a 'convolution matrix', which specifies how neighbouring pixels affect the central one. The exact operation performed is as follows :

p0..8 represent the original pixel, and m0..8 the matrix, arranged as shown :

```
p0 p1 p2   m0 m1 m2
p3 p4 p5   m3 m4 m5
p6 p7 p8   m6 m7 m8
```

The pixel corresponding to pixel 4 is replaced by p0 x m0 + p1 x m1 + p2 x m2 ..etc.. + p8 x m8

The multiplications are signed, so the matrix can contain negative values. The result is automatically scaled to give sensible output values.

The matrix values are specified in the Convolve window by clicking SELECT to increment, or ADJUST to decrement the values. Some preset matrices can be selected by clicking on the boxes to he right of the image: Blur is similar to the Smooth operation, Sharpen enhances edges and detail (but makes noise more visible), and Shadow emphasises diagonal edges very strongly, producing an interesting shadowing effect on certain types of image. The Reset box resets the matrix to a null operation, which leaves the image exactly as it was - obviously this isn't useful as it is, but is a quick way of resetting the matrix when experimenting.

The Sum box shows the sum of all the matrix elements, and is a useful guide when experimenting with different matrices - the more interesting ones tend to have sums in the range -5 to 5.

Click the OK box to perform the convolution, which takes a few seconds.

For more information on convolutions, consult a book on image processing, but feel free to experiment - you may find some interesting effects even if you don't understand exactly what's happening!

4.5.3 Smooth

This smooths (blurs) the image (Use Adjust for multiple passes, as the menu remains onscreen). Note that this operation can also be done using Convolve, but Smooth is faster.

4.5.4 Zit

This removes isolated spots (usually caused by electrical noise) from the image. The main use of this is to reduce the disk space used when saving files in Picture format (using the PicSave function), and the effect is rarely visible, except on a dithered image - don't use this function on dithered images, as it will effectively un-dither them!

4.5.5 X Flip, Y Flip

These flip the image horizontally or vertically respectively.

4.6 Save Sprite

Sprites of digitised images may be saved to disk, or transferred to other applications using this menu. The sprite file is saved in the same way as for other RISC OS applications, i.e. by dragging the file icon to a directory window, or entering a full pathname.

Using this function, images can be transferred immediately to other RISC OS applications such as DTP or !Draw, simply by dragging the sprite icon into the application's window. This makes the inclusion of digitised images in documents extremely quick and easy. You can easily produce an image which exactly fits into a space in a document, simply by dragging the TV window over the required space in the document window, adjusting the size to fit, and then using the 'Save Sprite' function.

The size of the saved image defaults to being the same as the TV window, but may be adjusted using the width and height icons (the size figures are in OS units). Clicking the 'Aspect' boxes adjusts the corresponding size to give the correct aspect ratio, given the other size, and the zoom setting. Click 'Fullscreen' to set the image size to full screen size. The default is to save a mode 12 sprite with a 16 colour palette, but this can be changed to mode 20 for improved resolution. Note that you don't need a multisync type monitor to use mode 20 sprites - the improved resolution can be useful when printing, as RISC OS printer drivers always use the maximum resolution available, regardless of the screen resolution.

Selecting 'Anti-Aliased' generates an anti-aliased sprite from a fullscreen sized image of the curent picture. This can significantly improve the quality of small sprites (e.g. for desktop file icons). Creating large (bigger than quarterscreen) antialiased sprites is fairly pointless, as it makes very little difference to quality, is slow, and uses more memory. When saving fullscreen sprites, if a 'not enough memory' error occurs, reduce the size (preferably the height) slightly, so that screen memory can be used as a temporary buffer. Alternatively, quit any other applications, and save the image to disk.
See the section describing the Print function for information on the Gamma Correction icon.

4.7 PicSave

This saves the image as a Picture (PicSave) format file, which contains the full 512 x 256, 64 grey level image stored in the digitiser's memory. The file is saved in the usual way, i.e. by dragging the file icon to a directory window, or entering a full pathname.

Picture files can be loaded by either dragging them to the TV window or TV icon on the iconbar, or by double-clicking on them.

You can view several Picture files in turn automatically if you drag them all into the TV window (e.g. by using ADJUST to select them in a directory viewer, or by using Select All). Each picture will be loaded and displayed, but note that the name in the title bar will NOT change for each picture, and will show the name of the last of the files loaded when it has been displayed.

PicSave should be used to save images you want to keep for future use, as they be subsequently reloaded into the digitiser, and all the image manipulation facilities can then be used, unlike sprite files, which can only be used 'as is'.

Note that if grabbing is enabled when using Save Sprite or PicSave, the picture is only frozen when icon is dropped into a directory or application, OK is clicked, or Return pressed.

The format of Picture files is described in the main digitiser manual. They have a filetype of &DFA, and are shown as a small picture icon in directory viewers.

4.8 Print

Images may be printed to any suitable RISC OS printer driver (!PrinterLJ, !PrinterDM etc.). The full resolution of the printer is used, and is therefore not dependant on the screen resolution. The image is printed as it appears in the TV window, so a section can be printed by using the Zoom function to select the required part, and the contrast settings are taken into account. The default size is the same as onscreen, using the RISC OS convention of 1 OS unit = 1/180". The image size, orientation, and position on the page can be adjusted by altering the appropriate figures in the Print window. Note that when you adjust the image width, the height is automatically adjusted to make the printed aspect ratio the same as that of the TV window. The height can also be adjusted seperately if required.

The position on the page is the distance of the bottom-left corner of the image from the bottom-left corner of the paper in 'portrait' mode, or the top-left from the top-left corner in 'landscape' mode.

When the Gamma Correction icon is selected, a correction factor is applied to the image intensities to improve the accuracy of printed grey levels. The reason for this is that the display tubes used in TV sets and monitors do not have a linear relationship between the light emitted and the voltage applied, and as the circuitry to compensate for this is complex, the correction is done in the video camera (because there are a lot less cameras in the universe than there are TVs!). The consequence of this is that if you put a linear grey scale in front of a camera, you don't get a linear voltage out, and if you then digitise and print the image, the darker greys will come out too dark. This is not of course the case with the greyscale produced with the greyscale icon in the contrast window, as this is artificially generated, without the pre-correction that a camera would apply.

The Gamma correction function in the Print, Dither and Save Sprite menus compensates for this, restoring a linear grey scale. The correction factor of 0.45 is the normal one used in most cameras, but you can adjust it for non-standard sources, or just to alter the appearance of images. A value of 1 produces a linear conversion (i.e. no effect), and as the value is reduced, the darker parts of the mage will become lighter. Note that the effect is not the same as using the Contrast sliders, as these have a linear effect, whearas the gamma correction factor determines the non-linearity of the conversion. If you print a dithered image, remember to apply the correction only once - enabling correction when dithering, then disabling it when printing will give the best results.

Don't worry if you don't understand this! You just need to remember that if you are creating an image which will eventually be printed (either using 'Print', or via a DTP package after transferring an image sprite), it will usually look better with gamma correction enabled. If in doubt, experiment! Gamma corrected sprites will look a bit pale or 'washed out' onscreen.

5 General notes

When a submenu window (e.g. Zoom, Print etc.) is onscreen, it can be made to disappear by clicking MENU anywhere inside the window.

The software tries to be as economical with memory as possible, and so doesn't reserve any memory for creating sprites. When the Save Sprite function is used, memory is temporarily claimed from the module area (RMA). This may result in an 'out of memory' type of error. If this happens, you'll have to exit from other application(s), save the sprites to disk, and then reload the applications. If there is enough memory on the screen, you will be given the option to use this - the screen will fill with garbage, but will be restored when the sprite has been saved.

In high video DMA rate screen modes (21,24,28), The screen is blanked during grabbing (as it is when accessing ADFS floppies in these modes). For this reason, the TV display is always frozen in these modes, and new images must be grabbed using SELECT. This blanking does not happen on systems using the ARM3 processor.

Changing the palette or screen mode causes TV to recalculate its screen colours to give the best approximation to a greyscale. 16 shades are usually available in 256 colour modes, 8 with the default palette in 16 colour modes. The Grey Palette function allows 16 shades to be used in 16 colour modes.

Resizing the TV window can be rather slow, particularly in high-resolution screen modes, as the whole window has to be redrawn completely, so it can be useful to do *Configure WimpFlags 13, which disables continuous dragging of window sizes (dragging windows and scroll bars remain 'solid', though). Note however that when dragging with SHIFT or CTRL-ADJUST to preserve the aspect ratio, the dotted outline will NOT correctly indicate the final size.

When grabbing at 'Fastest' speed, the mouse pointer will become sluggish if the window is small or obscured, due to increased grabbing rate. Use the 'Fast' speed if this is a problem.

If you use a graphics tablet instead of a mouse, there can be slight problems when grabbing continuously, especially at the 'Fastest' speed with a small or obscured TV window, or in 'Tiny' mode. This is due to interrupts being disabled whilst grabbing, causing characters to be lost from the serial port. This usually manifests itself as sluggish or jerky pointer response, and occasional 'phantom' button presses.

The TV window title bar can show one of several things :

TV	:	The current image was grabbed
<No Video>	:	A grab was attempted with no input signal
<filename>	:	The image was loaded from <name> or has been saved as <name>
Greyscale	:	The greyscale icon in the contrast menu has been used
Delay: n	:	The delayed grab facility is active, n is the countdown

A star (*) may appear after the above to indicate that the image has been modified since loading or saving. It will also appear if an image has been loaded with a PicLoad option other than 'Normal'

If you have a Lingenuity Colour Converter board fitted, you can leave it connected when using !TV, as it will be programmed by the digitiser module to pass monochrome video straight through.

6 Supplement to digitiser user guide for digitiser module V1.30

This documentation describes extensions and changes from version 1.01 of the digitiser support module (as described in the original digitiser manual) to the version (v1.30) supplied in the new ROM with the TV application.

This version of the digitiser module supports (and only runs under) RiscOS.

The following bugs have been fixed :
*Configure shades 16 didn't set table entry 0
SWI Vdig_Rotate with a 256 colour user lookup table didn't work properly
Grabs resulting in 'No video' errors didn't re-enable VRAM refresh
SWI Vdig_WriteColumn didn't work properly

6.1 Miscellaneous changes

*See now has another option V, to ignore 'No video signal' errors. This is useful when adjusting a TV or VCR tuner.

Slow operations (*Smooth, *PicLoad, *PicSave, *PicDump) display the hourglass. *Picdump also indicates the approximate percentage of time through the dump.

*Section M in modes which aren't 1280 by 1024 OS units in size (e.g. 16) doesn't work correctly.

Rotate in nonsquare modes (e.g.16) apears to squash the picture

*PicDump in mode 16/24 appears rather elongated. This can be altered using the W and H parameters.

The above three effects have deliberately not been 'fixed' to retain constistency with the OS, as the OS graphics facilities treat Mode 16 (24) as a horizontally extended mode 12 (15), not as a higher resolution mode. (e.g.circles aren't round on the screen, but will be if *PicDump'd).

System Variables File$Type_DFA and File$Type_DFB are set up as "Picture" and "LookUp" respectively. The TV application defines a desktop icon for 'Picture' files.

*FastSave and FastLoad are no longer needed, as *ScreenLoad/Save are now fast. For compatibility, FastLoad/Save are retained, but now simply do *ScreenLoad and ScreenSave, so error &80030A 'Not a full screen ScreenSave file' no longer exists.

All *Help text has been removed to save ROM space; *Help <command> now just returns a syntax string.

If The Lingenuity Colour Converter board is fitted, its contrast control is set to maximum, colour saturation to minimum and input channel to green when the digitiser module is initialised. This allows the converter to be left connected when grabbing monochrome pictures, as video will be passed straight through. (Technical note : IIC bus address 136 is written 3 times with data [1,0] [2,63] and [8,4] respectively)

6.2 Extensions to existing digitiser SWIs

SWI Vdig_Scale

SWI Vdig_Scale now works in all graphics modes, and should work in user defined modes, as long as all the VDU variables are set up correctly. SWI Vdig_Rotate now works in all 16 and 256 colour modes. SWI Vdig_FastGrab, *See M, *Grab now work in modes 16,17,21,27 and 28.

When using a lookup table with SWI Vdig_Scale in 4 colour screen modes, the 16 colour user lookup table is used. If the table contains values >3 (e.g. after tables are initialised), strange things will happen onscreen!

SWI Vdig_Scale & Vdig_Rotate update the OS_ChangedBox information when this facility is enabled. WARNING - key triggered grabs may update the box info from background, depending on the *Configure GrabOption settings.

SWI Vdig_Scale and Vdig_Rotate may be used when diverting VDU output to a sprite, but be warned of possible rounding/overflow problems when using BIG sprites, particularly with Rotate. Also, scaling/rotating very large images (>1x*1k pixels) can cause the image in digitiser memory to become corrupt, as the dynamic image memory on the digitiser will not be refreshed for a long period.

SWI Vdig_Scale in 16 colour screen modes with a lookup table is now about 80% faster. 256 colour modes with lookup and 16 colours with no lookup are also faster.

SWI Vdig_FastGrab etc.

SWI Vdig_FastGrab (and *See, *Grab) in mode 16/17 only displays 1024 horizontal pixels (512 if q set), not 1056. *ShowPic does use the full width. - this causes *GrabSave to not quite work as expected. SWI Vdig_FastGrab (and *See, *Grab) in 480 line modes crop 32 lines from the top of the picture. Quarterscreen grabs in these modes don't and therefore are a bit bigger then a quarter of a screen (256 lines)

SWI Vdig_FastGrab and SWI Vdig_Display DON'T update OS_ChangedBox info, and you also need great care when diverting FastGrab output to a sprite (e.g. end of line wrap needs setting if sprite width is different from the normal screen width).

SWI Vdig_Tables

This SWI now has two extra reason codes to simplify the writing of screen mode independant applications :

R0=9 : Sets up the user lookup table for the current screen mode to give the best approximation to a greyscale, taking into account the current screen mode and palette settings. In 256 colour modes, the 256 colour user lookup table is set, and in other modes the 16 colour table is used). In 256 colour modes, the setting of *Configure Shades is ignored, and the table is

set up assuming a colour monitor is in use. In 2 colour modes, the table is set up to contain either 0..15 or 15..0, (used to select the dot pattern number) depending on the relative brightness of the two available logical colours.
This call would typically be used by digitiser wimp applications on initalisation, and after a mode or palette change message from the window manager.

R0=10 : as above, but takes a 64 byte translation lookup table pointed to by R1, and passes each possible pixel value through it before calculating the nearest logical colour. For example, setting this table to values 63..0 would produce a negative image. Contrast adjustment is also possible using this method, without having to worry about the current mode or palette.

The above calls use the ColourTrans module, a copy of which is included in the Digitiser's ROM, as the initial release of the RISC OS ROMs did not include it.

SWI Vdig_VideoParams

This has some new parameters :

R2 - this is the time threshold used to detect the vertical synchronisation signal. (default 50 arbitary units). The vertical sync pulse is detected when the time between line sync transitions exceeds this value. To avoid problems with old applications, a new value will only be written if R2=&56nnnnnn (=ASC"V"), nnnnnn being the new value. This will only need changing on machines with different CPU speeds, unusual DMA rates, or with non-standard video signals (It does not need changing for a 20MHz ARM3).

R3 - This determines the action to take to avoid FIQ interrupts corrupting images when grabbing :

bits 0,1 :
0 Kill FIQs by setting the F bit in the PSR
1 Never Kill FIQs
2 Kill FIQs by FIQ claim service call
3 Kill FIQs by background FIQ claim service call

0 Is what the old software did (and the new software defaults to), and can cause problems when applications are using Econet.
1 Avoids all problems to other applications, but the grabbed image may be corrupted by any Econet traffic or FIQ activity which occurs whilst grabbing.
2 is the 'best' method, the only problem being that of an Econet packet arrives when grabbing, it will be ignored, and will probably be received when the sending station retries, unless the grabbing rate is high.
3 should be used if the grabbing is done fom a background task.

The new value will only be updated if R3 = &46xxxxxn (=ASC"F")

6.3 New Digitiser SWIs

SWI Vdig_DMAThreshold

Due to high video DMA rates in modes 21,24,28, and some user defined modes, The screen needs to be blanked for 20-40 milliseconds when grabbing, resulting in flicker (like when using ADFS floppies in these modes). When a MODE change occurs, the digitiser software runs a CPU speed test to determine whether DMAs will need disabling whist grabbing (e.g. ARM 3 systems do not need to disable DMAs). This is done (rather than looking at mode numbers) to allow correct operation in user defined screen modes, or with CPUs and/or memory systems running at non-standard speeds. A new SWI is provided to allow applications to deal sensibly with this situation, and to allow control over the threshold used to determine whether DMAs will be disabled :

SWI Vdig_DMAThreshold &802D4
On Entry : R0 = New threshold, or 0 to just read info / do test
On Exit : A CPU speed test has been performed.
R0 = Current threshold (default value is 1000)
R1 = Current CPU 'speed'
R2 = Current DMA disable flag state
(0=enabled,<>0=disabled)

The CPU 'speed' figure increases with increasing DMA activity or reducing CPU clock rate. If the speed exceeds the threshold, DMAs will be disabled whilst grabbing. Reducing the threshold causes screen blanking in lower resolution screen modes, whilst increasing it causes grabbed images to be corrupted in high resolution screen modes.

The CPU 'speed' is tested (and the disable flag updated) on a MODE change, on initialisation, and when this SWI is called. Mode independant applications might use this SWI to suppress continous grabbing in high res. modes to avoid flicker, for example :

SYS "Vdig_DMAThreshold" TO „flick% : IF flick% THEN <disable grabbing>

SWI Vdig_Dither &802D5

This SWI uses dithering to improve the appearance of images in screen modes having a restricted number (less than 64) grey levels. The SWI processes the image in digitiser memory for the required number of grey levels, so that it will look better when displayed using SWI Vdig_Scale etc.

R0 = 0, 1, 2, 3 for 2, 4, 8, 16 grey levels
R1 = fuzziness factor, 0..7 = none..100%
R2 = 0 or points to a contrast lookup table of 64 6 bit pixel values used to translate intensities before dithering
(Used by the TV application for contrast adjustment and gamma correction).

Note that after dithering, only the requested number of bits per pixel will remain in digitiser memory, so any required operations that use the full 6 bits (PicSave, Smooth, Convolve) should be performed before dithering.

SWI Vdig_Convolve &802D6

Performs a 3x3 convolution on the image in digitiser memory, writing the result back to digitiser memory. A multi-line buffer is used to ensure that the original and processed images don't overlap.

Entry : R0 points to a 9 word convolution matrix :
+0 +4 +8
+12 +16 +20
+24 +28 +32

The operation performed on each pixel is
p(x,y)= p(x-1,y-1)*c0 + p(x,y-1)*c1 + p(x+1,y-1)*c2
+ p(x-1,y)*c3 + p(x,y)*c4 + p(x+1,y)*c5
+ p(x-1,y+1)*c6 + p(x,y+1)*c7 + p(x+1,y+1)*c8

c0..8 are matrix entries (i.e. [R0]+0, [R0]+4 etc.), 0, 0 is the top-left corner.

The resulting pixels are clipped to 0 or 63 in the case of under/overflow. The matrix entries are fixed point signed numbers, with the point between bits 8 and 7, so a value of 256 represents 1, 128 =0.5, 512 = 2 etc.

No scaling is done on the result, so the matrix values should be pre-scaled to give a sensible result beforehand. The following BASIC code will scale the matrix, and gives reasonable results with most images and matrices.

```
REM table points to 9 words of matrix
max%=0 : FORa%=0 TO 8*4 STEP4 : max%+=63*table!a% : NEXT
IF max%=0 max%=1 : REM avoid div by zero
sf=&3F00/max% : FORa%=0 TO 8*4 STEP4 : table!a%=table!a%*sf : NEXT
```

SWI Vdig_Histogram &802D7

Entry :
R3 -> 64 word buffer for result
R4 = Step interval (should be a power of 2)
R5 = Threshold
R6 =0 to scan the whole image, or points to a block of four words:
+0 leftmost column in pixels (0..511)
+4 first line (0..255, 0 is top)
+8 rightmost column +1 (1..512)
+12 last line +1 (1..256)
Exit :
R0 = Minimum pixel value
R1 = Maximum pixel value

This SWI does a histogram of pixel intensity levels in digitiser memory, and returns high and low cut-off points for use by contrast enhancing software. Each word in the 64 word buffer is filled with the number of occurences of the corresponding pixel value. Increasing the step value allows the operation to be speeded up by omitting points - a value of 2 counts every other pixel and line, 4 counts every 4th pixel on every 4th line etc. A value of 0 uses a step of 1.

The thresholding operation is described by the following pseudocode :

(hist(x) is the number of pixels of intensity x)

```
pixval = -1 : total = 0
REPEAT
  pixval +=1
  total +=hist(pixval)
UNTIL total > threshold
min = pixval
pixval = 64 : total = 0

REPEAT
  pixval -=1
  total +=hist(pixval)
UNTIL total > threshold
max = pixval
```

The threshold value should be less than half the total number of pixels counted, which will depend on the step interval, and the scan area as defined by R6. When scanning the whole image, the totals are 65536 for step 1, 16384 for step 2, 4096 for step 4 etc.

e.g. To find the intensity levels needed to cut out n percent of the darkest and lightest pixels, use a threshold of &20000 DIV (step ^ 2) *n DIV 100

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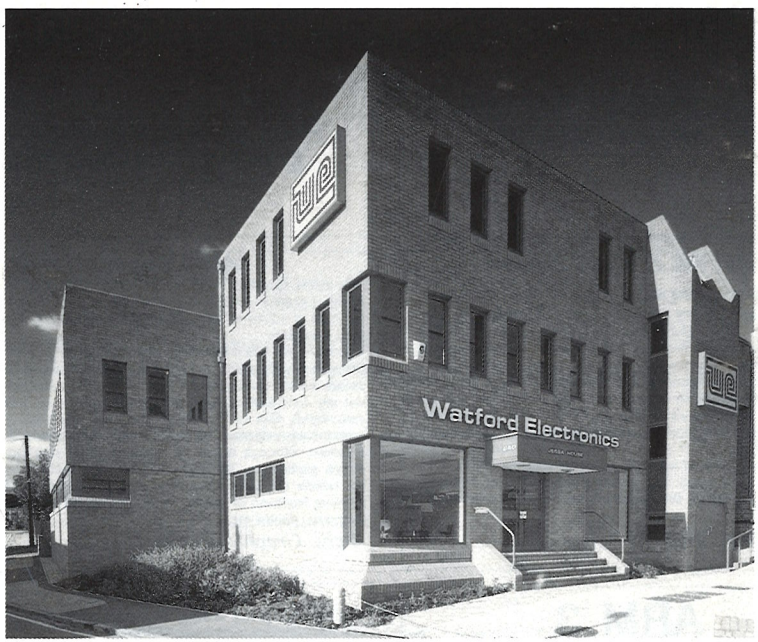

Jessa House, 250 High Street, Watford, WD1 2AN, England
Tel: Watford (0923) 37774, Telex: 8956095 WATFRD, FAX: 01 950 8989