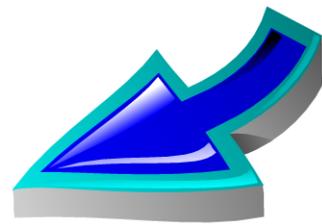


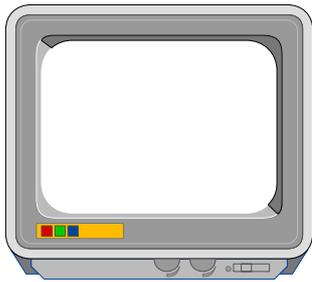
Eureka

**Issue 12
Summer 1994**



THE
ARM
CLUB

*The Magazine for Members of
The ARM Club*



THE ARM CLUB MAGAZINE

PUBLISHED BY

The ARM Club
FREEPOST ND6573
London
N12 0BR

Tel 071 624 9918
Fax 081 446 3020

EDITOR

Simon Burrows

SECRETARY

Geoff Stilwell

COVER CLIPART

Computer Concepts

PRINTED BY

Speedprint

An



Club Production

© 1994 The ARM Club
All rights reserved

CONTENTS

Editorial	2
Risc PC Update	3
Online Media	5
PhotoDesk Review	6
Club Products	11
Harrogate Show Report	12
Arnold's Observations	14
The Eureka Magazine Disc	16
CC Graphics Loaders	17
Reinventing the Wheel?	18
Pretty Good Privacy	21
Forms Suite Plus	26
Idiot's Guide to Acronyms	28
Printer Spooler	31
Club Matters	34
Pro-Mage Scan Software	35
ARM Coding Part 5	38
270Mb Syquest Drive	44
Maths Card Review	47
The Games Zone	50
A3000 Joystick Interfaces	58
Acorn News	66

Issue 13 of Eureka will be published
in October, with news of the Acorn World
Show, the PC Card and much more!

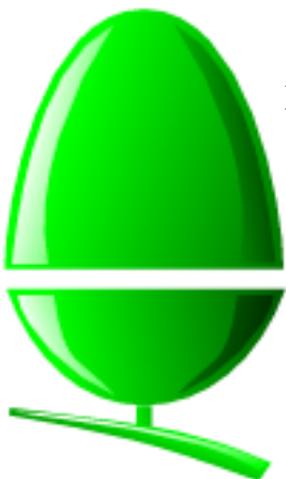
YET MORE?

A great volume of water has flown under the bridge since Issue 11 of Eureka, mainly due to the launch of the Risc PC by Acorn and the great enthusiasm with which it appears to have been met by most people in the Acorn world.

Hot on the heels of the Risc PC came another important announcement on 6th July from Acorn, namely the setting up of a new division called Online Media. The aim is to become a major player in the up-and-coming world of interactive multimedia and so called *set top boxes*; this could potentially be a great money-spinner for Acorn, and is discussed later.

On occasions in the past it has appeared that Acorn sits around doing nothing much at all, but that is certainly not the case at the moment. In the last issue of Eureka the comment was made that Acorn had further surprises and developments up its sleeve, and its entry into interactive multimedia is just one of these.

Following on from its focus on international markets for its products, Acorn's latest target is the "enthusiast" market, one which it has never really targeted in the past and which clubs such as The ARM Club were set up to support.



At the moment Acorn's Enthusiast Support is still in its infancy, but judging from the Risc PC launch event held in London and other announcements, the future looks exciting.

Simon Burrows
Editor, Eureka

Editorial

CLUB NEWS

Time seems to fly past as far as Club activities are concerned. No sooner is the Harrogate Acorn User Spring Show out of the way then we have to start planning for the Acorn World Show in October, as well as the various Open Days and meetings taking place.

We were very pleased to see so many of you up at Harrogate, taking the opportunity to see the Risc PC having read about it in this and other magazines, and to renew acquaintances with exhibitors and other visitors. Our thanks go to the organisers, Safesell Exhibitions, for their help and support.

The Club will be exhibiting as usual at the Acorn World '94 Show in October on stand 25. At the time of writing it still seems a long way off, but planning is already under way and Issue 13 of Eureka is not due out until shortly before the Show.

We would like to take this opportunity to thank all of our supporters and local groups who spend so much time and effort organising events and helping the Club, often with little or no recognition. From the beginning we have existed to encourage Acorn users to establish contacts with one another, and local events are an excellent way to do this. If you are not aware of any events in your area, how about setting one up yourself? We are always happy to help members, and a little effort put in at the beginning can mushroom into great things.



Latest news on the Risc PC

The last issue of Eureka contained a sizeable amount of information about the Risc PC, but it all went to press many weeks before the formal launch of the new computer from Acorn and so it was impossible to comment on reactions from ordinary users to the Risc PC.

It appears that the Risc PC has been very well-received by almost everyone in the Acorn world as well as many non-existing customers. At the Acorn User Spring Show in Harrogate, Acorn was unable to supply any Risc PCs for general sale because it knew that there were not enough in stock to even nearly satisfy demand at the Show, and there were fears that fights could have broken out!

According to Peter Bondar, Product Marketing Manager at Acorn, demand for the Risc PC has far exceeded Acorn's best expectations, and this would appear to be borne out by the problems which the company has been having in fulfilling orders. Top of the range ACB45 (9Mb) computers have been in particularly short supply, along with the 17" AKF85

Risc PC *Update*

monitor, and some people who ordered machines days after the launch in April were still waiting to receive them in mid-July. Acorn has been ramping up production of the Risc PC as fast as possible, but it is known that various production problems have affected the number of machines available for sale.

Two eagerly awaited upgrades to the Risc PC are faster processor cards and the 486 PC Card which will plug into the second processor socket on the Risc PC. With regard to faster processor cards such as one based on an ARM7 series chip, it looks likely that machines containing such processors will become available at the beginning of 1995.

Some customers and potential customers of Acorn have expressed concern that the PC Card is not yet available, not even in prototype form for demonstration purposes. To counter this, Acorn's Product Marketing Department has issued a fairly detailed statement answering common questions about the PC Card for Risc PC.

The key remaining technological development required for the PC Card is an ASIC (Application Specific Integrated Circuit) being designed by Future Technology Devices in Scotland along with Aleph One Ltd. The ASIC is currently being fabricated by Samsung, and as a result some 200 prototype units are expected to be ready during September for use by developers,

press, dealers and Acorn in Education Centres. All being well, a second batch of approximately 1000 units is expected to be ready for sale by the time of Acorn World '94 or soon after. Approximately another 1000 are expected to be available by the end of 1994.

Contrary to what was said in the last issue of Eureka, the PC Card will cost £99 +VAT if bought at the same time as a Risc PC, or £199 +VAT if bought afterwards. Both of these prices include Novell DR DOS 6.0 but not Microsoft Windows. Acorn has scrapped the idea of giving vouchers to people who buy a Risc PC before the PC Card is ready; instead the card will be available to all existing Risc PC owners at the reduced price for a period of three months after the launch of the PC Card. For this purpose it will be necessary to produce your dealer invoice for the Risc PC, so don't lose it! After 3 months the PC Card will only be available at the £99 +VAT price if bought at the same time as a Risc PC.



...The chip supplied on the PC Card will be a Texas Instruments 486SLX processor, which will be run at 33MHz...



The chip supplied on the PC Card will be a Texas Instruments 486SLX processor which will be run at 33MHz. According to Acorn this is functionally compatible with the Intel 486SX series and delivers equivalent performance across a wide range of benchmark tests. The processor will not be socketed so it cannot be replaced, and there will be no socket for a 487 Maths coprocessor chip. Aleph One will be supplying higher specification PC Cards using faster and better processors and having Maths coprocessor capability.

The BIOS used with the Risc PC 486 Card will be one written and supplied by Aleph One, and

is an enhanced version of the BIOS already used on their PC Cards for Archimedes machines.

The target performance of the Risc PC 486 Card is to deliver 100% of the performance of an equivalent specification PC compatible, although since the PC Card is still under development it has not been possible to measure its performance. It may exceed the performance of an equivalent specification PC system on some graphics intensive work.

The user interface to the PC Card will largely be the same as that already existing for users of the Aleph One PC Cards (podules). That is, either the Risc PC can appear to be running as an ordinary PC or else it can run the PC within a RISC OS window multitasking in the desktop. At present there is a problem in that RISC OS cannot access DOS file partitions greater than 32Mb in size, this limit will be raised to 512Mb by the time the PC Card is available.

PC software running on Acorn's PC Card will be able to access appropriate CD-ROM discs given suitable hardware. Soundblaster sound capability will be available to owners of the 16-bit sound card being developed by ESP in conjunction with Acorn, using special driver software from Aleph One.

Acorn has stated that it expects operating systems and user interfaces other than DOS and Windows 3.1 to be usable on the PC Card, for example Chicago (Windows 4), Windows NT, OS/2, SCO UNIX and Linux are possibilities, although some of these will require additional drivers to make them work.

Aleph One is developing a PC/AT expansion bus for the Risc PC which would enable standard PC peripherals such as scanners to be used with the Risc PC 486 Card, and an additional upgrade is being developed to allow

slot cards. It is expected that a Risc PC with 486 PC Card will be capable of being used in most situations where an ordinary PC could be used, for example as a Novell file- or print-server, or as part of a Lan Manager, Novell or RM network.

Other matters

A few relatively minor problems have come to light with the Risc PC, for example the fact that it isn't possible to connect additional floppy drives to the computer without making physical modifications to the motherboard; since every Risc PC is fitted with a hard disc this is not likely to be a problem for most users. Also the 3.5" drive slot in the second slices of Risc PCs is not cut out so can be rather difficult to remove. However these are minor matters compared with the advantages of the Risc PC!

Some people expressed concerns that Acorn was bundling all Risc PC computers with its own 14" or 17" monitor when they already owned expensive monitors suitable for use with the Risc PC. As a result Acorn has said that individual users may buy Risc PC models without monitor (for a discount of £250 ex VAT) provided they fill in some forms at a dealer and register as an "Enthusiast" with Acorn.

This issue of Eureka was produced on a 10Mb, 2 slice Risc PC with 17" AKF85 monitor, using the Impression Publisher package from Computer Concepts, with Camera-Ready Copy produced on a CC LaserDirect HiRes printer. Running at a screen resolution of 1280x1024 with 256 colours, the Risc PC / Publisher combination has been a dream to use compared with previous systems used.

Simon Burrows



On 6th July Acorn announced the setting up of a new division to be known as Online Media. It has the aim of developing interactive multimedia products and services for the huge emerging market linked to the so-called *Information Superhighway*.

To achieve this, Online Media will be using the technical expertise of Acorn in collaboration with industry partners including Olivetti, ARM Ltd, Advanced Telecommunications Modules Ltd, BNR / Northern Telecom, News International, MAI, Anglia Television, Oracle and Cambridge Cable.

In the first instance, Online Media's revenues will come from the supply of so-called *set-top boxes*, devices which connect sources of data and a domestic television set, named after the fact that they can sit on top of a TV set and are usually controlled by an infra-red remote controller. Longer term Online Media expects to derive revenues from licensing its designs, supplying authoring tools & consultancy, and developing on-line services.

Online Media will have its own offices and staff, although to start many of its staff have transferred from Acorn itself. The offices are based next to Acorn's Training Centre on Newmarket Road in Cambridge, in actual fact the same premises which Acorn's technical department used to occupy. The man in charge of Online Media is Chief Executive Malcolm

continued on page 20..

PhotoDesk

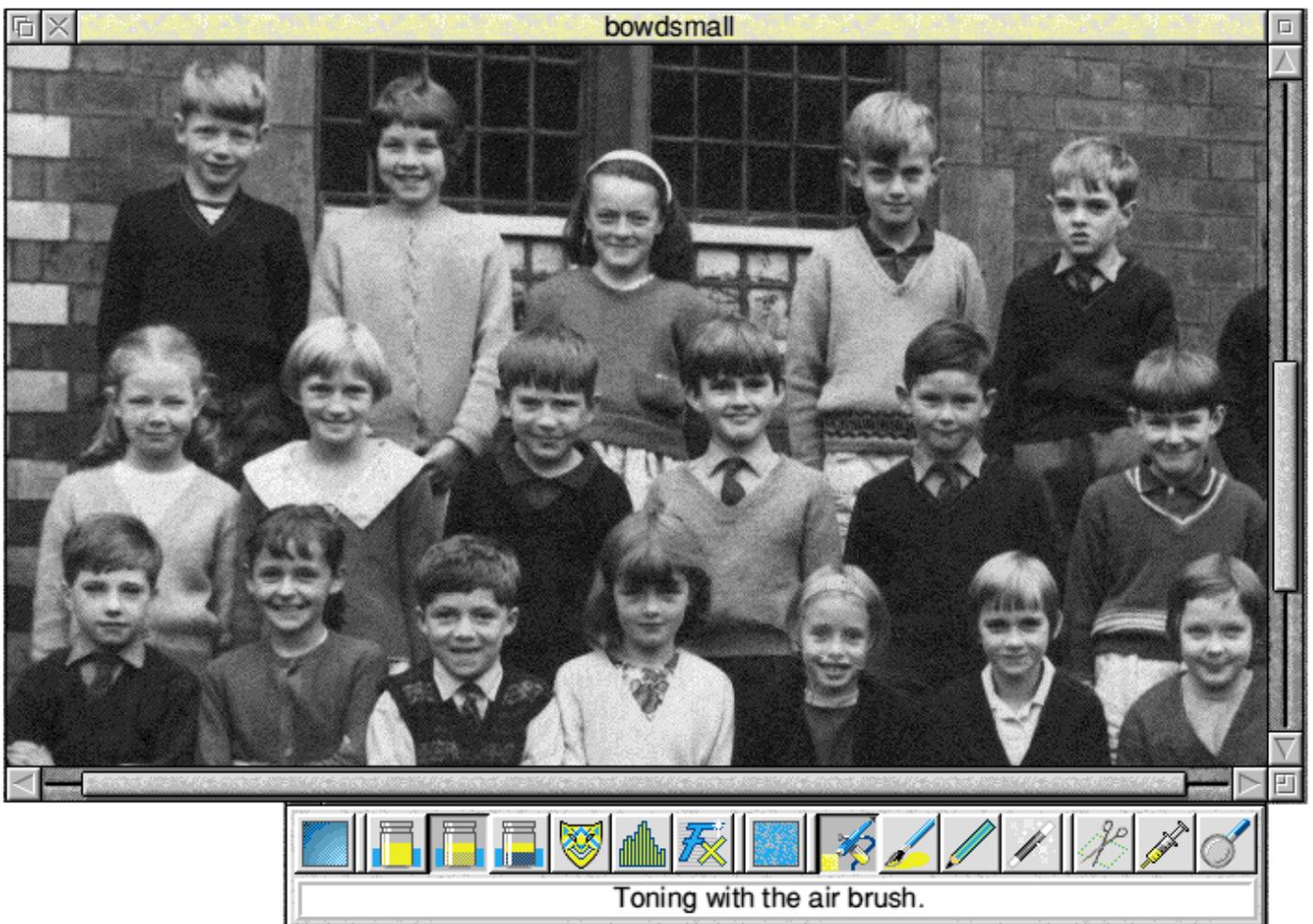
A review of the powerful new graphics package from SpaceTech

Graphics on the Archimedes have become quite dated over the past 2 to 3 years, although some interesting graphics packages have emerged which are very capable of producing interesting and detailed digital images. However IBM-type PCs (with inexpensive graphics cards) and Apple Mac computers made these images seem quite tame in comparison. Then came the new Risc PC from Acorn, and photographic quality pictures can now be displayed that would easily rival the above machines in speed and quality.

I'd been waiting for a facility to retouch old photographs that I own which have been damaged over the years due to bad storage and neglect. One photograph in particular was an old class photograph taken around 1962 and in

serious need of help from the new digital age. I acquired an Epson GT8000 scanner to transfer the image into the Risc PC. I thought I'd simply put the 24bit sprite into !Paint but I could not proceed until Simon gave me this handy hint – add the line *Set Paint\$Options X* to !Paint's !Run file – and hey presto, you can now edit 16M colour sprites [*with problems – Ed*]. This worked with my picture but the results were not that impressive, as you could see the join (know what I mean, Ern?).

At the Harrogate Show Spacotech were demonstrating **PhotoDesk**. I muscled my way through the crowds and was very impressed with the display given by Chris Hornby. Was this the answer to my problem? Now after



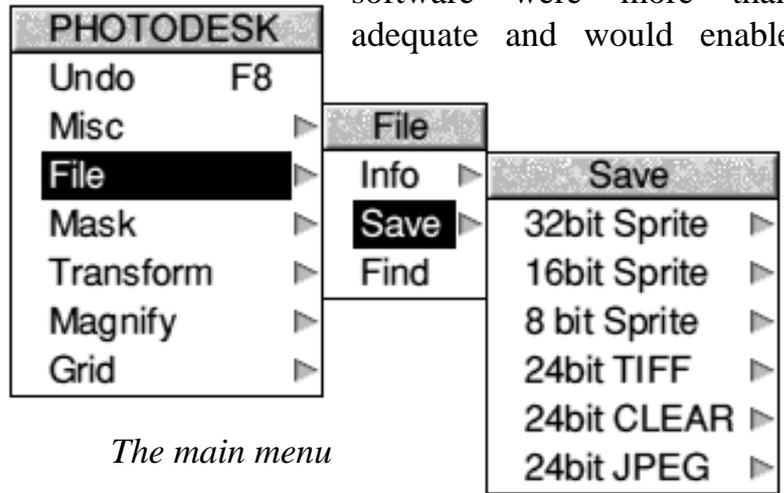
Part of the school photo rejuvenated with PhotoDesk. Spot a familiar face?

playing with a review copy of **Photodesk** over the last 3 or 4 weeks I can say a resounding Yes!

Acorn, with the help of Spacotech, are again leaders of the pack, capable of photographic imaging to match any of the high end PCs and Macintosh computers. **Photodesk** doesn't claim to rival programs like Adobe Photoshop, which cost around £800. However, a relative of mine who uses Photoshop on a Mac Quadra 800 AV, remarked that this is as fast, if not faster than his machine and with a display quality to match. That is high praise for a new product. It was his first introduction to the Risc PC and he was very impressed. A convert — who knows?

The eagerly awaited review copy of **Photodesk** arrived, containing three discs and some photocopied sheets. The first two discs contained the installation program and ancillary files, the third containing a description and sample JPEG files to play with. Once the original disc has been installed with your name, the program can be loaded from the hard disc. The original floppy disc is still required in case you wish to reinstall the program on another machine. I was glad to see that ID or dongle protection was not used.

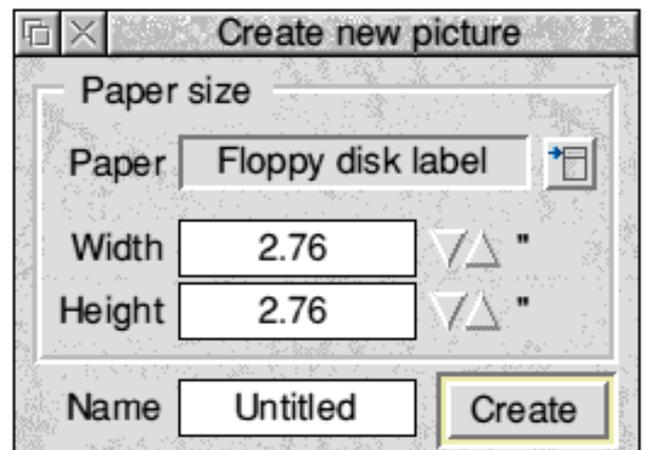
As the program is continually being updated with new features still being added, the manual was not ready for release. Spacotech understandably like to make their documentation as accurate and readable as possible. The notes that accompanied the software were more than adequate and would enable



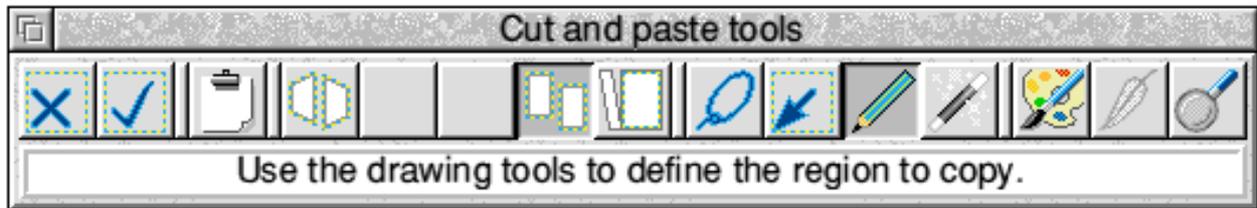
The main menu

you to use the program without any real problems. **Photodesk** has been designed to be as intuitive as possible, providing you understand the RISC OS environment.

Photodesk is designed not only to retouch photography but also to produce original artwork. It provides tools to brush, airbrush, draw lines, curves, shapes filled and unfilled, masking, stencilling, screening, cut & paste, image enhancement, filters, cloning, motion blur, camera focus, etc. One point that makes this package stand out is that it has done for bit map images what word-processing has done



The clipboard in action.



for traditional writing — it is possible to undo any images as finely as it was to create them. If a spray was used to apply an effect, it could be undone to the same degree of accuracy just by using the adjust mouse button.

The mouse buttons when using **Photodesk** are said to carry out the following functions — left button apply effect, middle button menu as normal and the right button to undo the effect. One other point to remember when using the mouse to select a tool or effect, is to use the right hand button. You will then be able to undo the changes that have been made. The left button will fix the image so that further undoing will have no effect. Perhaps a later version of the program could provide a window which would report when the picture is about to be fixed and would give an option to cancel the fix?

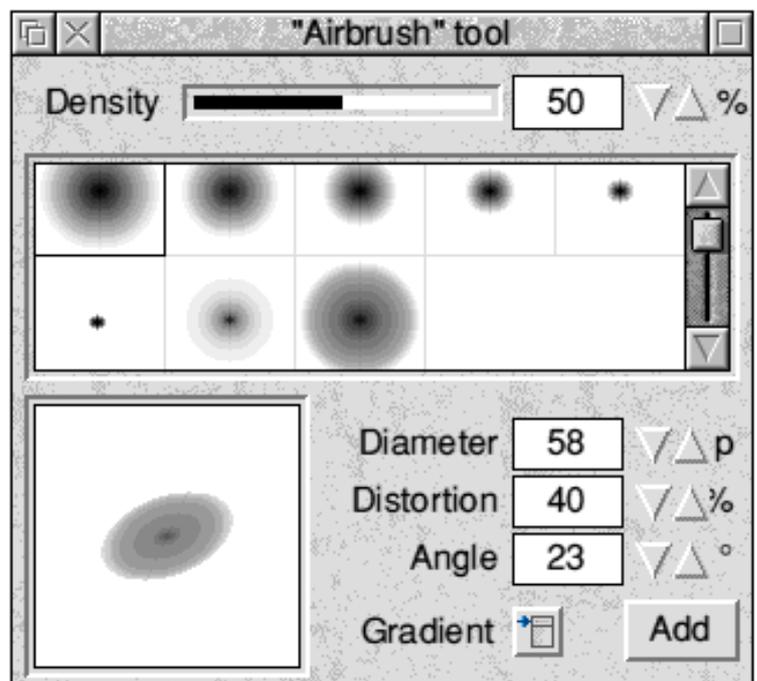
Once loaded, the following file types can be loaded directly in to **Photodesk** — 8, 16, 32 bit sprites, JPEG, CLEAR, TIFF, GIF and Photo CD files, just by dragging them to the icon on the icon bar. A fresh canvas window can be opened by choosing this from the menu option and preferences can be set up here for future use.

Photodesk works using a virtual memory system. This means the memory in the computer is supplemented by free space on your hard disc drive. This facilitates very large size files, such as the highest resolution Photo CD pictures 20Mb+ or many pictures to be loaded at once. Although using the virtual memory slows down the program somewhat, it allows those with limited memory access to all

images. Roll on cheap 32Mb RAM upgrades..

The clipboard which can be accessed from the icon bar will show all the pictures currently in the main memory and in virtual memory, dragging a window on one of these thumbnail views will open up a magnified canvas showing the area selected ready for editing.

The concept of **Photodesk** is that Spacetech provide a set of tools to apply several types of effects.



The airbrush tool dialog box

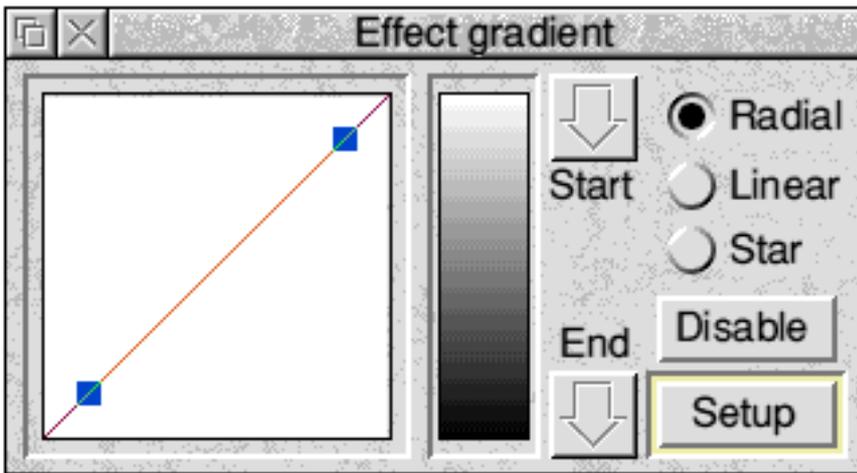
The **TOOLS** provided are: the airbrush, the paintbrush, the drawing tools, the Magic Wand.

The **EFFECTS** provided are: Colouring, Toning, Filtering, Cloning, Masking, Image processing.

Every tool can apply every effect — this so far

gives us 24 different processes. Spaceteck call these families because many variations can be generated by just one tool and effect. For example, the Airbrush tool has 8 different nozzles but you can also design more of your own very quickly. The density of the spray can be controlled between 0% to 100% in 1000 increments and the shape and angle of the spray may be adjusted. This gives an incredible variation on just one tool

RGB sliders or through opening up the Acorn colour picker from the menu option. You can adjust the palette to be your preferred 256 colours. Palette files can be saved and reloaded as required. the opacity or translucency of the colouring effect can be set using the various tools.



Toning effects – this allows you to hue shift any colour, alter the lightness or darkness, or convert colour to a grey scale. Again the opacity or translucency of the toning effect can be set using the various tools.

Filtering effect – the best way to describe this is to imagine looking at your picture through a coloured filter in the same way looking through sun glasses alters the outside world.

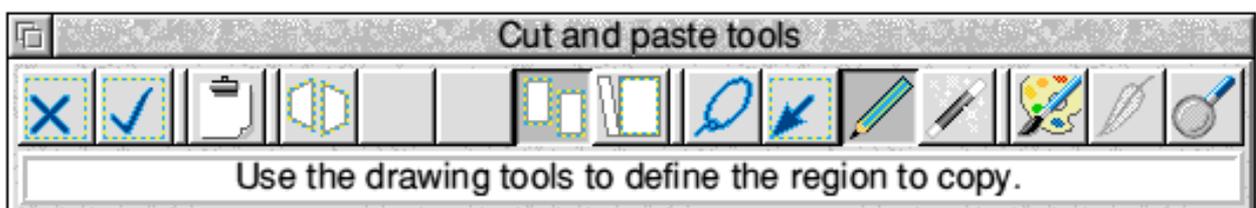
and effect. The Paintbrush has a similar concept of adjustment by the user. You can see the flexibility of the program growing.

The following is a brief explanation of the various tools and effects on the toolbar attached to each canvas:

The **Effect gradient** – all effects can be applied over a gradient set by the user where the start and end points can be defined. The gradient effect can be radial, linear or star, it can be edited using a bezier curve function.

The next tool box icon is the **Colouring effect** – this allows any one of 16 million colours to be selected either from the 256 colour palette choice, through adjusting the

Masking effect – this provides varying degrees of protection against any other effect from 0% to 100% in 1000 steps. This very powerful effect can be applied with any tool and once applied the mask can be inverted. For example you could make a mask with the text option from the drawings tool, invert the mask and then apply any effect as though using a stencil. The mask created can be moved around using select and shift. The mask shows itself in magenta although it can be user defined and hidden from view if required. Some of the special effects such as motion blur, ripple, camera lens etc. can only apply to the whole picture ie cannot be painted, airbrushed etc. However the above will obey the mask with an option to smooth out the mask at the edges.



Imaging processing effects – these could be a separate application in their own right and are subdivided into *Enhance*, *Gamma*, *Emboss*, *Math* and *Equalise*. As expected enhance allows various sharpening, smoothing high pass, edged detection, make negative filters to be applied and also allows you to edit your own convolution matrices and add them to the program.

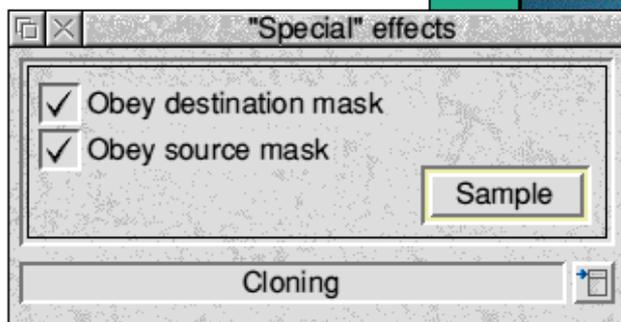
Gamma allows the usual gamma correction curves to increase, decrease contrast brighten and darken low mid & high tones and allows you to edit your own curve using bezier control points. Emboss allows rust weave shot blast effects to be applied. Again it is possible to add more of your own embossing blocks to the program. I need a little more time to get to grips with the other effects in this group.

Special effects – the options available here are *Cloning*, *Ripple* *Motion Blur* *Smudge* and *smear* and *camera lens*. Cloning as its name implies allows us to exactly copy any part of any picture to any part of any other picture. Cloning can be set to obey both the source and or destination masks of any pictures if needed. As stated earlier *Ripple*, *Motion Blur*, *Smudge* and *smear* and *camera lens* can only be applied to the whole picture



unless a mask has been set up. Motion blur is very effective for making static items look as though they are in motion. The speed and direction can be adjusted to achieve the desired look for a convincing result.

The Tool Styling icon – this allow you to change the way in which the tools operate and their textures. There are seven textures provided ranging from a crayon to ragging effect. Again the strength of the texture can be edited through adjusting the control points on a bezier curve and you can add your own textures if required. Anti-aliasing can be set so that it smoothes out the edge of an effect that has been applied with any tool.



A zebra superimposed onto a picture of a house



Airbrush tool – this was described earlier.

Paintbrush tool – this was described earlier.

Drawing tools can apply all the effects using tools similar to those found in Acorn's !Draw application and a text option similar to the !Paint text option.

Magic wand Tool – this allows the user to apply an effect over an area that is similar in density or colour. The limits at which the wand decides is similar are set by the user. 0% will only pick the colour selected. 100% will treat all 16 million colours as similar. The affect can be applied locally or globally and opacity is set in the usual way.

The scissors icon leads to another toolbox known as the cutting tools. From here we can cut crop, copy and paste to the picture, clip board or any other pictures focused by Photodesk. The tools to achieve this are a Lasso for freehand cutting, a Drag box, Drawtools and magic wand as previously described. A distort tool is also available from this tool bar. Opacity can be set in the usual way.

Returning to the main tool bar, the syringe is used to sample an area for cloning or to sample colours, tints, filters, and mask densities etc. Lastly there is the magnify icon which as the name suggests allows us to zoom into an area to see it in more detail.

Photodesk can output the following file types: 8, 16 and 32 bit sprites, 24 bit TIFF, CLEAR and JPEG files. This allows transfer to other platforms and enables files to be taken directly to typesetting bureaux for professional printing of our masterpieces!

I have only just scratched the surface of what this package can do and again top marks

must go to Spacotech for perhaps the most powerful bitmap software for any Acorn machine. On the Risc PC its a real dream to use all those colours and very fast too. Spacotech's past history of continually supporting and upgrading their software gives Photodesk guaranteed success. The price tag at £169.95 +VAT is perhaps a tad expensive but it should be on any serious photo retouching buff's shopping list. Now back to my primary school photo and then down to the printers..

P.S. If any readers were at Bowden C of E School in Cheshire around 1962 do contact me!

John Bancroft



Club Products

Many of you may be aware that the Club has set up a software development team with the aim of using our resident talent to produce software products of general interest, proceeds from the sale of which will go to Club funds.

Full details of our first products are included with this issue of Eureka. Briefly the current products are as follows:

- Landbuild** — £10.00
- Programmer's Utilities Disc** — £5.00
- Graphics Utilities Disc** — £5.00
- Desktop Utilities Disc 1** — £5.00
- Desktop Utilities Disc 2** — £5.00
- SmartCD Audio CD Player** — TBA

For more details on any of these items, please contact the Club Office. If you have ideas for other products or the programming ability to turn ideas into actual software, please write to Mark Smith via the Club address.

Harrogate Show Report

Andi Flower gives his usual roundup of the latest Acorn-dedicated show

This year saw the second Acorn User Spring Show in Harrogate for Acorn enthusiasts. Importantly it gave most Acorn users their first chance to get a glimpse of the new Acorn Risc PC. As you would probably have guessed, the new Risc PC was the star attraction of the Show and most of the stands (including the Club's) had one of their own to show off to the public.

This year the Show was held in a bigger hall than it was last year with an interesting entrance where you actually walked through the screen of a large computer to get into the Show Hall. Unfortunately the Ed. won't allow this Show Report to get too big and so I'll have to stick to mentioning only the best and most noticeable parts of the Show.

Of course, the most interesting stand (apart from the Club's!) was Acorn's; several different configurations of Risc PC were available for anyone to use but, by now, you will have all heard plenty about the new machines so I'll concentrate on the rest of the Show.

The biggest stand at the Show was actually the Theatre in which many presentations took place from companies such as Lindis, Sherston Software, Acorn, Oregon Software and Colton Software to name but a few. Even the guest celebrity Keith Chegwin took the stand on Saturday to give the Show his personal touch and to hand out the competition prizes.

Cambridgeshire Software House had what was probably one of the biggest products available at the Show. Their Frontier 2000 package is a huge and very impressive bundle of goodies all provided in a special case. The program is so large that it has to be stored on CD ROM and

the sheer quantity of high standard graphical images to accompany the information supplied in text, maps etc. makes this an outstanding package for education.

As far as games go, this Acorn User Show was as good as any other with new releases including Magnetoids, Diggers, Sensible Soccer and Speedball II. There was also a game that I am sure many people out there will be extremely glad to see on the Acorn platform, Flashback. It was being shown in demonstration form and what a game this is. It has achieved amazing status in the games machine world and looks set to be just as good on the Acorn. Let's hope that US Gold keep converting titles of this quality to the Acorn!

Castle Technology, a relatively new company to the Acorn scene were offering some great deals on Acorn hardware both old and new. They are now offering the same Risc PC discounts to ARM Club members through our discounts scheme.

Another company that has only recently come onto the Acorn scene is Sibelius Software. They have managed to release a program that has become what could probably be classed as the most successful music typesetting package ever seen. Sibelius 7 is an extremely powerful piece of software and the new version 2 was available at the Show.

Computer Concepts, one of Acorn's biggest supporters was showing off the first version of Impression Publisher which looks ready to set even more standards in the world of Desktop Publishing [*this issue of Eureka was produced using Impression Publisher — Ed*]. They also

showed a utility which quite a few people have been waiting for, called MacFS. This allows you to read and write to Apple Computer's Macintosh formatted discs.

Sherston Software provided one of the most entertaining stands at the Show: the Crystal Maze Challenge invited visitors to take part in some real life versions of the computer game's different challenges. They also had two new releases, *Bodywise* and *Time Detectives* — The Victorians. *Bodywise* gives you an animated guide to the entire human body and *Victorians* is the latest in Sherston's range of history packages.

Simtec Electronics had some exciting news on the hardware front at the Show and since then I have been informed of some even more interesting upgrades for Risc PC owners. At the show they had a 2–4 megabyte RAM upgrade for the A3010 / A3020 and A4000 which allows you to make use of the 1–2 megabyte upgrade that you already have fitted to your machine when you upgrade. The most interesting upgrade from Simtec however, will be released soon and is an upgradeable SIMM! The method used for this is to supply a one sided SIMM and to allow you to add the required number of chips to the second side to double the RAM capacity!

Oregan Software Developments had a very interesting new product at the Show: PhotoTouch looks to be a very impressive 24-bit image processing package with many advanced facilities that would satisfy even the most investigative artist.

Whilst at the Show you could have found yourself with a few minutes to spare and should you have done so, you could have travelled to the Compleat / Tekoa Graphics stand and had your face printed on a T-Shirt while you waited (eugh!). Alternatively many people took part in Avatar, the human-computer game organised by Safesell Exhibitions, the Show Organisers.

In my opinion the Show this year was as much of an improvement over last year's show as could possibly have been managed. With the new Risc PC from Acorn and all the different exhibitors there was little else you could have asked for. There was only one thing missing which I am sure some people will have missed (although some won't) and that is a dedicated "crashed spaceship" games arcade of the type which Acorn has provided in the past.

Andi Flower

Acorn World '94

Wembley Exhibition Centre • 28th–30th October 1994

The ARM Club will be present at this year's Acorn World Show on stand 25, providing an ideal opportunity to catch up on the latest developments, renew your Club membership if necessary, ask technical questions or even stock up on the latest Public Domain software. The Club's range of software products developed by members will be on sale at the Show. Make a note in your diary now!

Eureka Issue 13 will be published and sent out shortly before the Show.

ARNOLD'S OBSERVATIONS

Steve Arnold puts his life in danger..!

In this article I would like to take you on a whimsical journey regarding the recent Harrogate Acorn User Show, since I was called into action for this event. It was going to be just another weekend — a little travel, meet the public, a few beers with pleasant company, no children and no shopping! Sounded great! Oh how little did I know...

The Harrogate Acorn User Show

This is an account of my experiences helping at the exhibition with Ted, Bill, Bob, Peter and Harry... Oops, nearly forgot Leslie! (Message for my wife: Leslie is a male member of our entourage, but he does have strange tendencies). The names of the individuals concerned have been changed to protect the guilty — and to save me from physical abuse!

Time: 5.30am Saturday morning

Left my house with Bill, kissed the car for good luck! It was a long journey and I wasn't sure it was going to make it without some extra encouragement from me. Come to think of it, I wasn't I was going to make it! The car started first time (I knew that kissing would work). We started to settle down for the long haul ahead. I tried to making polite conversation; Bill tried to say that it really wasn't the time for such things, that sleep was more important. I tried to go to sleep but driving and sleep can be terribly dangerous.

Time: 8.30 am Off the Motorway

Stopped for a comfort break. Sampled the various morning delicacies at motorway cafe. Standard, much improved from previous attempts to find sustenance. Started to feel a bit more human. Bill seemed to be slowly

responding to my general chit chat, mind you I think it may have been the coffee. Our enthusiasm was starting to leak through the morning mist. The conversation came round to the Show. I had delusions of grandeur regarding getting the odd mega bargain!



This gives a new meaning to computer shopping..

(The wife had allowed me some pocket money! Still not enough to buy anything of real value, just a few beers!) Bill had planned his day with military precision. I admired his confidence. I explained about stand duty, about the people, about the teamwork. I think then he realised that this was maybe not quite what he was expecting — I tend to exaggerate a bit. I gave the impression of a seasoned campaigner, a professional; Bill went very quiet and a little pale (I wonder if it was my driving?).

Time: 9.30am Arrived at Harrogate

We checked in at the stand. Everyone else was there. It was obvious that some of the members of our wonderful Club had not had three Weetabix for breakfast. Harry was busy copying PD discs in a frenzy. He was mumbling something about being up all night copying the most popular discs.

Harry is a real stalwart. He quietly gets on with things. He is almost happy mumbling about everything. He has a sage-like quality, a “seen it, done it approach”. A good guy in crisis. Ted was ensuring everything was in its place. He’s a stickler for presentation. The sort of guy that only buys his underpants from Marks & Spencer because he knows the creases are all in the right place. Ted announces that he won’t be able to do much stand duty as he’s got lots of people to see. This causes a few eyebrows to be raised. Harry mutters something about when the going gets tough... Ted gives everyone a hurt look. Still I’d heard Ted had worked quite hard on the Friday, making sure things happened, coordinating, you know the sort of thing. Peter was his usual quiet self, building up his adrenaline for the onslaught ahead. Leslie was noisy as ever, full of life, energy, a Mr Motivator, a fun person, but he’s also very loud! Bob was already buzzing around the rest of the show stands.

Time: 10.00am Show started

I judged from the queues outside that it was going to be a very busy day. Everyone was as ready as they would ever be. Everyone was practising their best smiles, remembering their pat little speeches (including yours truly!). First new member for the day was coerced into joining by Leslie at 10.01am. He was as pleased as punch. Ted departed and wished everyone good luck. Harry mumbled something, but I couldn’t quite grasp it. Bill hustled around

the ever increasing number of people outside our stand. He obviously likes getting in at the deep end. The more reserved of us (wise) awaited opportunity. It didn’t take long for someone to try and get attention by making eye contact. As soon as this had been established, they would launch themselves into panic mode speech to ensure no-one else got in first.

Time: 11.30am Mid Morning Session

It was hell! We weren't going to make it. Too many people, they just kept coming.

Time: 1.00pm Lunch

What no lunch? We were too busy to stop. The crowds made it almost impossible to move. Questions and answers were flowing rapidly from our tongues. The teamwork was keeping everything together. If I couldn’t answer the question I passed it on to the next member who usually could answer it. Bill was really doing very well, he was playing the crowd. Harry was performing feats of magic with the PD library. Peter was demonstrating the Club’s software and answering those very difficult technical questions that some clever so and so usually saves for these events. Leslie was flying from pillar to post, helping where needed, plug the gap as required.

Time: 2.30pm Mid Afternoon Session

It was still hell! We were going to make it. Not so many people but they just kept coming.

Time: 4.00pm The final session

I was starting to feel the effects of non-stop talking and of quite literally thinking on my feet. I was now working on automatic. I felt that I could answer any question. I would mentally go down my internal list to answer the question posed to me — question number 41 use stock answer number 36. What really amazed me after 6 hours of interfacing with all aspects of the human race on all manner of

subjects, was that I could still smile. I was actually enjoying it.

Time: 6.00pm The Close

By this time I was completely worn out. The day had been a success. Everyone on the stand had worked well as a team. The Club had done very well. Only a few minor arguments, no violence. Not bad for a Saturday! It was then that I realised that the pubs were open, I was a free agent... in Yorkshire.. in Theakstons country.. I was in need of urgent refreshment. So I made my excuses, grabbed my stuff and made a sharp exit. I looked over my shoulder and everyone was following me... to the pub. Time for me to become the Beer Monster!

Time: 2.00am Bed

What a good day, what a jolly good evening. Good Beer, Good Food and Good Company!

Epilogue

This has been a fictional account based on the facts. You work it out! I did enjoy working on the stand at Harrogate. I always find it refreshing to meet people with a common interest and obvious enthusiasm for Acorn machines. Yes, there were people who were critical and those with unreserved praise for the Club. That is what belonging to a community is all about. I would recommend working on a stand to anyone who has the desire to have a go, but remember it's hard work as well as fun!

Next time I shall be discussing special needs and education, so if you have any opinions or just want to make some comments on either of these items, write in and share them with us. Anyway time for me to close.

Thought for the Day:

There is no such thing as computer error, it is always human error somewhere along the line.

Steve Arnold

Eureka Disc

The main item on Eureka Disc 12 is PGP, the *Pretty Good Privacy* Package discussed in Paul Allen's article on encryption and security. This includes everything you need to get going with PGP, including the Wimp front end by Peter Gaunt and several files of *Frequently Asked Questions* giving help and advice on the successful and secure use of PGP. Of course all PGP users are paranoid, so for all you know we could have tampered with the software before including it on the disc!

The read-only version of the *ArcFS* decompression program is included on the disc as usual, we hope that none of you have problems with this version. For help and advice on using *ArcFS*, double click on the application called *!UseArcFS*.

The Freeware version of *SmartCD* is also present on the disc. This utility is for owners of CD-ROM drives connected to their Acorn machines who want to play audio-CD discs using their computer. Full instructions on use are included, and an enhanced version will shortly be available for sale through the Club.

The archive called *A4* contains an A4 Forms Viewer program and several sample forms created using Forms Suite Plus, a package reviewed in this issue of Eureka.

The *School* archive contains the education resources mentioned in Geoff Stilwell's Education Column.

The Club's PD Library Catalogue viewer has been updated, we apologise if the previous version refused to work on your particular computer. The latest catalogue has also been included giving details of the hundreds of discs available from the Library.

Computer Concepts

Graphics Loaders

The latest versions of Computer Concepts' acclaimed *Impression* and *ArtWorks* packages are better suited to professional use than in the past, especially now that the Risc PC is available with its superior graphics capabilities.

Intensive graphics users may be disappointed to find that *Impression Publisher*, *Style* and *ArtWorks 1.5* cannot directly accept JPEG, PhotoCD or Clear files. It is necessary to convert such files into an acceptable format (such as 32 bit sprite) before they can be dropped into Computer Concepts' packages.

To solve this problem, Computer Concepts have developed loaders for these types of graphics image, as well as enhanced loaders for TIFF format files.

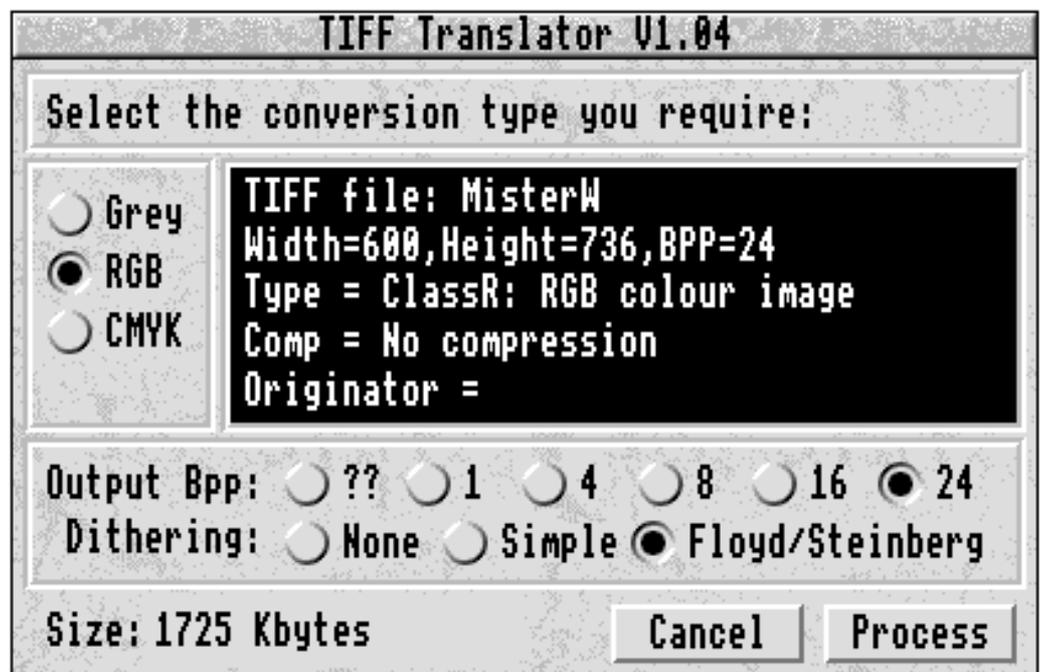
The CC Graphics Loaders are supplied on a single floppy disc in a CD-style case with a brief instruction manual. The usual CC installation program is used to install the loaders inside the

!CCShared directory on your hard disc. The loaders require RISC OS 3.1 or later, and a hard disc.

Once installed, the loaders are pretty transparent in operation. Graphics files can be dragged directly into documents or *ArtWorks* files. A dialogue window such as that shown below presents information about the file, and allows options such as dither type to be selected. Also included on the disc is documentation on writing your own graphics loaders. The Clear file loader is written in BASIC so that anybody can see how it works.

All in all, the Graphics Loaders perform their job efficiently and are a great time-saver for the intensive graphics user. The price of £39.00 +VAT is reasonable considering the functionality provided and their appeal to professional users. My personal feeling is that there is not enough differentiation between *Impression Style* and *Publisher*, perhaps these loaders could have been included as standard with *Publisher*? Nevertheless they perform their function well and are recommended.

Simon Burrows



Information and options are presented in a dialogue box

Education Column: Reinventing the Wheel?

Geoff Stilwell presents some projects and some ideas..

At the recent Acorn User Show in Harrogate I had the opportunity to speak to many teachers who enquired about The ARM Club's services. It seemed that most of the conversations came around to how teachers are always re-inventing the wheel (see the Maths card review elsewhere in this issue). We are all producing material that is exactly the same, or at least very similar, as that produced by the schools down the road, in the next town and the next county.

Many teachers still feel threatened by that awful, thinking machine that the children seem to understand better than they. Many IT Coordinators have told me of the wonderful day's inset they have provided for the staff, only to find weeks later that the discs they gave everyone have stayed in teachers' drawers unused.

The Dearing Report has now placed IT right in the centre of the National Curriculum. Teachers have got to come to terms with the new technology. But it needs time and lots of it, and time is something that teachers seem to have much less of these days.

One of the ways The ARM Club can help in all this is to provide a central resource of IT material for teachers. Think of it as an educational PD library. Many of the teachers in Harrogate spoke of having discs full of resource material they would be willing to share. Even those teachers who do not personally own Archimedes computers are producing material in the classroom, including material the children have created eg. database files, textfiles based on research, interesting LOGO procedures, even suggestions, hints and tips about software that met the needs of your class.

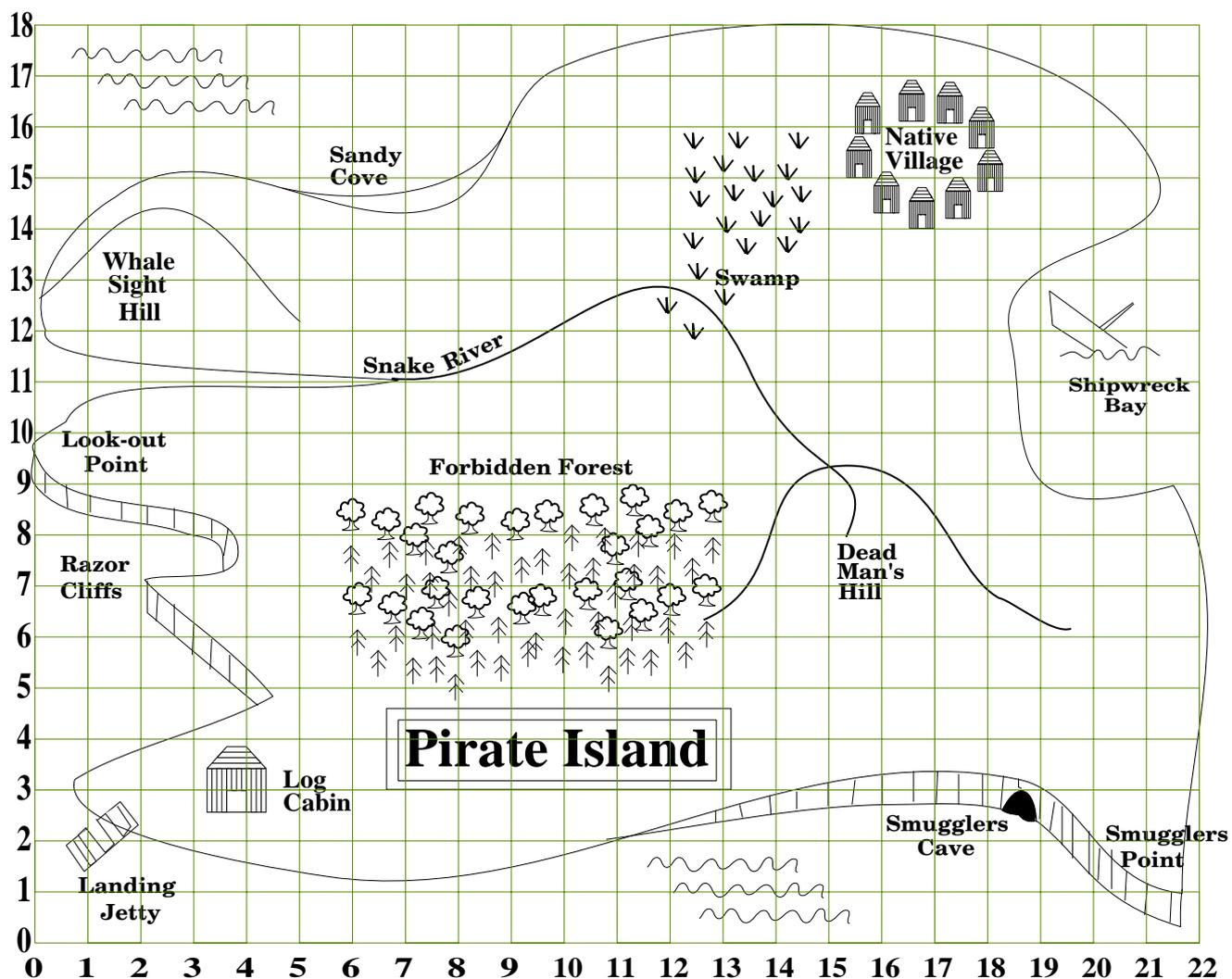
Book Review

Name:

A template for writing book reviews

I personally have always used my computer as a tool to produce material for use in the classroom. On this month's magazine disc there are some of these. They are mostly Drawfiles that contain graphics and text. This issue contains files focused on Reading, Growth and Geography.

The Reading directory contains three drawfiles BookReview can be



printed and provides younger children with a simple review template. Candle1 and Candle2 are textfiles; the first a story excerpt and the second questions related to the text.

The Growth directory contains only one graphics file about the different nutritional values of food.

The Geography file contains a larger selection of files. There are outline maps of the world and of Great Britain. There is a file containing a large number of ordnance survey symbols for use in creating your own maps with Draw. Pirate_Map is an imaginary treasure island with a simple coordinates grid. Treas_Hunt is a textfile of questions related to the Pirate_Map. TolfordMap is a file showing two maps of the imaginary Tolford, separated by

five years. A small private aerodrome has grown into a commercial airport with all the environmental changes that entails. The potential for discussion, role play, writing and follow up work investigating changes in your own local area is enormous.

These are all files I, and some of my teaching friends, have used successfully in the classroom. Please feel free to alter/adapt them to your own preferences and/or situation. If it saves teachers' time then we've achieved something.

If the teachers we spoke to in Harrogate who promised us material are reading this, in fact anyone reading this who could contribute to an educational PD library, then please send the discs direct to my address: 40 Barlow

Road, West Hampstead, London, NW6 2BJ. I would also like to hear from teachers about what they would like to see in the educational column. A possible future article could be about a successful LOGO project. Please write or ring (on The ARM Club number) and tell me what you think.

Geoff Stilwell



Online Media

continued from page 5..

Bird, better known as Technical Director of Acorn Computers Ltd.

A question asked by many people is “what benefits will interactive multimedia and owning a set-top box bring to me?”. At present the whole market is in its infancy and it is not entirely clear how it will develop. At the launch of Online Media in London, prototype set-top boxes were running a demonstration service which included the following: video-on-demand (VOD) — allows the user to watch a film of his/her choice, audio-on-demand — listen to music tracks of your choice and perhaps order a CD to be delivered by post, home-shopping — browse through a selection of products available and order on-line by credit card for immediate delivery, interactive games — play the latest arcade games in your home for a small charge, personalised news — see and hear the latest news (personalised for your particular interests) when you want, home banking and so on.

A set-top box can potentially receive its data from a variety of different sources, for example copper pair (telephone cable), coaxial cable (as used by cable TV companies), optical fibre or satellite links. At the present time it is not known which of these technologies will be

most popular — it is vital that all equipment and service providers stick to the same standards if interactive multimedia is to take off, so companies such as Online Media are fairly restricted. However Online Media has the great advantage over other companies that through Acorn it has great experience in using TV-resolution displays, minimal memory usage, ROM-based operating systems etc. Rival companies such as Intel, IBM and Microsoft are at a disadvantage to Online Media/Acorn because they do not have control over an entire computer, only parts of it.

Online Media’s first trials of set-top boxes will take place in the Cambridge area in collaboration with Cambridge Cable (a cable TV company) and Anglia Television. These will use a set-top box based on a Risc PC motherboard, including ARM610 processor, VIDC20, IOMD, 2Mb DRAM and 2Mb ROM, as well as a network interface and MPEG decoder. MPEG is a standard for displaying VHS video-quality films on a computer screen, and is impressive when performed by a hardware decoder chip. The set-top box is also likely to have a joystick socket on the front as an alternative to using the IR controller for playing games!

In the longer term Online Media is very interested in using a communications technology known as Asynchronous Transfer Mode (ATM). One of OM’s partners is a company called ATM Ltd, run by Hermann Hauser, co-founder of Acorn which is working on making super-cheap ATM services available. Overall the interactive multimedia market is still very much in its infancy and Acorn is taking a gamble by staking an interest in this potentially huge market. Given its experience and generally cautious nature let’s hope that the venture is successful.

Simon Burrows

Pretty Good Privacy

This electronic postcard from Paul L Allen appeared on the Editor's computer...

Electronic mail (e-mail) is gaining in popularity: increasing numbers of companies and individuals are joining the Internet where e-mail and files can travel around the world in minutes for the price of (at most) a b-rate call [see the Autumn 1993 issue of *Eureka*]. As the Internet comes into more homes via dial-up access or as a by-product of cable services, it is easy to imagine that e-mail will eventually become as common as the fax is today. Already companies use e-mail to transfer information between geographically-dispersed sites, universities exchange data in collaborative projects (either with other universities or with industrial concerns) and individuals order goods via e-mail. Compared with fax e-mail is quicker (it transfers the ASCII code for each character rather than a bit-map of the character) and (because of error-correcting protocols) almost immune from corruption by line noise.

The Need for Privacy

However, there are serious problems with e-mail: your message is passed from machine to machine until finally reaching its destination — system operators on the routing machines can read what is, in effect, an e-postcard. Worse still, it is a postcard written using electronic pencil — those who can read it are often capable of changing it. The protocols are such that system operators on routing machines can forge complete messages and make them appear to have originated from you.

If e-mail is to become as ubiquitous as the fax it must be made secure from eavesdropping, tampering and forgery. Companies don't want to risk the chance that

competitors can read e-mail going between their different sites. Universities don't want years of collaborative research data going astray. People ordering goods via e-mail don't want their credit card numbers ending up in the hands of some joker who orders them a ton of horse manure...

Envelopes

The only way to prevent someone reading your e-mail (the equivalent of using an envelope) is to encrypt it. Given that your e-mail might be routed through institutions with supercomputers the encryption needs to be very strong.

The only guaranteed-secure encryption technique is the *One-time Pad* (OTP) traditionally used by spies and for diplomatic communications. The problem with the OTP is that both parties need to find some secure way to exchange the list of random numbers which compose the OTP (you need as many random numbers as there are characters in the message you want to send) — this is not a problem for embassies with their diplomatic pouches (or spies, who get their OTPs from embassies) but is impractical for general e-mail. Note that OTPs are only secure provided that the pad is *never* re-used and that the numbers are *truly* random (a software random number generator is worse than useless).

The obvious way of avoiding the physical bulk of a OTP is to use a *secret-key* cipher. Here both sides agree on a (relatively short) key and some method of utilising that key to encipher messages (the encryption algorithm). Like the OTP, the key must be communicated using a secure channel (e.g., physical meeting) to ensure that it remains secret. Another problem

is finding a strong cipher: the *Vigenère* cipher was considered to be very secure in the 17th century, but succumbed to mathematical analysis. The US *Data Encryption Standard* (DES) is widely used today (especially by banks for electronic funds transfer) but it is estimated that a dedicated machine costing around \$1 million could be built which would break a 56-bit DES key in 3½ hours. Note that many software implementations of DES only offer the trivial *Electronic Code-book* (ECB) mode and not the more secure modes like *Cipher Feedback* (CFB) or *Cipher Block Chaining* (CBC).

Newer secret-key ciphers like the Swiss *International Data Encryption Algorithm* (IDEA) with its 128-bit key are strong enough that it is doubtful sufficient computing power could *ever* be assembled to break them by trying every possible key — electronic gates cannot shrink below the atomic scale and the speed of light places a lower limit on the time it takes signals to propagate between gates (even if the distance between gates is no more than a few atoms).

Cryptography

Strong secret-key ciphers exist, but the problem remains that a very secure channel is required to transmit the secret key — if you have a high-bandwidth, secure channel you don't need a cipher in the first place. The answer to the key-distribution problem was solved in 1976 by Whitfield Diffie and Martin Hellman when they invented *public-key* cryptography.

Diffie and Hellman realised that there are mathematical functions which are relatively quick to calculate but that calculating the inverse function is a much lengthier task. One such function, which is at the heart of the *Rivest-Shamir-Adleman* (RSA) algorithm, is that of multiplying two primes together; however finding the prime factors of a number is a much more computationally-intensive task.

As an illustration, what are the factors of 8910029? [answer at end of article]

With secret-key cryptography (such as DES) the same key is used for encryption and decryption:

$$\begin{aligned} C &= E(P, K_S) && \text{encryption} \\ P &= D(C, K_S) && \text{decryption} \end{aligned}$$

where P is the plaintext (message), K_S is the secret key, E is the encryption function, C is the ciphertext and D is the decryption function.

Public-key cryptography uses two keys: a public key and a secret key — a message encrypted with the public key can only be decrypted with the secret key.

$$\begin{aligned} C &= E(P, K_P) && \text{encryption} \\ P &= D(C, K_S) && \text{decryption} \end{aligned}$$

where K_S is now the secret key of *one* of the two communicating parties and K_P is the corresponding public key. The public and secret keys are generated as a pair by an individual; the secret key is retained by that individual and the public key is made available to anyone who wishes to communicate with that individual. It is also possible to run the algorithm 'in reverse' encrypting with the secret key and decrypting with the public key — this feature allows the possibility of digital signatures.

The actual algorithm used by RSA involves more than just factoring as it has to satisfy a number of objectives:

1. Messages encrypted with the public key must be decryptable with the corresponding secret key, and *vice-versa*.
2. It must not be possible to use the public key to decrypt messages encrypted with that public

key.

3. It must not be possible to derive the secret key from the public key.

4. It must not be possible to derive the secret key by comparing plaintext with ciphertext produced by the public key.

This results in the following scheme, starting with two large primes p and q (each around 512-bits for a 1024-bit key):

Key Generation

	Private	Public
Primes	p, q	
Modulus		n where $n = p \times q$
Public Exponent		e where $e < n$ and e is relatively prime to $p-1, q-1$
Private key	d where $de \bmod (p-1)(q-1) = 1$	
Public key		(n, e)

Encryption / decryption

	Known to Sender	Public	Known to Recipient
Public key	(n, e)	(n, e)	(n, e)
Private key			d
Plaintext	P		
Encryption	$C = P \bmod n$	C	C
Decryption			$P = C \bmod n$

If you don't understand how and why this all works you're not alone. Rest assured that competent mathematicians are satisfied that it *does* work.

Some people worry that because the public key is in plain sight an enterprising security organisation could embark upon a project to calculate all possible RSA keys and store them for future use since it is much faster to

make a key than to break one. However, the number of possible 1024-bit RSA keys (around 4×10^{180}) is larger than the number of photons in the universe, making storage somewhat difficult.

Public-key algorithms are very slow compared with secret-key algorithms — a refinement which combines the best of both worlds is as follows:

1. Choose a random key and encipher the message with the random key using a fast, conventional secret-key algorithm.
2. Encipher the random key used in step 1 using a public-key algorithm.
3. Send the random-key-enciphered message together with the public-key-enciphered random key.

Since the random key is around 16 bytes this will be faster for the vast majority of messages whilst allowing the convenience of public-key cryptography.

Signatures

This still leaves the problem of authenticating the identity of the sender and verifying the contents of the message since anyone can encrypt a message to you using your public key. One way around this is to encrypt twice: first with the sender's private key (which can be decoded using the corresponding public key) and then with the recipient's public key, but RSA encryption is a very slow process. Apart from speed considerations there are situations where it is useful to be able to digitally sign material

without encryption: one application is for software distribution — those who have the encryption package can verify that the software has not been tampered with, those without the encryption package can still use the software.

The answer is to use a cryptographically-strong one-way hash function (also known as a message digest algorithm). This takes a variable-length message and produces a fixed-length hash — given the hash it is computationally-infeasible to find a message which corresponds to the hash, and it is impossible to determine any usable information about the message from the hash. One popular algorithm is MD5 which generates a 128-bit hash very quickly — it will chomp through around 350K / second on an ARM3.

It is no good sending just the hash of a message as anyone could substitute a different message and compute the new hash. However with public-key cryptography it is possible to encrypt the hash with the sender's secret key; the recipient decrypts the hash using the sender's public key (the hash is small so the process is quick). Assuming that the sender's secret key has not been compromised this verifies that the message originated with the purported sender and that the message has not been tampered with (only the sender is in a position to encrypt the hash with his secret key).

PGP

Putting all the concepts together into a working encryption package is a daunting task, so it is fortunate that Phil Zimmerman came along and did just that with something he called *Pretty Good Privacy* (PGP). PGP uses MD5 to calculate message digests, IDEA for conventional encryption and RSA for public-key encryption / digital signatures. By default PGP compresses data before encryption and has an option to 'armour' ciphertext (convert it to

printable 7-bit ASCII) so that it doesn't get mangled by e-mail gateways. Messages may be encrypted to multiple recipients with only a small overhead. PGP supports several character sets and keeps its prompts and messages in a separate translation file so that different languages and platforms can be supported. Phil also took great care over the easily-overlooked (but important) details like using keystroke timings to generate random numbers and prefixing the IDEA key with random bytes before RSA-encryption to avoid a potential problem when encrypting messages to multiple recipients.

PGP has a large number of operating modes. You can use it for conventional (IDEA) encryption of personal files, hybrid (RSA/IDEA) encryption of e-mail and for applying digital signatures to encrypted text, plain text or other data. The digital signatures can either be appended to the file they apply to or kept in a separate file — the latter option allows you to create a 'detached signature certificate' for an archive without modifying the archive itself (so people without PGP can still use it).

In addition, PGP supplies an answer to the one remaining problem of public key cryptography: how to know that a public key is genuine. Although public-key distribution does not require a secure channel, it does require a *tamper-proof* channel: you wouldn't use PGP unless you were worried that someone could tamper with your e-mail, so it's no good e-mailing your public key to someone as it could be replaced by a bogus key. PGP gets around this by allowing you to sign public keys that you are sure of.

For instance, I could meet Simon Burrows at an exhibition, show him proof of identity and exchange public keys on floppy disc — after exchanging encrypted e-mail (just to make sure there is no deception) we would then sign

each other's public keys. Later Simon might sign the key belonging to Nick Evans. Should I wish to communicate securely with Nick PGP will find that there is a 'chain of trust' extending between us. Actually, there's a little more to it than that because PGP allows me to indicate how careful I think Simon is in verifying identities before signing keys. Later still Nick might sign Toby Smith's key — but since I've never met Nick I'd have to tell PGP that I don't know how careful he is at checking identities: should I try to encrypt to Toby PGP will warn me that I cannot be certain of the validity of his key. Fortunately PGP considers all possible trust chains and weaves them into a 'web of trust' — you can configure how long a trust chain can be and how many partially- or fully-trusted signatures are needed before PGP trusts a key, allowing it to build up a fault-tolerant trust web.

Clouds

The US government has become concerned about the ability of US citizens to run strong cryptography on home computers and is trying to introduce an algorithm called *Skipjack* which is embodied in the *Clipper* chip (for secure phones) and *Capstone* (for secure computer networks). *Skipjack* was designed by the *National Security Agency* (NSA) despite legislation passed in 1987 forbidding them from interfering in civilian matters.

Skipjack is supposedly quite strong (80-bit key), but it comes with a built-in back-door in the form of 'key escrow' (there may be other hidden back-doors but the algorithm is classified and the chips resistant to reverse-engineering so we may never know). Each unit has a special key which allows its communications to be decrypted — the key is split into two halves and each half lodged with a separate escrow agency. Law-

enforcement agencies may obtain the keys with a court order (or, more ominously, an 'executive order'). The escrow agencies never actually see the court order, they just get a fax saying that a court order has been issued and a list of unit serial numbers. Even if a key is obtained illicitly any evidence gathered with it will nevertheless be admissible in court. As icing on the cake, the NSA has a guaranteed right to the key of any unit they claim is being used to communicate with a foreign country.

The stated reason for putting in a back door is so that criminals could not benefit from the system. Given that no serious criminal would be so stupid as to use *Clipper* and that there are only 800 court-authorized wiretaps per year in the US this seems like a lot of effort for no good reason. Unless the real motive is to allow the continued use of unauthorised wiretaps — the whole scheme is wide open to abuse at all levels of government and law enforcement.

Following close on the heels of *Skipjack* is proposed legislation forcing phone companies, computer networks and even bulletin boards to allow remote access by the FBI on demand (with no court-order necessary) — the justification being that *Skipjack* supposedly provides protection against abuse.

If *Skipjack* gets the go-ahead there is a strong possibility that the US will turn into a police state the likes of which George Orwell could only dream of (think back to the misdeeds of McCarthy, Hoover, Nixon, North, Reagan, Bush and even Clinton) as other forms of crypto will probably be made illegal. AT&T has already been pressured into dropping its own design of secure phone in favour of *Clipper*. Even more worrying is the fact that the US are busy trying to sell *Skipjack* to European governments.

However, all is not yet lost — there is massive

public opposition in the US, and Phil Zimmerman is currently working on voice PGP which will turn a PC with a Soundblaster card and a fast modem into a secure phone.

Thought for the Day

Someone pointed out rather wryly in the sci.crypt newsgroup that if one could obtain a bank loan for \$1 million one could purchase a dedicated DES-cracking machine, forge electronic funds transfer authorisations, pay back the loan with some of the proceeds and walk away very much richer...

*Unless the author has made a mistake,
8910029 = 2971 x 2999. But you already
worked that out for yourself. Didn't you?*

Paul L Allen



Forms



Suite



Plus

A review by Nick Evans

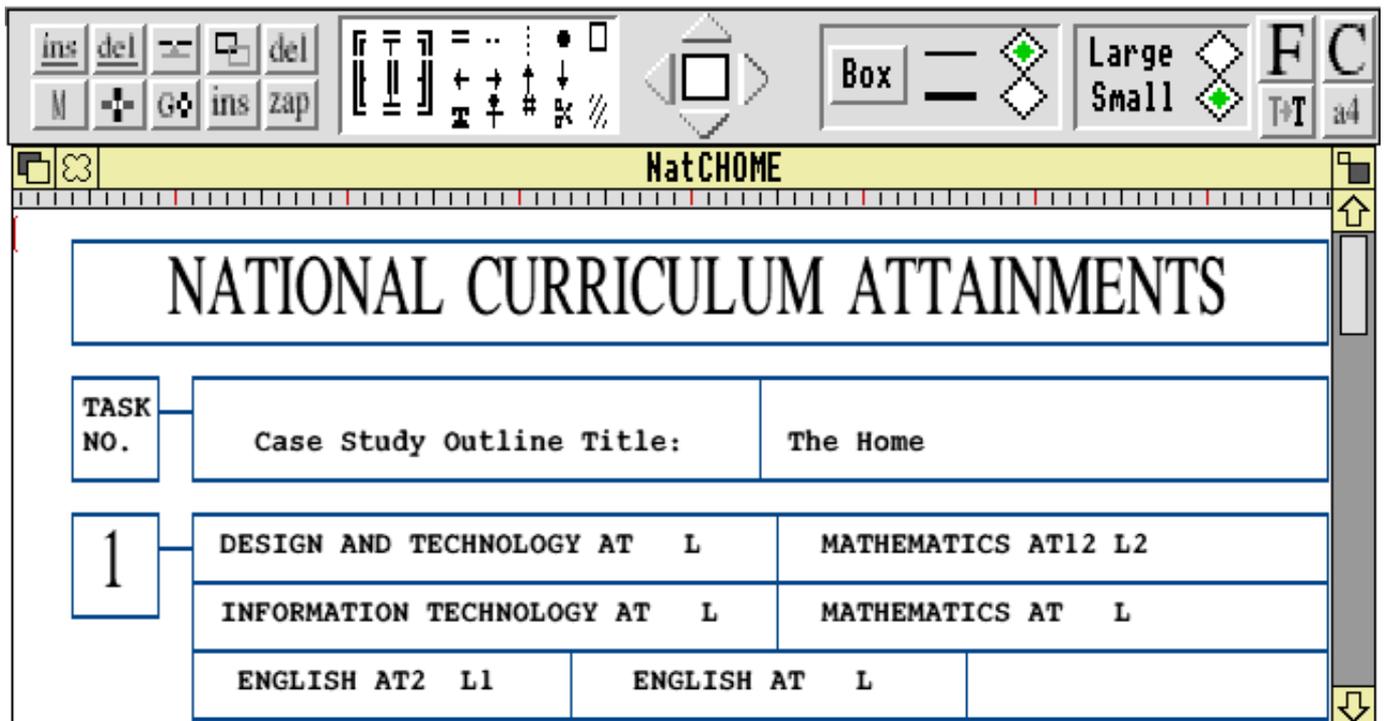
Forms Suite Plus from MEWSOft allows an infinite variety of forms up to A4 size to be designed. The forms may be either vertical or horizontal (sideways). The suite consist of a disc and a 14 page manual. There are 28 example A4 forms covering a variety of topics, with the majority having some sort of educational bent, 16 horizontal forms and 8 examples of calculating forms. the latter being forms that contain some part as either a formula or data slot.

The vertical and horizontal forms are treated separately and are produced by separate programs which are both basically the same in their mode of operation. Both programs are easily installable on a hard disc having a unique ID displayed on start-up and also encoded in some places within the program to discourage their unlicensed use.

The manual runs to 14 pages and is quite comprehensive in giving an overview as well as detailed instructions. The form may contain any or all of: standard sized text, large font text, Lines, boxes, data markers, a draw and a sprite file.

Clicking with SELECT on the icon bar brings up a window with a toolkit at the top from which a great many of the facilities may be chosen. Needless to say the toolkit can be removed if it is not wanted. The screen acts as a window on the form and a preview window can also be available for an overall view of the form.

Text is positioned by using the cursor keys or the mouse. Either outline fonts or the system font can be used although editing a form is best carried out using the system font. The reason for this is partly historical in that with early versions of the Forms Designer the form was devised as a piece of paper of up to 70 lines and 80 columns of equal width. This meant that a monospaced font, either a specially designed BBC font, or later an outline font such as Corpus could be used and still appear in exactly the same position on the page. However with the evolution of the program the use of more outline fonts was proposed but these, being proportionally spaced, do not fit exactly on the line where the system font would be. The net result is that positioning text needs a little more care when editing, but the resulting forms are very professional in appearance.



A form taking shape in Forms Suite Plus

One slight snag I find is that, although text can be centred on a line, it cannot be centred within a box. This is due to the fact that the lines of the box are not set by the program which only recognises them as characters ie part of the font. This just means that text must be carefully edited if it is needed centrally in a box but not centrally on a page.

Boxes and lines can be of two thicknesses and Ctrl-K and Ctrl-N can toggle quickly between them. They can be chosen from the toolkit using the mouse as can some symbols such as arrows, scissors, a telephone and an area of hatching. There is a global join feature for adjusting any slight discrepancy at corners of boxes and where lines cross.

Data can be imported into marked positions and can be either in TSV or CSV format. Lists can be sorted alphabetically within the form and the functions of a primitive spreadsheet are present allowing you to create slots for formulae or data. Recalculation within these slots is also allowed.

Sprites or Draw files can be moved and resized, although only one of each can be included on a form at the present time.

The form may be saved as a native form with filetype 0A4 or as a Draw file (which may not show all the characters from the form). The forms may be printed out using the RISC OS printer drivers — this is essential if outline fonts have been used, or else by using the in-built Epson or Canon Bubblejet print routines.

The default setting can be changed, but not by an Options menu arising from the icon bar but by loading a file hidden within the application Resources directory into Edit. To be fair, the instructions to do this are given in the manual.

The various keys that have any special use are:

Delete	deletes the previous character
Copy	deletes the character at the cursor and closes the gap
Insert	inserts a space at the cursor
Home	sets the left hand margin
Print	initiates Print option

continued on page 43...

Idiot's Guide to Acronyms

Being on the "other side of the counter" at the Acorn User Spring Show was indeed a wonderful experience for me. It was satisfying to be treated as someone who knows everything even though I am (as I told many visitors to the Show) the least technical member of the Club Committee. As Nick Evans commented in Eureka issue 11, "secretaries are chosen for their administrative inabilities" (bloomin' cheek!).

After reading the last Eureka magazine and attending the Harrogate Show it occurred to me that not being technical could be a positive advantage. I am always amused when several technophiles get together because they all start talking in numbers and letters. "I've got an AKF18 but I'm going for an AKF85" or "ADFS [*pronounced addfus*] is so much better than DOS on the PC". Some of these have passed into common parlance now but it seems acronyms are breeding.

The new Risc PC, extensively covered in Eureka 11, brought with it a proliferation of acronyms. I had to keep backtracking to remind myself what the letters stood for, and even when I knew I was none the wiser about what it meant. I decided at the Show that I would write a layman's or "Idiot's Guide" to Acronyms (IGA). Below is a table showing many computer related acronyms in common usage. Unlike the PC acronyms by John Ward, featured in Eureka 11, these are the truth, albeit simplified. I have assumed absolutely no knowledge whatsoever so the layman, like me, can follow and all you techies can smile knowingly and skip the rest completely.

Geoff Stilwell

If you come across any acronyms which could be added to this guide, please do send them in. Also if acronyms are used in Eureka which you think ought to be explained, please shout!

Acronym/ abbreviation	Expansion	Meaning
ADFS	Advanced Disc Filing System	The built-in program that handles all the disc drives, saving, loading, copying, folders, directories, programs, files, etc. A part of the OS (see OS).
ARM	Advanced Risc Machine	Machines that use RISC chips, the company that make the chip, and the club that produces this magazine.
ASCII	American Standard Code for Information Interchange	The standard code describing the alphabetic, numeric (alphanumeric) and punctuation characters present on the keyboard. Plus it also includes several other characters which mean different things to different computers and printers. An ASCII text file is one that can be understood by Acorn & PC computers alike.
ASIC	Application Specific Integrated Circuit	This device will enable foreign processor chips to be used alongside native ARM chips in the new Risc PC.

Acronym/ abbreviation	Expansion	Meaning
BASIC	Beginners All-purpose Symbolic Instruction Code	Computer language designed at Dartmouth, USA. Intended as a teaching language, became accepted as the most common language for home computers.
BIT	Binary digIT	A zero or one, the only digits possible when counting in binary.
byte	(Not an acronym or abbreviation)	The quantity of the computer's memory it takes to hold a single character like the letter 'A'. A byte comprises eight bits.
CD	Compact Disc	Disc holding laser printed information; sound, pictures, text, up to 540Mb. Needs a CD ROM drive which acts like a normal disc drive but with CD's information can only be read not written (see ROM).
CGA	Colour Graphics Adaptor	Initial standard of display electronics developed for the PC.
CMYK	Cyan Magenta Yellow Key	Colour control system using degrees of cyan, magenta, yellow & key which refers to black.
CPU	Central Processing Unit	The central or principal chip which controls the computer. The main engine of the computer.
DD	Double Density	This is a measure of the capacity of floppy discs. Discs used on Acorn machines hold 800 Kb of information, similar discs used on PC machines hold 720 Kb.
DMA	Direct Memory Access	The chip which allows peripheral devices to access memory without interrupting the main processor.
DOS	Disc Operating System	This is the program controlling disc access on the PC. It is not usually built-in, but has to be soft loaded from a hard or floppy disc.
DPMS	Display Power Management Signalling	This will cut power to the monitor when the computer is not being used.
DRAM	Dynamic Random Access Memory	RAM that is dynamically refreshed every few cycles of the CPU. When you switch off or reset everything is lost.
DTP	Desk Top Publishing	Software which allows text and graphics to be incorporated in a document, viewed on screen and printed onto paper.
EPS	Encapsulated Post Script	A format in which a graphic image may be saved (by Artworks among others) which can be understood by postscript printers. Postscript are a breed of printers capable of high resolution printing, often used to provide copy for professional printers.
FDD	Floppy Disc Drive	Usually 3½" format nowadays and the discs don't seem very floppy, but inside the hard plastic case they are.

Acronym/ abbreviation	Expansion	Meaning
GUI	Graphical User Interface	Apple Computer initiated this user-friendly WIMP environment. In the PC world it is now known as Windows and in the Archimedes world it is known as The Desktop.
HD	High Density	This is a measure of the capacity of a floppy disc. Discs used on Acorn machines (fitted with high density disc drives) can hold 1.6Mb of information. Similar discs used on PC machines hold 1.44Mb.
HDD	Hard Disc Drive	These can be built into the computer itself or be a separate unit. They can even have removeable cartridges. HDD's can hold upwards of hundreds of Mbytes of information.
HSV	Hue Saturation Value	Colour control system: Hue refers to actual colour, Saturation is the intensity of the colour and Value is the brightness of the colour.
IDE	Intelligent Device Equipment	Standard interface commonly used to connect disc drives (hard or floppy) to computers.
IOMD	Input Output Management Device	The device that will handle all the comings and goings for the Risc PC computer.
Kb	Kilobyte	Approximately 1000 bytes (1024 actually)
Mb	Megabyte	Approximately 1 million bytes (1024 Kilobytes actually)
MHz	Mega Hertz	This is a unit measuring frequency. It usually has a bearing on the speed of a computer.
MIPS	Million Instructions Per Second	A measurement of computer processor speed.
OS	Operating System	The program that tells the computer what to do. This is built into the ROM of Acorn computers.
PC	Personal Computer	Mostly referring to IBM compatible machines, until now!
PCB	Printed Circuit Board	This is literally a board containing electronic components, chips, resistors, capacitors, etc., connected together with a printed conductive track.
RAM	Random Access Memory	Memory holding programs, files, whatever, which is lost when computer is switched off or reset.
RGB	Red Green Blue	Colour control system using degrees of red, green & blue
RISC	Reduced Instruction Set Computer/Chip	This is the main chip controlling the operating system in Archimedes and Risc PC computers which is characterised by having a reduced instruction set.
ROM	Read Only Memory	Memory holding the operating system program built into Acorn computers.

Acronym/ abbreviation	Expansion	Meaning
SCSI	Small Computer System Interface	(Pronounced Skuzzi) Standard interface used to connect all kinds of peripheral devices; disc drives, digitisers, MIDI devices, etc.; to the computer.
SIMM	Single In-line Memory Module	Memory PCB cards that can be plugged into sockets inside the computer to upgrade/enlarge the memory capacity.
SVGA	Super Versatile Graphics Adaptor	The next step up from the VGA display device on the PC.
VDU	Visual Display Unit	Posh terms for a monitor screen.
VGA	Versatile Graphics Adaptor	The next step up from the CGA standard display device on the PC.
VIDC	Video Controller	The chip controlling what you see on the screen and the sound produced by the computer.
VRAM	Video RAM	Memory dedicated to looking after the screen output. A bit like shadow RAM on the BBC Master 128.
WIMP	Windows Icons Mouse/Menus & Pointer	The user-friendly way computers now 'interface' with users. The wimp provides an environment that uses picture icons on screen and responds to clicks when a pointer controlled by a mouse is over them (see GUI).
WYSIWYG	What You See Is What You Get	(Pronounced wiz-ee-wig) Generally refers to word processing or DTP software and its ability to produce on paper what is also visible on the screen.

Printer Spooler

Nick Evans reviews this recent arrival from Clares Micro Supplies..

!PrintSpl from Clares (version 2.91) arrived in a flimsy plastic wallet big enough to take an A5 sized insert as the front cover where the name is incorrectly given as !Spooler.. Apart from the front and back covers there was a single 3.5" inch disc.

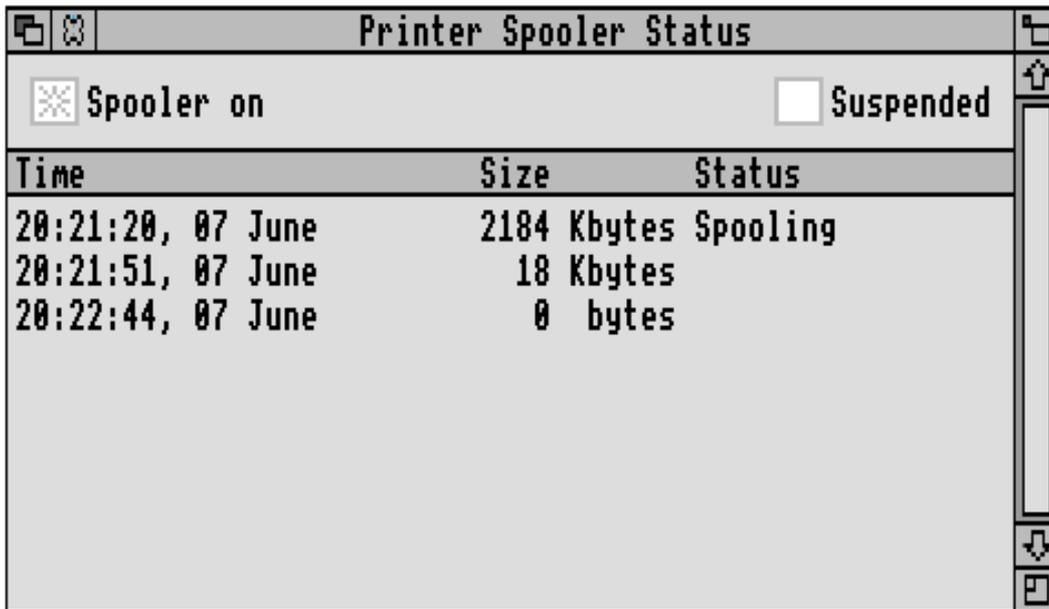
Loading this disc caused the usual (for now at any rate) window to open for registration details to be entered. The opening window, complete with details, was displayed for about 3 seconds in the middle of the screen each time the application was loaded.

On the disc was the manual in text file format. I do dislike text files which run to more than a page which also have linefeeds, as these have to be removed when loaded and formatted in a word processor for subsequent printing.

Also present was Acorn's *Msgtrans* v0.06 module along with *!SysMerge* for easy updating of your *!System* folder if necessary, and a couple of sprites produced with *Pro-Artisan2* in case you need something to print out to test the program instantly.

The manual is quite comprehensive and basically tells you that !Spooler intercepts all printing from desktop applications, storing it temporarily on disc and then prints the page in the background. It also has the ability to print multiple pages. We are also told that the best results are obtained with the slowest printers (but not that the fastest processors are more beneficial), and the application works with all printers apart from direct drive laser printers. You can also queue up the printing tasks provided there is enough space on your hard disc.

!PrintSpl can just be loaded and used *as is* but you have to realise that the program writes data back onto the disc from which it was loaded into the 'Printed' directory within !PrintSpl itself. This file can easily reach 650k per page so make sure your disc (floppy or hard) has enough space. A different directory can be nominated by dragging an empty (or else you will get an error message) directory onto the !PrintSpl icon on the icon bar.



The Printer Spooler Status Window in action

All you then have to do is print out using the RISC OS printer drivers in the usual way. The message on the iconbar will change from 'inactive' to 'spooling' as necessary.

To speed things up it is suggested that you change PrinterBufferSize to 16k with RISC OS 3 which is impossible with 4 mb of memory as each page in memory is 32k.

I tested the program with a RISC OS 2 440 with 4 mb of memory, ARM2, hard disc and a Panasonic KXP4450 laser printer using a page of mixed text and graphics,

The results that I obtained were:

	With !PrintSpl	Without !PrintSpl
Return of control of machine	67 seconds	286 seconds
End of printing	275 seconds	286 seconds

and a datafile of about 650K was written back to the disc.

I then tried to print out a 9 page Impression II document, but after processing 8 pages and not having control of the machine for 22 minutes I got a 'disc full error' with the spool file having filled the remaining 5Mb on the disc. The

print was therefore cancelled and my 22 minutes wasted without producing anything. It seems a shame that the program could not have written a couple of pages to the printer, deleted the relevant spooled files (since it produced one file per page on the disc) and then carried on with processing the rest of the document).

However for single pages the reduction in time until I got control of the machine back was most impressive with the printer working for over three minutes after I was back at the machine being ?productive, and I had no

problems with a clash using Impression II. The only other problem which came to light was that the machine crashed irretrievably with an 'outside file' error when I tried to halt the printing at any time by pressing <Escape>.

I next used !PrintSpl with an A440/1 again with 4Mb of memory, 35MHz ARM3, hard disc and a Canon BJ300 bubblejet printer and was able to compare the performance with a TurboDriver from Computer Concepts. Using Acorn printer driver version 0.33 (the old RISC OS 3 driver) the results that I obtained were:

ARM3 cache on

	TurboDriver	!PrintSpl
Return of control of machine	31.5 seconds	86 seconds
End of printing	101.5 seconds	101 seconds

The TurboDriver returned me back to the desktop in one third of the time of !PrintSpl which only produced a small saving (15 seconds) on its presence.

ARM3 cache off

	TurboDriver	!PrintSpl
Return of control of machine	184.7 seconds	496 seconds
End of printing	184.7 seconds	496 seconds

The difference here was most marked and I can only assume that it is due to the difference between the TurboDriver and the RISC OS 3 printer driver. This result is also a demonstration of the speed of the bubblejet printer because I assume that its print speed (with a 30Kb buffer) was able to keep up with the processing speed of the ARM2.

Unfortunately I had only just finished this review when along came the new Acorn RISC OS 3 printer drivers (version 1.22) and so I went back to the printer and the results that I obtained with this driver were just over 5% faster print

speed with the cache off but no difference with the cache on.

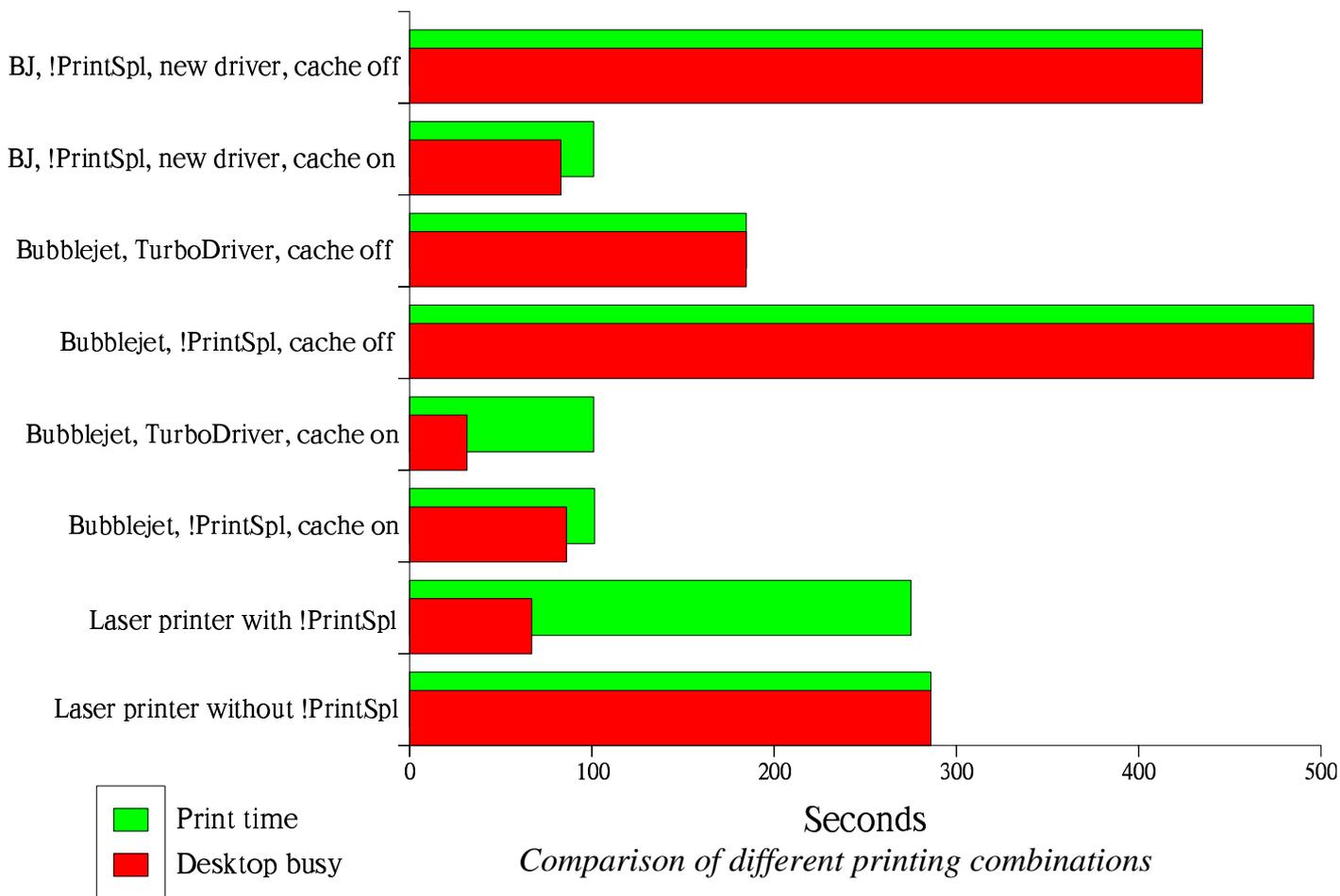
	ARM3 cache on	ARM3 cache off
Return of control of machine	83 seconds	435 seconds
End of printing	101 seconds	435 seconds

Clares say that the greatest difference in using !PrintSpl would be on a slow printer such as a dot matrix, and although I was not able to test this my results with the laser printer would bear this out.

With a laser printer which is not driven directly, the complete page (or as much of it as possible) is processed into a bit-image and then this data is squirted down to the printer. !PrintSpl writes this data to disc and as soon as the page is complete sends it to the computer. Therefore the time saved should approximately equal the time taken in transferring the print data.

With a dot-matrix or bubblejet printer the data is transferred in small chunks of little more than a line and so the delay in printing is due to the speed of the print-head. This is much longer in a dot-matrix which has to make two or three passes over the paper for each line, than for the bubblejet which only makes one pass, and that at a higher speed. The time saving should therefore be greater with a dot-matrix printer. The bubblejet is able to print at a faster rate than an ARM2 can process the data and so the bottleneck is inside the computer and !PrintSpl had no data to send to disc. In fact the message on the icon bar never changed from 'inactive' to 'spooling' I assume because it never got the chance to do so.

In conclusion I am quite sure that anyone with a dot-matrix or (non direct drive) laser printer will find some time saving benefit using this program which will, paradoxically, be greater on ARM3 than ARM2 powered machines.



Whether the time saved by using a TurboDriver as against this program is worth the extra money is a matter of personal priority (£15 as opposed to £55). I would like to see the problem of cancelling the print process for large documents because of lack of disc space dealt with.

As a comparison, there is a similar program available for the PC Windows market called SuperQueue with an RRP of £49.00, although you can pick up a copy for £24.95 if you look really hard.

Nick Evans

!PrintSpl is available from Clares Micro Supplies, 98 Middlewich Road, Rudheath, Northwich, Cheshire CW9 7DA priced £15.00 including VAT.



Club Matters

The Club Committee is currently looking for a competent person prepared to carry out an Audit of the Club's Financial Accounts. A small remuneration may be available. Please contact the Club Office if you would be willing to carry out this work for us.

The Club's South Wales Area Group has been very active in recent months under Derek Rowlands and his team, with regular meetings and training courses. We hope to give a full roundup of Welsh activities in Eureka Issue 13.

Regrettably from time to time the Club has problems when individual members approach companies asking for review copies of software on behalf of the Club (but really for their own benefit). Please note that this cannot be allowed to happen, all requests for review products should be made through the Magazine Editor.

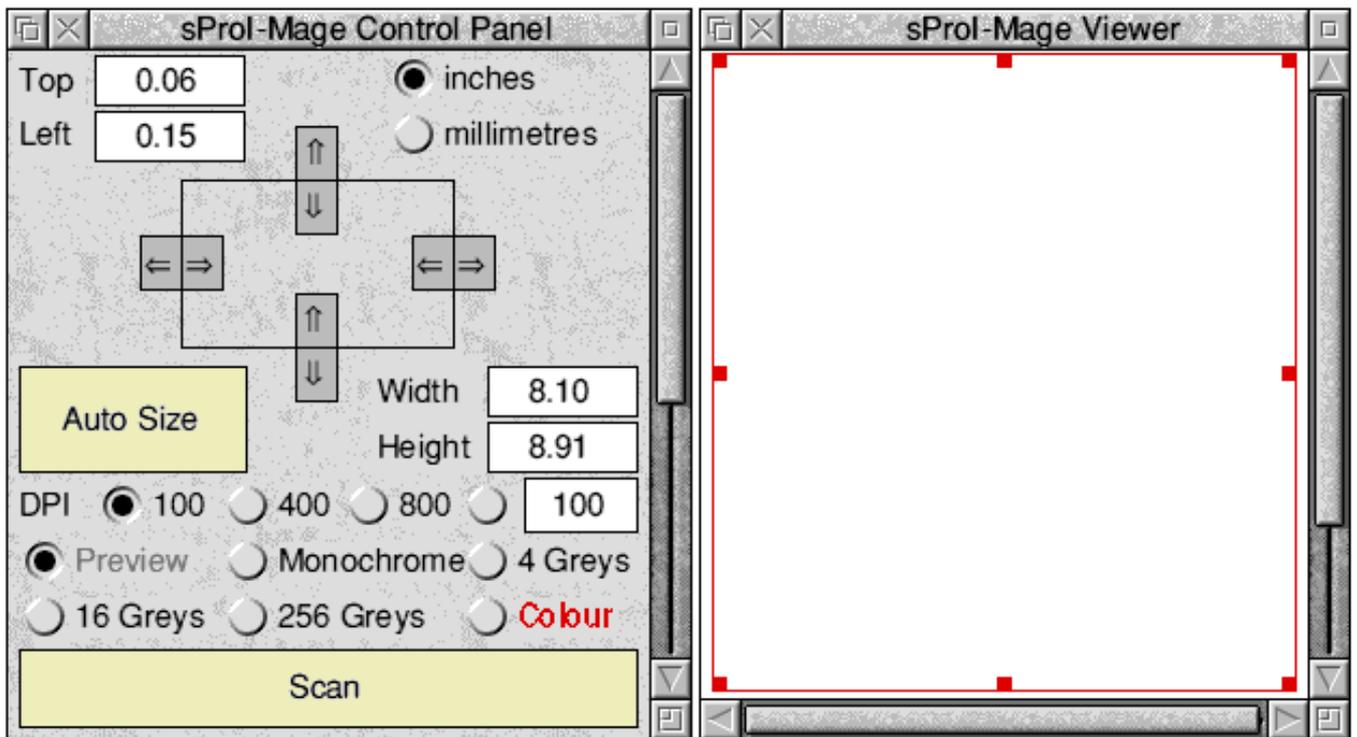
ProI-Mage Scan Software

Most computers these days have enough power to display images with photographic quality on their screens — the new Risc PC particularly shines in this field. So what technology is needed to get all these pictures into our computers? There are several methods - the first being videos and cameras using a digitiser, but these have a fairly low resolution, usually not more than 640x512 pixels. For the affluent, there are some very expensive digital cameras (costing over £3000) with resolutions over 1500x1000 pixels.

Another option are scanners, ranging from low resolution (200dpi) black and white hand held units, to high resolution drum scanners (over 3000 dpi) in full 32bit colour. Again, the latter needs a bank balance the size of Paul Getty's. With the advent of Kodak Photo CD, the average punter can take films to the Chemist and have them placed on a compact disk. Each disk can store approx. 100 very high resolution images — great for new films, but still a little pricey at about 50p per picture. A useful

resource is the library of pictures available from commercial and PD sources. Many high quality images can also be downloaded from bulletin boards. My personal choice was to go for a flat bed colour scanner. This way I could have my own high quality images to manipulate and it would also double up as a good photocopier.

I was fortunate enough to acquire an Epson GT8000 flatbed colour scanner which proved to be a very capable piece of hardware. However, the hardware is only as good as the software that drives it. Irlam instruments supplied me with **ProI-Mage** — their colour scanning software. This is sold as a package with their scanners, Irlam are looking into selling ProI-Mage as a separate stand-alone application although no price has yet been set. The current scanner packages available from Irlam are: Logitech Colour Hand Scanner £359, Sharp JX100 £449, Epson GT6500 £699 and Epson GT8000 £799, all ex VAT. There are several versions of **ProI-Mage**, one for



The sProI-Mage Control Panel offering a range of options

each of the various scanners and interfaces but all have a similar user interface.

Irlam have been in the forefront of scanning technology on the Acorn computers for as long as I can remember. I expected and received a high quality software scanning application. **ProI-Mage** is not an image enhancing program. It is a user friendly scanner driver, that readily allows you to be able to use the scanners inbuilt options.

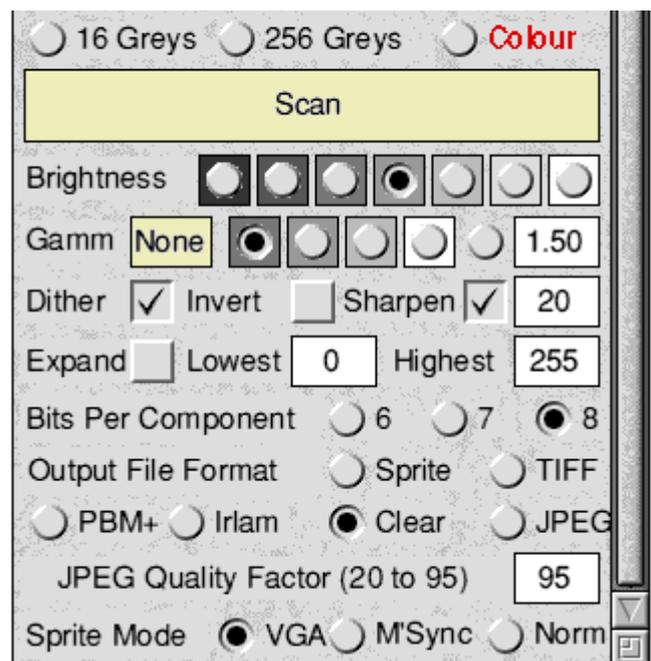
The manual supplied is an A5 fifty-four page, ring bound book. It was well written and presented with explanations of how scanners work, a classification of the types of scans and advise on what can and cannot be scanned. It explains how to set up the hardware and which interfaces may be used, how to use the **ProI-Mage** system. It also indicates the estimated size of the scan. One notable feature is that the top of each page shows an icon for each of the different scanner types described on that page. This saves unnecessary reading. There is a section on how to use Acorn's ChangeFSI, as this is supplied on the disk for image enhancement. The manual concludes with information on printing your scans.

The software itself can only be loaded if the scanner is connected and turned on. When loaded, the **ProI-Mage** icon installs itself on the icon bar. Clicking on the menu over this icon gives access to the program version info. Show viewer will open up a viewer window. A greyed out transparency option is available for those lucky enough to have the additional transparency adaptor for the scanner. The save choices option allows your preferred set up to be saved and from here we can quit **ProI-Mage**.

Clicking select on the icon bar opens up the main control window and the viewer window. This is by default, normally set up for an A4 low res. grey scale preview scan. However, this

can be changed by the save option from the icon bar. Just press the scan button once to start the scan and a second time to stop. Once you have previewed your picture, you can mark the exact area that you wish to scan by entering the size and position in the control panel dialogue boxes. Or by dragging the ears on the box in the viewer window, this box can be moved about by clicking adjust when in the middle of this frame. For fine adjustment, nudge arrows are provided in the main control window. There is also an autosize option which will automatically size the box to fit any picture which is against a white background.

When we have selected the area for the full scan, we need to decide at what resolution and how many colours we require. The selected resolution can be 100,400,800 dots per inch (dpi) with a further editable dialogue box to enter up to 1600 dpi, (the max for the GT8000). The optical resolution is actually 400 dpi the higher resolutions have to be interpolated. For life size images, 100 dpi is usually good enough. An A4 8bpp colour scan would use about 1Mb of memory, a 24bpp scan would require almost 3Mb. The same size picture at 400 dpi would need almost 50



Yet more options available to the user

megabyte. Normally we would use the higher resolutions to magnify a smaller area, but this aspect is covered in detail in the manual.

Having set the resolution, the colour mode can be set from 1bpp monochrome to 4, 16, 256 grey levels and full colour. When scanning, the viewer window shows the picture building up in a 256 dithered colour mode. Newer versions of the software will support the higher 16 & 32bpp modes of the Risc PC. The main scanned image is built up on the computer's hard disc. With the viewer window open, the scan size is limited to the maximum free ram in the computer. However, if the viewer window is closed, then **ProI-Mage** treats the hard disc as virtual memory, allowing very large scans of over 100Mb to be created. The only limit is the free space on the hard disc. It must be pointed out that very few programs on any computer can sensibly use files of this size.

When **ProI-Mage** is scanning, it is multitasking, allowing you to do other tasks at the same time. This is helpful, as some of the larger high res. scans can take a long time to complete. Once completed, the scans can be saved in various formats, such as an 8bit sprite (newer versions of **ProI-Mage** will save 16 & 32 bit sprites), industry, standard tiff and jpeg files, PBM+ files, as used on workstations, Irlam's 24 bit files and 24 bit Clear files. So this enables easy transfer to other platforms.

By moving the down the scroll bar on the control panel window, we can gain access to the more advanced features of **ProI-Mage**. Firstly, seven levels of brightness can be set using radio switches. By default this is set midway. The image can be lightened or darkened three settings either way.



Save Options

Gamma correction can be applied, which affects the contrast of the image. Five preset values can be used or alternatively values between 0.01 to 4 can be entered in a dialogue box. Values less than one will darken the image, whereas values greater than one make the dark areas appear lighter, the lighter parts staying the same.

Dither should be set for 256 colour scans for the best results using the standard palette. However for best printed results this should be turned off.

An Invert option is available to allow a black and white negative to be scanned and made into a positive image.

The Expand option measures the 256 grey level of the image and can be used to equalise or brighten the image. Manually adjusting expand can be used for special effects.

Bits Per Component only affect TIFF files. Instead of 24 bpp files (8 bit per component) being created, 21 and 18 bpp files can be made. Even at 18bpp images can have up to 256,000 colours and the file size can be reduced by 25%.

In conclusion **ProI-Mage** has made it extremely easy to access most of the GT8000 inbuilt functions without resorting to complex menus. High quality images can be obtained with the minimum of fuss.

Irlam Instruments have lived up to my expectations of a company who have been involved in scanning technology on the Acorn Risc machines since the early days.

John Bancroft



ARM Coding – Part 5

Mark Smith concludes his look at ARM assembly language..

Some more arithmetic and logical instructions

I've already mentioned the ADD and SUB instructions. There are, however, a number of other arithmetic instructions which I shall now describe.

ADC — Add with carry

ADC Rd, Rn, Rm – Rd=Rn+Rm+C
ADC Rd, Rn, #exp – Rd=Rn+exp+C

This is similar to the ADD instruction except that the carry flag is added to the two operands. For example to add two 64 bit numbers, one of which is held in R0 (most significant word) & R1 and the other is held in R2 (most significant word) & R3. The answer is to be stored in R0 & R1:

ADDS R1, R1, R3
ADC R0, R0, R2

SBC — Subtract with carry

SBC Rd, Rn, Rm – Rd=Rn-Rm+C-1
SBC Rd, Rn, #exp – Rd=Rn-exp+C-1

This instruction allows subtraction with numbers of more than 32 bits. The carry flag is used as a 'NOT borrow'. For example, to subtract two 64 bit numbers held as in the above example:

SUBS R1, R1, R3
SBC R0, R0, R2

RSB — Reverse Subtract

RSB Rd, Rn, Rm – Rd=Rm-Rn
RSB Rd, Rn, #exp – Rd=exp-Rn

This is similar to the SUB instruction except that the first operand is subtracted from the second instead of vice-versa. This allows a register to be subtracted from a constant or from a shifted / rotated register (explained below).

RSC — Reverse Subtract with carry

RSC Rd, Rn, Rm – Rd=Rm-Rn+C-1
RSC Rd, Rn, #exp – Rd=exp-Rn+C-1

This is similar to the SBC instruction except that the first operand is subtracted from the second.

The ARM processor can also perform bitwise logical operations as detailed below.

MVN — Move NOT

MVN Rd, Rm – Rd=NOT Rm
MVN Rd, #exp – Rd=NOT exp

Set each bit of the destination so that it is the inverse of the corresponding bit in the source register or expression, i.e. where there is a 0 in the source register, the destination register has a 1 and where there is a 1 in the source register the destination register has a 0.

AND — Perform a bitwise AND

AND Rd, Rn, Rm – Rd=Rn AND Rm
AND Rd, Rn, #exp – Rd=Rn AND exp

Set each bit to 1 in the destination register where the corresponding bits of both operands are 1. All the other bits in the destination register are set to 0. It is usually used to mask out (clear or set to 0) all bits from a register except certain required bits. For example:

```
AND R0,R0,#%11111111 ; Mask
out all bits in R0 except the
bottom eight
```

ORR — Perform a bitwise OR

```
ORR Rd,Rn,Rm      — Rd=Rn OR Rm
ORR Rd,Rn,#exp    — Rd=Rn OR exp
```

Set each bit to 1 in the destination register where the corresponding bit of either or both operands are 1. All the other bits in the destination register are set to 0. Uses include combining information from two registers

into one register. For example:

The top 16 bits of R0 and the bottom 16 bits of R1 hold useful data. All other bits in R0 & R1 are 0. The bottom 16 bits of R1 need to be copied into the corresponding bits of R0

```
ORR R0,R0,R1
```

Also, the ORR instruction can be used to set specific bits in a register:

```
ORR R0,R0,#1 ; Set the least
significant bit of R0.
```

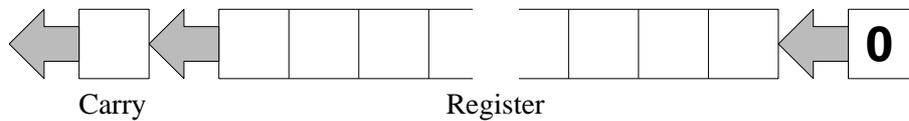


Figure 1 - Logical Shift Left (LSL)

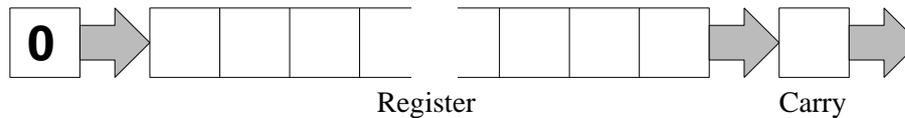


Figure 2 - Logical Shift Right (LSR)

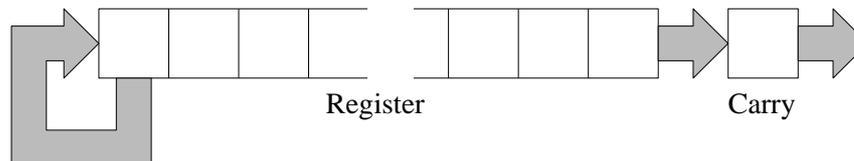


Figure 3 - Arithmetic Shift Right (ASR)

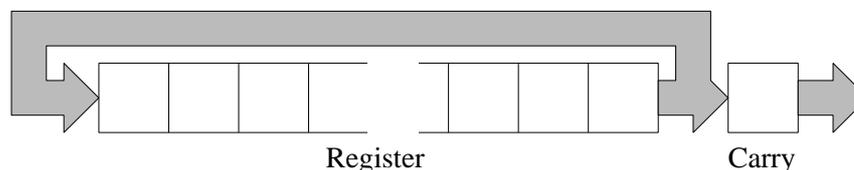


Figure 4 - Rotate Right (ROR)



BIC — Perform a bitwise AND NOT

BIC Rd,Rn,Rm — Rd=Rn AND NOT Rm
BIC Rd,Rn,#exp — Rd=Rn AND NOT exp

BIC performs a bitwise AND with the contents of Rn and the inverse of the second operand. It is useful for clearing specific bits in a register. For example:

BIC R0,R0,#1 ; Clear the least significant bit of R0

EOR — Perform a bitwise Exclusive OR

EOR Rd,Rn,Rm — Rd=Rn EOR Rm
EOR Rd,Rn,#exp — Rd=Rn EOR exp

Set every bit in Rd where the corresponding bits of either operand, but not both, are 1 (i.e. the corresponding bits of the two operands are not equal). Clear all other bits in Rd.

One application is to toggle specified bit(s) in a register. Eg:

EOR R0,R0,#1 ; Toggle the least significant bit of R0

Also, since EORing a register with the same value twice leaves it unchanged, EOR can be used for primitive encryption techniques:

EOR R0,R0,#constant ; Encode R0
EOR R0,R0,#constant ; Decode it again

Finally, if the two operands are equal then the result will be zero. This can be used as a check to see if two registers contain the same value, or if a register contains a specific value:

EORS R0,R1,R2; Does R1 equal R2?
BEQ r1_equals_r2; Branch if they are equal

Clearly, in the last example, the result of the exclusive OR, placed in R0, is not required if all we wish to do is test whether R1 and R2 are equal.

TEQ — Test Equal

TEQ Rn,Rm — Test if Rn is equal to Rm
TEQ Rn,#exp — Test if Rn is equal to exp

For this reason there is an instruction that performs the EOR operation and sets the processor flags on the result, but does not store the result in a register. The S suffix does not need to be specified in the instruction to set the processor flags on the result of the operation since there would otherwise be no point to the instruction. It can however be specified if the programmer wishes, the instruction will operate in exactly the same way.

TEQ R1,R2 ; Does R1 equal R2?
BEQ r1_equals_r2 ; Branch if they are equal

TST — Test

TST Rn,Rm — Test if any bits are set in both Rn and Rm
TST Rn,#exp — Test if any of the bits set in exp are also set in Rn

In the same way that TEQ performs an exclusive OR but doesn't store the result (except by setting the flags), TST performs an AND without storing the result in a register. Again, the S suffix is implied in the instruction.

The main practical use for this instruction is to test whether or not a certain bit is set in a register. In particular, where a register stores information about a number of options, each of

which may be on or off, the status of each option may be stored in one bit of an options register:

```
TST R8, #(1<<6) ; Test bit 6 of
R8 which holds a series of
options
BNE bit_set ; If the bit is
set, the Zero flag is now set
BEQ bit_clear ; Otherwise the
Zero flag is clear
```

In the above example, if bit 6 of R8 is set then ANDing it with the expression which only has bit 6 set will generate a result which only has bit 6 set, since this is the only bit which is set in both operands. Hence, the result is not zero and the Zero flag is not set.

If bit 6 of R8 is not set then ANDing it with the expression will generate a zero result, hence the Zero flag is set.

The Barrel Shifter

One of the more powerful features of the ARM range of processors is the ease and speed with which any register can be shifted any number of binary places to the left or right. For example:

```
MOV R0, R0, LSL#1
```

Shift the contents of R0 one binary place to the left, ie multiply it by 2.

```
MOV R3, R4, LSL#3
```

Shift the contents of R4 3 binary places to the left (i.e. multiply by $2^3=8$) and store the result in R3.

```
MOV R2, R5, LSR#4
```

Shift the contents of R5 4 places to the right

and store the result in R2. This will divide an unsigned number by 16 (2^4), but cannot be used to divide negative numbers held in 2's complement format.

All the above are logical shifts (hence, LSL is Logical Shift Left and LSR is Logical Shift Right). The bits that are shifted in at the bottom (for left shifts) or the top (for right shifts) are always 0. The logical shifts are shown in figures 1 and 2. To divide signed 2's complement numbers an Arithmetic Shift Right is used. Instead of 0s being shifted in, the sign bit is duplicated as shown in figure 3.

```
MOV R1, R2, ASR#2
```

Divide a signed number held in R2 by 4 (2^2) and store the result in R1.

Bit rotation

As well as being able to shift bits to the left or the right, it is also possible to rotate bits to the right. As each bit is shifted out of the register, it is shifted into the most significant bit as well as the carry (see figure 4).

```
MOV R0, R0, ROR#16
```

Swap the most significant 16 bits of R0 with the least significant 16 bits.

Note that it is not possible to shift bits to the left. However, shifting n bits to the right has a similar effect to shifting $32-n$ bits to the left. For example to move the most significant bit of R0 into the least significant bit and shift all other bits one place to the left use:

```
MOV R0, R0, ROR#31
```

There is still one other case to consider. That is a shift one bit right with extend (RRX). As can be seen in figure 5, this has the effect of

shifting the least significant bit into the carry flag, all other bits one place to the right and the most significant bit is loaded with the original contents of the carry flag (i.e. the contents before it was loaded with the least significant bit). At first sight, it may seem as though there is not much use for this, however it can be useful in some circumstances.

For example, suppose we have a 96 bit signed number stored in three registers: R0, R1 and R2 (R0 contains the most significant 32 bits) and we want to divide it by two. It can be done in three instructions as follows:

```
MOV R0,R0,ASR#1 ; Shift the most
significant 32 bits. The least
significant of these end up in
the carry flag.
MOV R1,R1,RRX ; Shift the middle
32 bits. The old contents of the
carry needs to be shifted in at
the top, and the least
significant of these 32 bits
needs to be shifted out into the
carry for the final instruction.
MOV R2,R2,RRX ; Shift the least
significant 32 bits. The bit
shifted out of R1 needs to be
shifted into the most
significant bit of R0.
```

Use of the shifter in combination with arithmetic and logic instructions

The barrel shifter can also be used in combination with instructions such as ADD, SUB, ORR etc. It can be used on the second operand where it is a register (Rm). For example:

```
ADD R0 ,R0 ,R0 ,LSL#1
```

Multiply R0 by 3 ($R0=R0*[2^1+1]$)

```
TEQ R0 ,R1 ,LSR#16
```

Test whether the top 16 bits of R1 are the same as the bottom 16 bits of R0 (assuming the top 16 bits of R0 are all 0)

```
RSB R0 ,R0 ,R0 ,LSL#4
```

Multiply R0 by 15 ($R0=R0*[2^4-1]$)

The Multiply Instructions

There are now only two remaining instructions present on all the ARM processors that Acorn use and that I haven't mentioned. Those are the multiply (MUL) and multiply and accumulate (MLA) instructions.

MUL — Multiply

```
MUL Rd ,Rm ,Rs — Rd=Rs*Rm
```

There are some restrictions on the choice of registers. Rd must not be the same as Rm and also, it is not possible to shift or rotate Rm (or Rs) as it is in other arithmetic and logic instructions. Finally, it is worth pointing out that both operands must be a register, no immediate constants are allowed.

MLA — Multiply and Accumulate

```
MLA Rd ,Rm ,Rs ,Rn — Rd=(Rs*Rm)+Rn
```

Again, Rd must not be the same as Rm, none of the operands can be shifted or rotated and all operands must be registers.

Note that when multiplying by a constant, it is sometimes easier to use the barrel shifter in combination with the MOV, ADD and RSB instructions than it is to use MUL, especially where the constant is either a power of two or one greater than or less than a power of two.

For example, to multiple R1 by 5 you could

use MUL:

```
MOV R0, #5
MUL R1, R0, R1
```

or you could use ADD with the barrel shifter:

```
ADD R1, R1, R1, LSL#2
```

The LSL#2 effectively multiplies R1 by 4. This is then added to R1, making the result R1*5.

Although the second solution may not be immediately obvious to anyone reading your program, this can be overcome by putting in a comment to explain what it does. There are three main advantages over the first solution. These are that it uses only half the number of instructions, hence half the memory, it is also faster and it doesn't involve any other registers apart from R1.

So there you have it — all you need to know about programming in ARM code. Of course, the secret is not only in knowing about ARM Code programming, but also in making use of the hundreds of Operating System SWI calls provided by RISC OS. If you are familiar with BASIC programming, you may already have used some with BASIC's SYS command. I will be covering some of the more useful ones with example programs in future issues of Eureka.

Mark Smith

The ARM Club's Technical Help Service is available to assist with any problems which you may have with your Acorn computer. This includes programming in ARM assembly language. Please address all queries to the usual Club address and enclose an SAE if at all possible.

Forms Suite Plus

continued from page 27

Tab	moves the cursor to the next marker
F2	inserts a data marker
F3	saves form
F4	deletes the line
F5	inserts a blank line
F6	starts line/box drawing
F7	previews form
F8	toggles between System and RISC OS fonts
F9	changes from sheet calculator to toolbox
F10	enters the sheet calculator
F11	toggles between insert and overtype
Ctrl-F3	starts block copy
Ctrl-C	centres text on line
Ctrl-D	changes to small text
Ctrl-K	draws thick lines
Ctrl-L	changes to large characters
Ctrl-N	draws thin lines
Ctrl-Q	recalculates sheet
Ctrl-S	swaps case or sorts alphabetically if a block is marked
Ctrl and arrow keys	move the cursor
Shift and arrow keys	move the cursor to the start of the next (previous) word
Page Up/Page Down	moves the page

I found the manual most helpful but also found that I was helped by playing around with some of the sample forms included with the package.

The cost of Forms Suite Plus is £55.00 and I can thoroughly recommend the suite of programs. It provides a great deal of fun and I have found it very useful for producing forms, tables and pages which can all be exported as a Draw file into a word processor as well as a multitude of other uses. An A4Forms reader and a couple of example forms have been included on the Eureka Disc.

Nick Evans

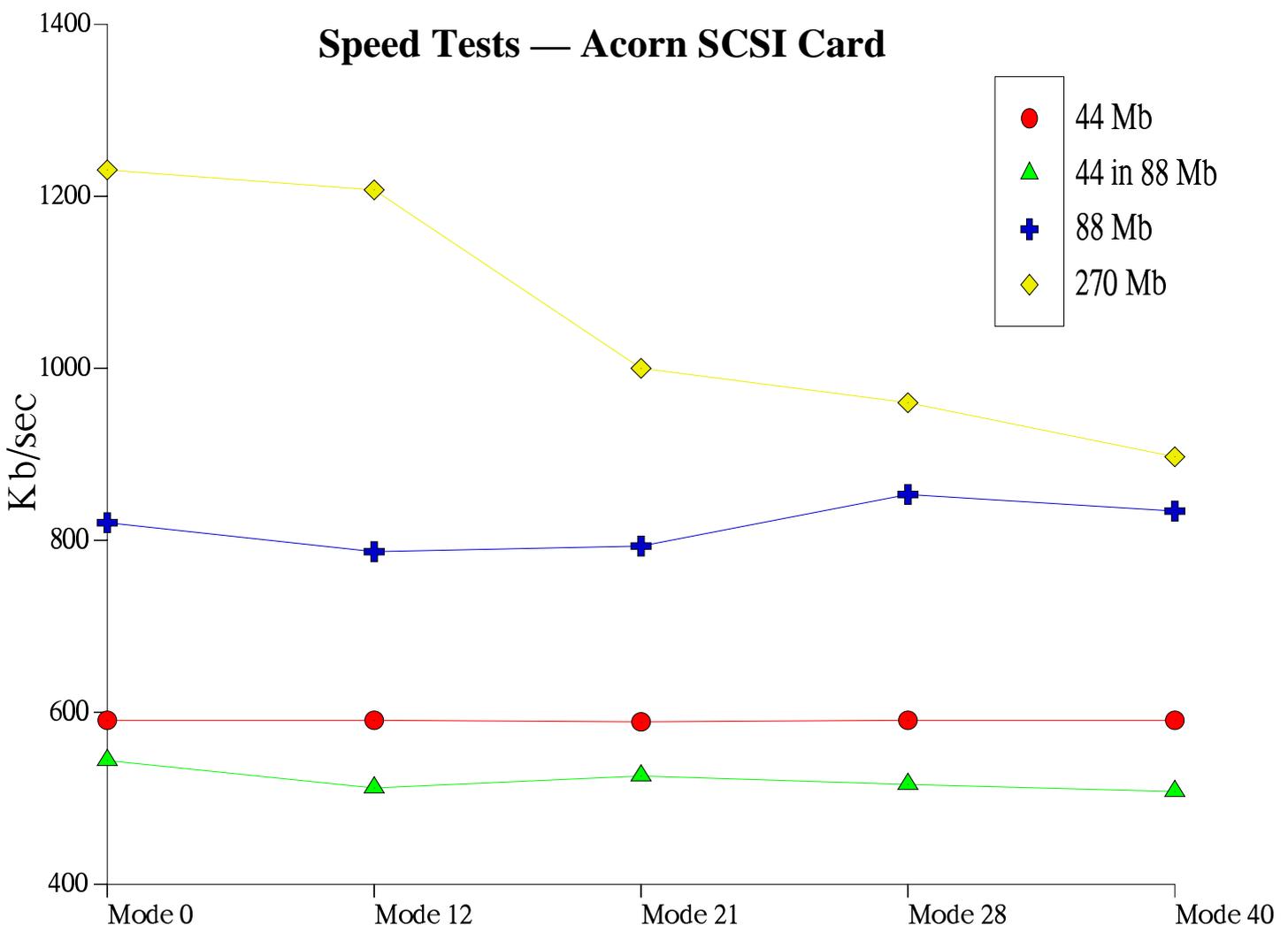
The 270Mb Syquest Drive

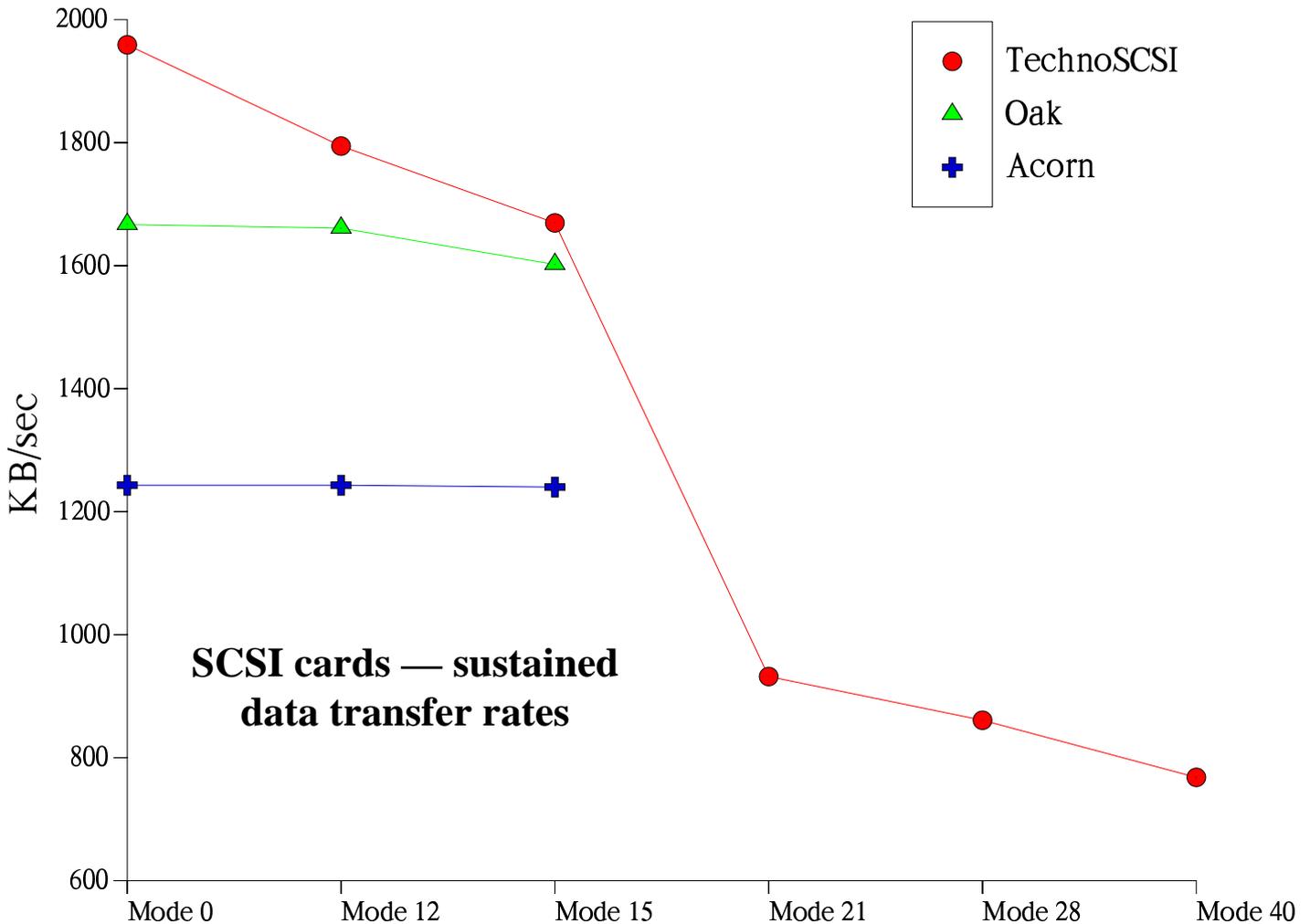
Nick Evans shows off the latest in his collection of Syquest Drives

Two days before the Harrogate show I managed to obtain one of the new Syquest removable 3½ inch drives. It was from the first batch of 5 to arrive from Singapore where they are made, and is an external SCSI device. It is sold as a 270Mb drive, but, on formatting is a mere 256Mb (or a quarter of a gigabyte if you prefer). it is able to read and write to the 105Mb. discs from the smaller capacity of drive which was introduced next year. It is housed in a small grey box.

I connected it up to my Acorn SCSI interface, switched on and formatted the disc. All went well until I tried to alter the sector size from the 2K (size 11) which the SCSIDM formatting

program suggested I use. I just couldn't do it, as any change to a sector size less than that produced an error. I suppose that with 256Mb on each disc a small increase in sector size won't hurt the pocket too much. For those who don't know what I'm talking about, when a file is written to a disc, whether its a hard disc or a floppy, the file is written on preformatted sectors on the disc. If the sectors are, say 512 bytes long and a file is 640 bytes long then it will fill 1¼ sectors. You might think that the next file will then start ¼ of the way along the sector which is only partly filled, but it can't. Each new file has to start at the beginning of a new sector and hence, to a certain extent, the smaller the sectors on the discs the less space





will be wasted. This is only significant if you put a lot of small files on a disc, or have a large disc, but if the sectors are 2K long then that is the minimum space a file can occupy. If you click on 'Display -> Full info' and look at the length of the files on a disc you will see that a lot of them are very small — !Boot, !Run etc.

Apart from that small problem which I have not yet resolved the Syquest drive has behaved impeccably over the past two months. I have used it with an Acorn and an Oak SCSI card with no problems, and have even managed to get it to work with a TechnoSCSI card which has previously defied all attempts to drive any SCSI disc that I have tried it with. The drive will work either horizontally or vertically and can be fitted into any 3½ drive bay.

As some of you who have visited The ARM Club stands at Acorn shows etc may know, I seem to have developed the habit of collecting Syquest removable drives and the following graph is a comparison of the speeds of the various drives that I have. They are 44Mb, an 88Mb which also reads and writes to 44Mb discs, and a 270Mb drive.

As expected the 88Mb drive is slowest when reading 44Mb discs because the drive head has to "double-step" ie move two tracks instead of one when moving to the next track.

The 270Mb drive is very fast compared to the earlier Syquests and the speed of the SCSI card becomes important. The Acorn card is the one I use most and is the slowest, having a maximum transfer rate of 1.25Mb/sec. and this affects the results of the first speed test which I

Help Required

did using the Morley hard drive speed test program (transferring a 20 Mb file to the drive and reading it back again). My sustained speed tests showed the TechnoSCSI card to be fastest (unfortunately it has proved by far the most unreliable in use and supports the least range of drives) with nearly 2 Mb/sec transfer speed.

I assume that the drop-off in the speed of the 270Mb drive at high screen resolutions is due to the relative decrease in the CPU which spends so much more time on screen updating but any other theories would be gratefully received. I used an A440/1 with 35 MHz ARM3 for the purposes of this small review.

The drive has proved extremely reliable in use and, due to the unfortunate demise of my internal ST506 drive has been used as my Boot-up drive for the past month.

The Syquest 270Mb drives are available from Mac and More, 1 The Wilderness, Churchgates, Berkhamsted, Herts HP4 2AZ. Tel 0442 870300, fax 0442 870707. They cost £399 plus VAT or £480 including VAT and postage, and there is no surcharge for using a credit card. Individual discs cost £60 or £70.50 including VAT. The drives normally come with a 25 pin D to 50 pin SCSI connector, but if you ask then this will be changed for a 50 pin SCSI – 50 pin SCSI cable.

There are other exciting developments on the way from Syquest — the new SQ1080 drive is due to be released later this year — this is a removable 88Mb. drive with the discs being 3cm. square and 0.8 cm high (the size of a stack of three After Eight mint in their wrappers!) and also a cheap magneto-optical drive should arrive within nine months which will be very useful for storing all those enormous works of art produced on the Risc PC.

Nick Evans

The Reverend Michael Morris is an ARM Club member living in Wales. He is involved in the development of a multimedia project to give his Sunday School pupils some graphical simulations with a message.

He needs someone with a little programming expertise to write routines that will simply animate some graphics. These routines are probably already in existence but Michael doesn't have the experience to be able to adapt them for his graphics. The ideas or routines he has in mind are similar to:

- a) Space Invaders (these need to be caught rather than zapped)
- b) Pacman
- c) Maggot Moments
- d) Walking through mazes
- e) Picking up wheat and leaving the weeds behind

I would imagine that none of these would tax a relatively experienced programmer with some time to spare. If you can help Michael you can get in touch with him on 0239 682552, or if you prefer to write, his address is: The Vicarage, Llechayd, Cardigan, SA43 ZNY. You'll certainly be helping a good cause.

Geoff Stilwell, Club Secretary

Acorn !Printers

A few months ago Acorn released an updated version of its printer drivers for RISC OS 3. The updated version (v1.22) is improved in a number of ways and the upgrade is recommended. Ask your local dealer for a copy, or alternatively send £1.00 to the Club PD Library which is distributing the drivers by kind permission of Acorn Computers Ltd.

Maths Card Review

An education resource creation package comes under scrutiny...

Teachers are continually re-inventing the wheel. I am sure this happens in business, commerce and industry too, but I believe it is more prevalent in education, (because we get so little support from above?).

I was just as guilty of this in my own teaching. I would create a banda worksheet only later to find an almost identical exercise in a book.

When computers came along I saw their potential, not only for the children's benefit, but as tools for teachers. I worked on the principle that a worksheet created on the computer could be, with adaptations, used again and again. I even went so far as to write a BASIC program that would print out

addition and subtraction sums, with varying degrees of difficulty.

Creative Curriculum Software (CCS) also seems to be on the same wavelength. "Maths Card" is a simple but very effective piece of software which enables teachers, or children, to create maths worksheets on the screen and print them out using Draw. (It even provides the answers, which my little program didn't do.)

Maths Card is packaged in a video style box with a disc, an installation guide and an A5 landscape manual. The installation guide explains how to register your disc and how to install the software onto a network, or a hard or floppy disc. Installation is a matter of double

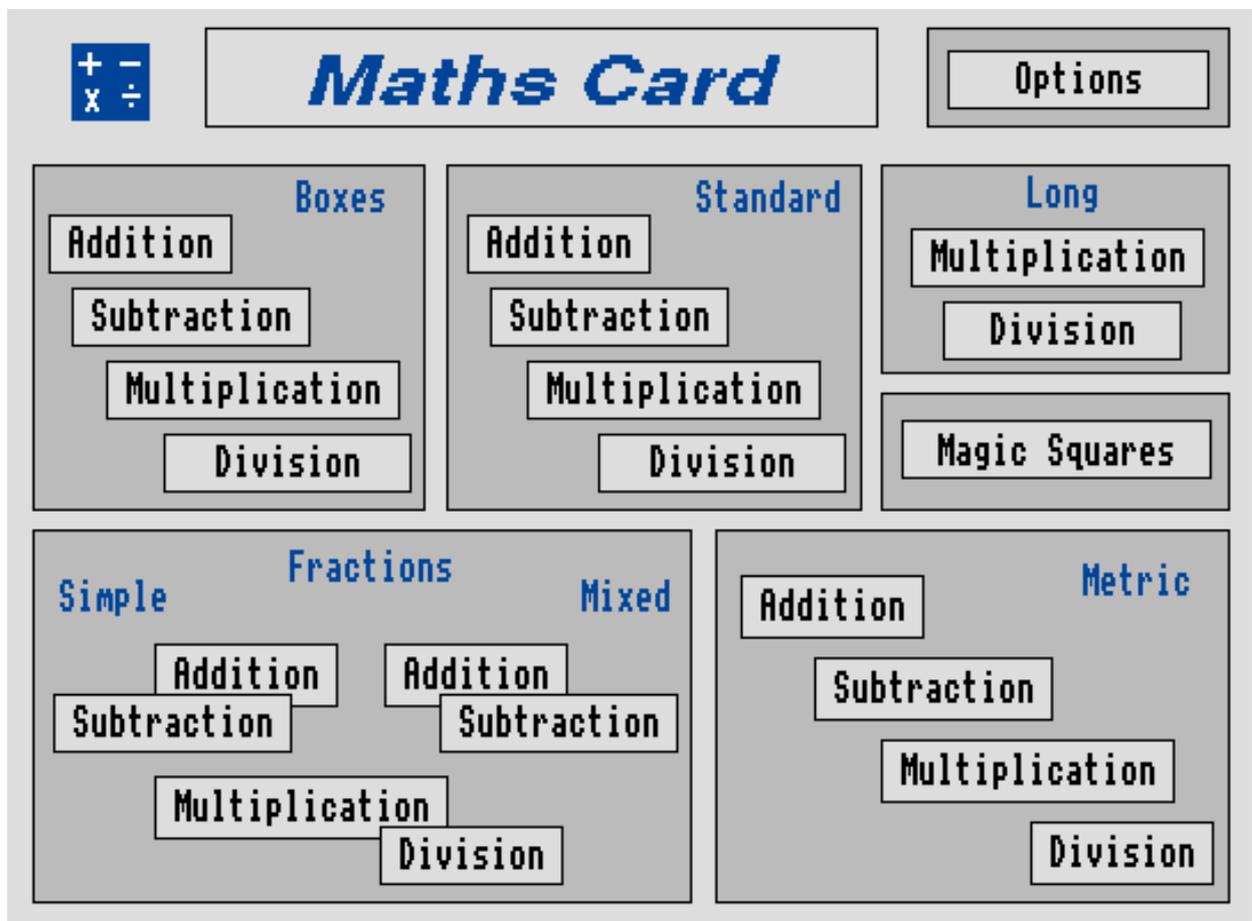


Figure 1 — the front window to Maths Card

clicking on the Install icon. Instructions are provided in each subsequent window about dragging the Maths Card icon wherever you want it.

The software protection system I had not experienced before. It allows you to copy the program as many times as you've paid for - for a single user, only once. If you subsequently want to change to a different machine you have to reload the Install program from the master disc and de-install Maths Card back onto the master disc, then re-install it elsewhere. You cannot, however, de-install copies made to floppy discs.

Maths Card's front window displays all its major options (see fig.1). Boxes prints the sums across the screen with boxes printed in which the pupil must insert a missing number. Standard is the usual columnar format, and the rest are self explanatory.

Clicking on one of these takes you to a further window (see fig.2) which allows you to choose levels of difficulty and how you want the worksheet displayed. Everything is chosen by clicking on box icons, leaving a tick behind to select the option or a cross to de-select. Choices range from how many column places (Units, T&U, HTU etc. up to 6 digit numbers), which multipliers or denominators, what symbols or words you use for the operation (- or minus, less, take away, subtract, equals or =), to whether the sum carries or not. Choosing the Metric option allows you to specify units such as pounds, metres, centimetres, kilometres, or litres. Most options can be absolutely set or to be chosen at random when the worksheet is created.

When the selections are made click on the Prepare icon and the worksheet appears with between 8-12 problems set, depending on the options selected (see fig 3). If you're not happy

with the result make the necessary changes and click the Prepare button again. Two lines at the top of the worksheet on screen can be edited to provide titles, dates, worksheet number references, etc.

When you are happy with the layout of the worksheet click on the Save button. This saves the worksheet as a Drawfile into a directory called !Saved which you have previously clicked on to let the program know where it is. The resulting Drawfile is in landscape format with two identical worksheets side by side.

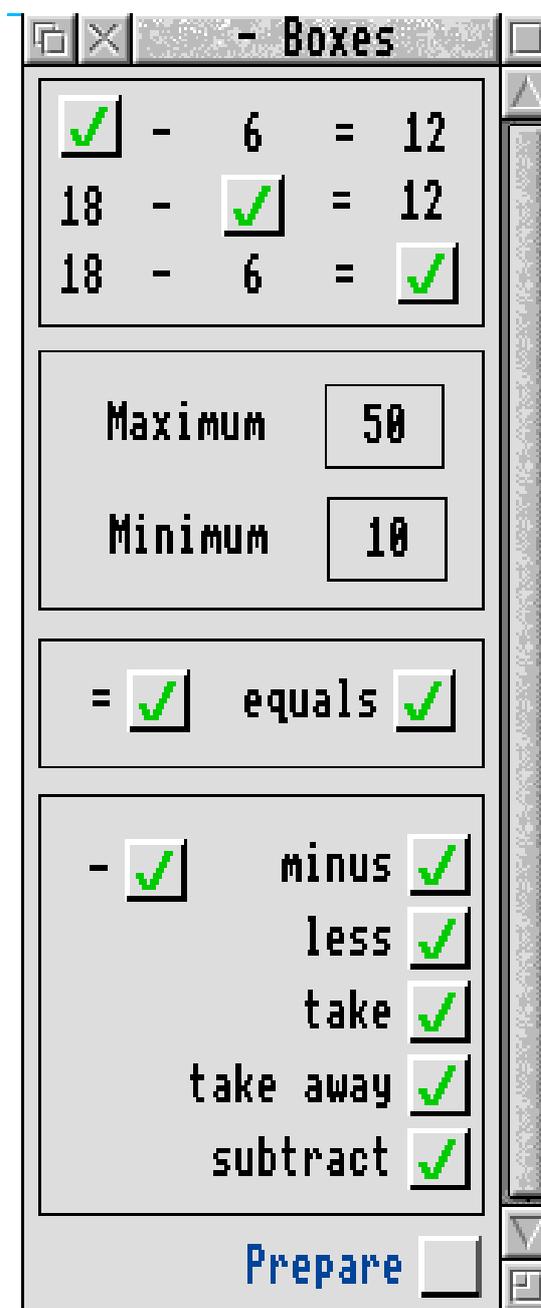


Figure 2 — levels of difficulty

Work Card

Example Primary School : AT: Lev:

Card 1Ab Name: Date: Save

1)	35	minus	<input type="text"/>	equals	24
2)	49	-	39	=	<input type="text"/>
3)	<input type="text"/>	subtract	33	equals	10
4)	15	take	<input type="text"/>	=	3
5)	<input type="text"/>	minus	18	equals	21
6)	32	take away	14	=	<input type="text"/>
7)	<input type="text"/>	subtract	12	equals	21
8)	23	less	23	=	<input type="text"/>

Figure 3 — part of a work card, ready to be saved as a drawfile

This is my only criticism of this product. In my opinion it would be better to have the option of two different worksheets side by side, with a greater number of problems on an A4 sheet. It is possible to combine two separate worksheets together on the same Drawfile — grouping the elements together and saving the selection across — but I'm sure teachers would prefer this were done for them.

Answers may be printed alongside the problems for the teacher's benefit (see fig.4). This option is switched on or off from the Work Card menu which mostly duplicates the options available from the front page.

The manual is excellent and leads you through the various options step-by-step, although the program is so easy to use the manual is virtually redundant. The first time I used the program I showed a ten year old

child the basics and left him to get on with it. Within minutes he'd printed out worksheets for others in the class to try.

The scope of this application is limited but it does fulfil a useful function admirably. I'd guess that many teachers would be using Maths Card almost every day. They could provide specific maths reinforcement exercises for individual children, quickly and easily, and without having to re-invent anything.

Maths Card is available from Creative Curriculum Software, 5 Clover Hill Road, Savile Park, HALIFAX HX1 2YG. Tel (0422) 340524 Fax (0442) 346388

Geoff Stilwell

Single user Licence — £49.00 + VAT

Primary Licence — £89.00 + VAT

Full Site Licence — £149.00 + VAT

The Summer Games Zone

REVIEW GAMES

Acorn games players are almost spoiled for choice at the moment with a number of top games released at or soon after the Acorn User Spring Show in Harrogate, both conversions from other platforms and native Acorn games.

Particularly interesting are games such as Diggers (from Millennium) and Flashback (from US Gold) which have been converted and are being marketed directly by the companies which released them for other platforms. This partly indicates the growing size of the Acorn games market, and also the efforts of Acorn itself in helping such companies to convert their titles and gain a foothold in the Acorn marketplace.

One slight cloud does seem to be lingering over the Acorn games scene, namely that so much interest is being devoted to game conversions rather than original Acorn titles such as Magnetoids. The PC Card for the Risc PC may also have a significant effect on games development if it means that games players no longer have to wait for games to be converted and spend their money on the PC versions of games. Do write in and tell us what you think.

• The Games Zone • FREEPOST ND6573 •
• London • N12 0BR •

FLASHBACK

Reviewed by Brian Hughes

US Gold have marked their return to the Acorn market by releasing Flashback, a graphical platform adventure game which has enjoyed great success on other formats.

The most striking feature of this game is the attention to detail, for example in the movement of your character, a chap called Conrad. The animation of the movement of



Poor Conrad has had his mind erased...



Death is always just around the corner for poor Conrad

Conrad is nothing short of amazing, resulting in very fluid and realistic movement controlled from the keyboard. The various movements such as jumps, rolls, climbs, dives, leaps and drawing a gun all look very natural, apparently real stuntmen were used in the development of the movement routines. It may look complicated to control Conrad but the moves quickly become second nature. A gun may be pulled and fired from most positions, the attention to detail even goes so far as showing the used cartridges flying out of the gun!

The plot behind the game is that Conrad, an ordinary sort of guy, has discovered a secret alien plot to take over the Earth. Unfortunately he was discovered, had his mind erased and was dumped far away. The journey back to Earth is along and difficult

one, involving exploring the numerous levels and completing various tasks as you go along. For example at one point he has to visit an Employment Office in order to earn money to continue the quest. When Conrad performs some sort of special action such as picking up an object, one of many short non-interactive animation sequences is shown, adding to the atmosphere of the game. These are also used to guide the actions which Conrad must take in the future.

Flashback has three different skill levels which basically affect the effectiveness of aliens in attempting to thwart Conrad's efforts and simplify the tasks necessary to complete each level.

Each level of Flashback is entered by completing the previous level, and each has its own password which can be entered from the main Flashback window. It is also possible to save Conrad's position in the game, but only at fixed "save points" scattered around the game.



Conrad can hop on an underground train to get to his destination

Fortunately there tends to be a save-point just before each difficult section of the game where Conrad is likely to get killed. Inevitably some parts of the game have to be repeated again and again until you get the hang of them and make no mistakes, for example one section has to be completed within a short time-limit and takes a lot of practice to complete.



Part of an animation after Conrad completes the Death Tower game

Flashback contains many puzzles and more straightforward action sequences which tend to involve shooting different types of opponent. As with Conrad himself, the animation of these opponents is very impressive; there are various types of opponent, some of which are more easy than others to kill.

being fully configurable so that they can be turned off or reduced if the user so requires. The music is frequently triggered by particular actions such as climbing down a hole, adding atmosphere to the game. The music and sound-effects are well chosen and unobtrusive, adding significantly to the game rather than detracting from it.

The music and sound are also impressive, both



Conrad must have a good head for heights...

Overall I would say that Flashback is an excellent game, the attention to detail puts virtually all native Archimedes games to shame.

The graphics and sound are very good indeed, and the game definitely has that important addictive quality which means that it won't sit on your shelf gathering dust. Wholeheartedly recommended.

Brian Hughes

Flashback is published by US Gold and is available from all usual game suppliers, priced at RRP £27.99.

MAGNETOIDS

Adrian Jackson blasts away and turns some PC owners green with envy...

There must be something strangely enthralling about blowing large chunks of rock into smaller chunks of rock. Since the very first version of Asteroids, extra features have been added as computers have become more advanced. And with Magnetoids, it seems, the rock demolition business has reached new heights of excitement.

It all starts at 61 Cygni, where the first contact with aliens is made. Unfortunately they don't all speak English with a slight

American accent like the ones on TV, so communication is a bit of a problem. After a while a breakthrough is made, and they head for 61 Cygni, towing a weird object that the scientists christen "The Dumpling". A research vessel flies out, and promptly crashes into the Dumpling, so the scientists decide to kill all the aliens just in case. As always, they only have one shuttle and one fighter pilot...

When you're converting an all-time classic like Asteroids to the Archimedes you need to



I'm in deep space in a jerry-built shuttle, shooting down purple magnetic rocks. I want to go home!



Do you think it's friendly?

produce something rather special. Spheres of Chaos did it with the multiple-player option, and as far as I was concerned, that was the only game of its kind that the Archimedes market had room for. That was, of course, before I saw Magnetoids.

The first thing that hits you when the game loads is the stunning music. I've not heard better music on any Archimedes game, even the conversions. A quick tap of the space bar brings you to the options menu, which gives you an impressive array of customising options. There are two ships you can fly, one which manoeuvres left, right, up and down, and one which handles like your ship from Elite: rotate anticlockwise and clockwise replacing move left and right. You can choose from two types

of joystick, two sets of keyboard controls, or mouse control. Finally the sensitivity and auto-centering of your chosen control method can be selected. Certainly nobody can complain that their favourite method of control isn't represented.

Then you launch yourself into the game itself. The music fades out, and your ship glides gently onto the screen. And it's here that you see what's so special about the game: it's all done in beautiful 3D, with objects shaded by the light of the nearest star. You can select the distance from which you view the whole game with the cursor keys: either take a long view so you can see what comes at you from behind, or zoom in so that you can get more shooting accuracy.

You might have thought it would be easy to dodge rocks when you have three dimensions to play around in, but not so. They're not called magnetoids for nothing: they're attracted to the metal of your shuttle, and as the first of the large purple rocks heads straight for you, you've got to start moving quickly. The graphics are nothing short of incredible: more complex than Elite's graphics, and also beautifully shaded. It's all too easy to be struck by how impressive it all is, and forget to start shooting. The frame rate is very high, and the motion is all extremely smooth, no matter what speed things are moving at or how many things are on the screen.

A few well-aimed shots split the magnetoid into two halves, each of which in turn shatters into smaller fragments, which can be completely demolished with just a couple of blasts. The problem is, the more pieces you send flying around, the more pieces there are to crash into, and what with them all homing in on your ship, you're going to have your work cut out for you pretty quickly.

The first level consists of a single magnetoid, followed by a small alien fighter craft. Shoot the alien down, and it leaves behind a small pod, which you can pick up for a power up. The power ups range from an extra life, through increased speed, to a rack of four computer-controlled missiles. My favourite was the shield: pick this one up and you're safe - until you hit something too big for the shield to handle, that is.

Things soon get harder: by level four you're faced with magnetoids that split into four fast attack craft when shot, and more of them turning up all the time. In fact, for the first few days of playing the game, I was convinced that it was impossible to get past level five. But if you stick at it, you

eventually pick up the best tactics for dealing with the various types of ship, and the game rapidly becomes almost possible to play. In fact, that's one of the only things I found annoying about Magnetoids: to start with it seems a little bit too difficult. But with a bit of perseverance, you can reach levels which are a lot harder, believe you me.

In fact, every seven levels you're pitted against a large nasty thing of some description. The first one is a large cannon, which slowly rotates to face you and then starts launching whole magnetoids at you. Level fourteen sees you taking on a giant space station, bristling with laser cannons. After that it just gets harder...

I only have one real complaint about Magnetoids. When you play with the traditional ZX" keyboard selection, it's all too easy to try an impressive manoeuvre, hold down the wrong selection of keys, and accidentally quit the game. Surely by now everyone knows that pressing Z, ? and " together is the same as pressing Escape... It doesn't happen too often, but when it does you can guarantee that it's going to be just as you're about to beat your record score.

All in all, Magnetoids is probably the most impressive Archimedes original game that I've seen in a long time. It has gameplay, graphics and sound that wouldn't be out of place in an arcade, and it has all the little extras that make a game special. Certainly one to make PC owners green with envy...

Adrian Jackson

Magnetoids costs £24.95 from Oregon Software Developments, 36 Grosvenor Avenue, Streetly, Sutton Coldfield, B74 3PE. It is also available from all usual game suppliers.



Stunt Racer 2000 — Extra Tracks

Andi Flower goes mad behind his car wheel...

For many years (when all I had was a meagre 8 bit machine) I looked in envy at my best friend's Amiga (bleurgh!!). I saw the likes of Lotus Turbo Challenge and Stunt Racer, but then I bought my Archimedes and with that came hopes of great games to come.

Well, quite a long time later, Lotus Turbo Challenge II was released but I was still waiting for the 3D Stunt Racer to appear.

When Stunt Racer 2000 was first released by the Fourth Dimension I wasn't impressed by my first glance at the graphics. I thought that the old Stunt Racer on the Amiga was graphically superior but then I sat and played Stunt Racer 2000. The gameplay far outweighed that of the old Stunt Racer and I was hooked.

Since then Stunt Racer 2000 has held up well to the test of time in my hands. I still enjoy the occasional game but I was getting tired of the same old tracks so was pleased to hear that Fourth Dimension have released a new set of tracks.

So what do you get in the new Extra Tracks pack? Well you get a complete new set of tracks (what did you expect? A nice new Jaguar — well tough!).

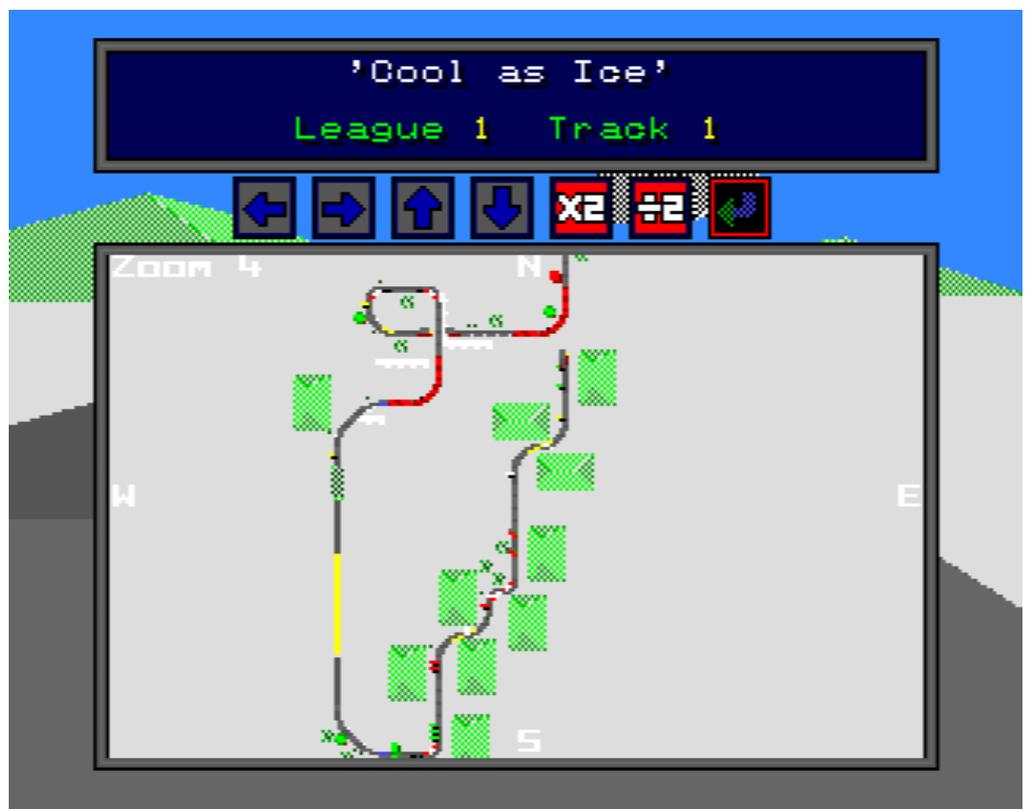
The first thing that I noticed about these new tracks is the fact that they are so easy to install. Simply put the disc in the drive, click on the

SR2000 icon and the installation program does the rest.

Unfortunately there isn't much to say about the tracks themselves because they... well... basically consist of the same things as the original set. However, this is by no means a condemnation of the Extra Tracks because they are also just as entertaining.

I don't know about anyone else but I have just as much fun on games like this by causing spectacular crashes as I do when I play the game seriously (and usually still cause a spectacular crash!) and I think that this gives a game two sides. You can basically play around and try out the stunts and cars on the practice laps or you can really try and compete with the computer drivers on the main race circuits.

Having played the original game for many hours I am reasonably certain that the upgrade



An overview of one of the new tracks

set of tracks will be just as long lasting and I think that there is a good case for 4th Dimension to continue developing more sets of tracks for this game. If as much time and effort continues to be put into more extra tracks there should be little stopping Stunt Racer 2000 becoming one of the biggest and best car racing simulations on the Acorn.

There are only two things that I would say against the Stunt Racer 2000 Extra Tracks. The first is that the only difference between the original game's box and the Extra Tracks box is a label telling you that the box contains the Extra Tracks! Come on 4th Dimension you could have come up with a more adventurous cover surely?

The second thing that I have reservations about is that the tracks may just be too much of the same for some people. I haven't found this myself because this new set of tracks presents a challenge that is different not more difficult and so I would thoroughly recommend the Extra Tracks to everyone who liked the original.

Andrew Flower



Freepost Address

Many members have commented on how useful they find the Club's Freepost address, however we receive an astonishing amount of post sent to the Freepost address but still bearing a stamp. When this happens the Club still has to pay for the postage, so the Royal Mail is actually paid twice for delivering the same item.

If you wish to pay for postage then please use our non-Freepost address (also for overseas use) which is: 40 Barlow Road, West Hampstead, London, NW6 2BJ.

Classified Ads

Club Members can advertise any unwanted hardware or original software free-of-charge in Eureka Magazine. Please remember that the Magazine is only published quarterly so it is best not to send in adverts just after this issue has been published.

FOR SALE: Aleph One 486 PC Card
with 4Mb of RAM. Price: £400 or nearest offer.

Contact Mr Piggott:
Tel 0480 467546 (Home)
Tel 0480 462048 (Work)

FOR SALE: Archimedes A410/1 computer
with 20Mb hard disc, 2Mb RAM
14" Microvitec Cub colour monitor
I/O Expansion card fitted
(Serial & Parallel Printer Ports, Port for
Concept Keyboard and headphones)
Includes manuals and some PD &
Educational software (Junior Pinpoint,
Jiglet, Numerator, Painter Plus, 1st Word
Plus, Artisan, PC Emulator.
Price: £450 or nearest offer.

Contact: Mrs Luff:
Tel: 081 670 9036 after 6pm

FOR SALE: Music Hardware & Software
including Roland CM64 LA/PCM sound
module, EMR MIDI Interface card, EMR
SMPTE card, EMR Sampler card, EMR Studio
24 Plus Version 3 & Utility disc, Rhythm Box,
Sound Synth, Midi Analyser and Scorewriter
version 2. Plus lots more, including software
and hardware for BBC Micro and Master.
Please telephone for full details.

Contact: Mick Cooper
Tel: 0705 371018

A3000 Joystick Interfaces

David Reid explains how to build an effective yet inexpensive joystick interface suitable for the ever-popular A3000 computer

So, you have an A3000 and you want a joystick port, but haven't managed to get enough spare cash to buy one yet?

Well The ARM Club could have the answer... The ACJoystick interface — a do-it-yourself project. To fit this project to your A3000 you must remove the Serial Upgrade if you have it fitted. The project will be supplied as a kit of parts or as a ready built unit to simply plug-in-and-play or as a bare PCB for those with access to the components required.

If you know which end of the soldering iron to hold (the cold end!) you should be able to successfully build this project.

The Software

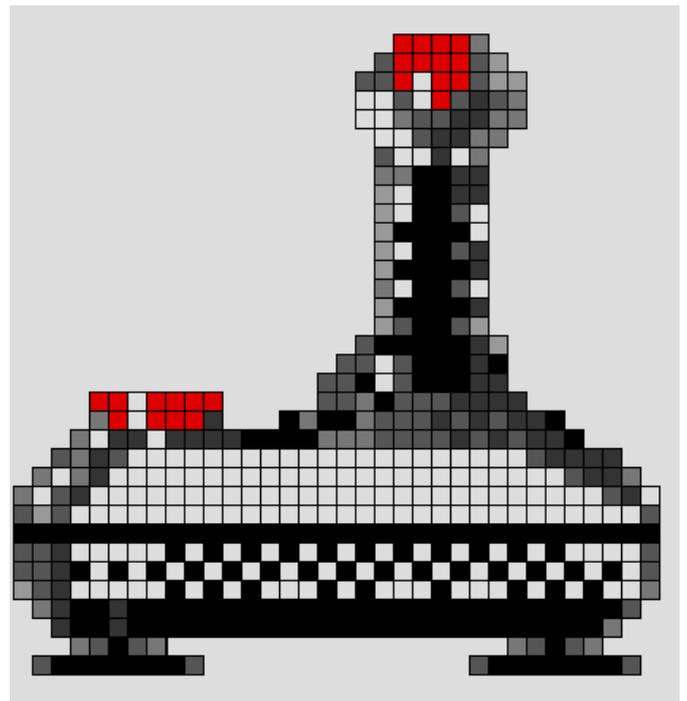
Let's start with the software which you will need to make the joystick function correctly. basically this is a simply Relocatable Module which all new games call via a SWI called "Joystick_Read". There is only one SWI and it is called with register r0 containing a 0 or a 1 to tell our module which joystick it wants information about. As the hardware in this design will have only one joystick attached to it, we have to respond to both joystick numbers and pretend to be both joysticks. In Acorn PRM style the joystick module is described as shown opposite.

Let's explore what all this means and what our software has to do to make sure that the game gets what it expects back when it calls our version of the Joystick SWI.

From the detail above, we know that the game will give us a number for the joystick and expect a result to be returned in r0. We are only

interested in what Acorn calls "single switch joysticks" and what we all know as 9 Pin Atari® Type joysticks. Looking at the above description, we have to return a 32 bit word in r0 with the relevant bits set for the game to function correctly.

Let's look at what we need to do in some more detail. Take the first byte we need to look at, which is byte 0 — using signed binary (setting the top bit for negative numbers and having the numbers range from -127 to 127) this must be (&40) for UP, (&C0) for DOWN and (&00) for the rest position. Likewise for left and right but this appears in byte 1 so LEFT is (&C000) and RIGHT is (&4000) and the rest position is (&0000). Byte 2 corresponds to the FIRE button and so the value to return will be &010000 when the fire button is pressed. The last byte is byte 3 and as it is reserved, we must leave it alone — so we will just return &00000000 in that one.



So that we can go diagonally, we must be able to return values such as LEFT and DOWN at the same time, this is achieved by ORing the results of the each test together to get the final 32 bit word for r0 which we return to the game.

Ok, this gives us something to work with now, we know what we get when the game calls us, and we know what we have to give back when we return to the game. So that we can remember these we can define more variables in our source:

```
swi_up      = &00000040
swi_down    = &000000C0
swi_left    = &0000C000
swi_right   = &00004000
swi_fire    = &00010000
```

There is no need to define the reserved byte 3 as we never want to use it.

Now we need to look at the hardware (see circuit diagram). we can see from this that the byte of information we will get when we read the hardware chip (a 74HC245 Tri-State buffer chip) is wired up so that bit 0 is connected to the LEFT button on the joystick and its position in the byte is bit 0 (00000001). Next, is the DOWN button and it appears in bit 1 (00000010). The FIRE button is next and appears in bit 2 (00000100). The RIGHT button appears in bit 3 (00001000) and finally the UP button appears in bit 4 (00010000). In the ideal world, if we were to hold the joystick in the DOWN and RIGHT positions and read the hardware, we would get back a byte with:

$$\begin{array}{r} \text{DOWN} = 00000010 \text{ (decimal 2)} \\ + \text{RIGHT} = 00001000 \text{ (decimal 8)} \\ \hline 00001010 \text{ (decimal 10)} \end{array}$$

However, nothing is ever that easy, all Atari® joysticks change the signal to 0 volts

(a binary 0) when switched, and not 5 Volts (a binary 1). So what we would really get is:

$$\begin{array}{r} \text{DOWN} = 00011101 \text{ (decimal 29)} \\ + \text{RIGHT} = 00010111 \text{ (decimal 23)} \\ \hline 00010101 \text{ (decimal 21)} \end{array}$$

This makes doing straight maths on the result the hardware gives to us very difficult for us mere humans to understand. But the ARM has a special command for dealing with this kind of problem. The TST command will AND a value we supply with the byte read and set the Z flag which we can test using a conditioner on the following instruction. As an example, if r11 holds the value we read from the hardware and “mask” holds the bit we want to test, we can test to see if the bit is a 0 using the command ‘TST r11,mask’. if the bit in the “r11 AND mask” is equal to 0, this will set the Z in the Program Counter (r15) which we can use to conditionally (using EQ), OR the appropriate bits into our result register (r0) to return to the game.

In some early games, the calls were implemented wrong, and the left and right are reversed. you can make another version of the module for these games by simply swapping hw_left and hw_right variables to allow these games to work properly.

So that we can easily remember which bit in the hardware corresponds to which direction the joystick is pointing, let’s set up some more variables:

The ‘%’ sign signifies that the following 1’s and 0’s are in binary.

```
hw_left     = %00000001
hw_down     = %00000010
hw_fire     = %00000100
hw_right    = %00001000
hw_up       = %00010000
```

We will use these as the “mask” part of our

testing to see what direction the joystick is pointing. We need to test all conditions for all possible directions and 'OR' this into r0 if the 'Z' flag in r15 is set.

Assuming that r11 contains the byte read from the hardware, our code for determining which bits were set looks like this:

```
mov     r0, #0
tst     r11, #hw_right
orreq   r0, r0, #swi_right
tst     r11, #hw_down
orreq   r0, r0, #swi_down
tst     r11, #hw_fire
orreq   r0, r0, #swi_fire
tst     r11, #hw_left
orreq   r0, r0, #swi_left
tst     r11, #hw_up
orreq   r0, r0, #swi_up
```

The instruction `mov r0,#0` means put the value 0 into r0. This clears our results register (r0).

The instruction `tst r11, #hw_right` means if the bit of r11 in position `hw_right` (bit 3 %00001000) is 0 then set the Z flag in the program counter (r15). The "Z flag" means the result was zero.

The instruction `orreq r0, r0, #swi_right` means if the Z flag in the program counter (r15) is set then OR r0 with the value `swi_right` (&00004000) and put the result back into r0, otherwise don't do anything.

This code will then test all our possibilities and present us at the end with r0 containing the required 32 bit number.

Now we know that this routine will process the byte we get from the hardware and make the correct word to be returned in r0, we still have to work out how to get the byte into the register in the first place.

SWI Interface for Joystick Devices

The Joystick module provides a SWI interface for reading the state of a joystick. When the module initialises it tests for the existence of built-in joystick hardware and if it does not find any then it will not initialise. Third parties can replace this module to provide different hardware. It is recommended that any such modules have version numbers greater than 2.00 so that Acorn can upgrade its own module without preventing its replacement.

Joystick_Read (SWI &43F40)

Returns the state of a joystick.

On entry: R0 = joystick number (0 or 1)

On exit: R0 = joystick state

Interrupts: Interrupt status is not altered

Processor mode: Processor is in SVC mode

Re-entrancy: Not defined

Use: This SWI is used to obtain the state of the requested joystick. The state is returned in the following format:

Byte 0: signed Y value (range -127 to 127)
-64, 0 or 64 for single switch joystick
(corresponds to Down, Rest, Up).

Byte 1: signed X value (range -127 to 127)
-64, 0 or 64 for single switch joystick
(corresponds to Left, Rest, Right).

Byte 2: Switches (eg. fire buttons) starting in bit 0, unimplemented switches return 0.

Byte 3: Reserved.

The serial port is located at &033B0000 in the A3000 memory map so... let's define another variable:

```
hardware = &033B0000
```

In the module, we want this address to be at the end, so that if we ever need to change it, we will know where to find it easily, but in our program we want to have it near the beginning so that a quick glance will tell us what hardware location the module will be accessing. This is achieved by assigning the value to the variable "hardware" at the beginning of the program and using a label in the source (serial_address) to hold the value held in the 'hardware' variable (&033B0000).

Our module must get the address of where the value is held, and this is done with the command:

```
ldr    r11, serial_address
```

Literally this means load the 32 bit number that is at the label serial_address, and put this number (&033B0000) into r11.

Because we do not need the address once we get the byte we can use the same register for getting the byte from the hardware with the command:

```
ldrb   r11, [r11]
```

This means load the byte from address in r11 (&033B0000) and save the result back into r11. Hey presto, we have the byte...

Error Checking

A little bit of error checking never goes amiss, especially when dealing with relocatable modules so let's check and see whether the user made a correct SWI call to our Joystick module.

As laid down in the golden rule book from

Acorn (The PRM) when a module SWI is called, we get a number in r11 which refers to the switail. This will indicate that the user matched what we were expecting ("Read") — if it does not, then we will set the V_flag (The "V_flag" means overflow, and is used, in this instance, to signify an error has occurred, we must exit with R0 pointing to an error number which is followed by some text explaining about the error) in the Program Counter (r15) and exit the module to let the caller know it made a bad SWI call.

At this point, a few more variables would be useful:

V is the overflow flag in the program counter (r15) which is used for setting a SWI error state and the $1 \ll 28$ is the same as %00010000000000000000000000000000 — but is a lot easier to remember. Literally it is 1 shifted 28 bits to the left.

```
V_flag%=1<<28
```

SWI_HEAD and TAIL

swi_head\$ is simply the name of the Header of the Module SWI, it is also the title and creates the *Help command as well. Be careful on the spelling and capitalization of the string — if it is different, then some programs will not work because they call the SWI by its name instead of the SWI Number (&43F40) like a program written in the C Language would.

Switail0\$ is the only other entry to the module SWI and the capitals and spelling are critical here as well.

```
swi_head$="Joystick"  
switail0$="Read"
```

We can also take this opportunity to define the strings which will be printed on the screen when an error occurs. These are at the beginning of the source code for the same reasons that all the other variables are defined

at the top of the program. I find it easier to define my variables at the beginning of the program, then I don't have to hunt the entire program looking for the text bits, should a change be required.

```
badswi$="SWI value out of range for
module "+swi_head$
toobig$="Joystick number out of
range"
```

That's got some more variables we need defined, so let's check the validity of the SWI call the game has just made. First we want to check that the switail matched our switail0\$ and as the OS conveniently gives us this in r11, we need to check this is equal to 0 as we have only one valid switail.

```
teq    r11, #0
adrne  r0, error_bad_swi
orrnes r15, r14, #V_flag%
```

The instruction `teq r11,#0` does a bitwise OR of r11 with 0 which will set the Z flag in the program counter (r15) if r11 is equal to 0, or will clear the Z flag if r11 does not equal 0.

The instruction `adrne r0, error_bad_swi` will put the address of `error_bad_swi` (containing the error number and text string) into r0 if the Z flag is clear (r11 <> 0).

r0 is now pointing to a memory location which holds the error number and text string which can be printed by the game issuing an `ADDVS R0,R0,#4` and then a `SWIVS "OS_Write0"` command after returning from the module SWI. (In practice, no-one does this, but we must provide the correct response, should anyone wish to process the error).

The final instruction in this group, `orrnes r15, r14, #V_flag%` is really quite simple to understand, but does a lot of things in one instruction. If the result of the 'teq' command

clears the Z flag, it will set the V_flag bit in r14 and copy the link register (r14 with the V_flag set to indicate an error) into the program counter (r15) and forces an update of the status portion of the program counter so that the V flag will get updated and returned to the game (indicating an error has occurred). This also exits the module and returns to the game at the point the SWI call was made, at which point the game must handle the error by checking the V flag and doing what it sees fit with the error.

Just about the only other error than can occur in our module is if the game requests the state of a joystick greater than 1, so we need to check that the value of r0 which the game passed to us on entry is a valid joystick number (0 or 1). this is done like so:

```
bics   r11, r0, #1
adrne  r0, error_bad_joystick
orrnes r15, r14, #V_flag%
```

The instruction '`bics r11, r0, #1`' is a bit clear instruction this takes the #1 and does a binary inversion on it (so %00000001 now equals %11111110) and then ANDs this with r0, as in this example:

```
11111110 inverted #1
00000001 joystick 1 is valid
00000000 result = 0 so the Z flag is set due
to the 's' on the 'bics'
```

```
11111110 inverted #1
00000010 joystick 2 is invalid
00000010 result = 2 so Z flag is cleared due
to the 's' condition
```

You can see from these examples that anything bigger than 0 or 1 will clear the Z flag and this will execute any instructions which test the Z flag - such as the NE in the following `ADRNE` and `ORRNES` instructions. Essentially, the NE means the Z flag is clear



(the last result stored in the Z flag was Not Equal to zero) and coincidentally, the EQ condition means that the last result stored in the Z flag was Equal to zero, and therefore the Z flag is set.)

The following two commands `adrne r0, error_bad_joystick` and `orrnes r15, r14, #V_flag%` function exactly as the `bad_swicones`.

Creating the source

Right, now that the educational stuff is out of the way, we need to create the source for the module. Type in all the text which is highlighted in BOLD textface from this article into your BASIC program. This will give you a source file which will make the Relocatable Module. We need some more variables:

```
file$="ACJoystick"  
version$="2.01"  
date$="17 Apr 1993"  
type$="A3000 Internal-Serial"
```

These are used to provide a filename for the Module, the version number must be greater than 2.00, the date of creation of the module and the *help modules "type" description.

```
start = 0  
initialise = 0  
finalise = 0  
service = 0  
commands = 0  
swi_chunk = &43F40  
swi_decode = 0
```

These variables are used in the module header and always including them allows quick creation of any module, by simply filling in the ones you wish to use with the required values. Our module is quite simple and therefore doesn't have any real use for most these variables, except for the `swi_chunk` which must be the same as the Acorn `swi_chunk` for games to access the module by SWI number instead of name.

(&43F40)

Now that the variables are out of the way, we can start coding the module.

I have used the BASIC assembler and this requires the usual FOR..NEXT loop to increment the `pass%` variable for the assembly OPT command.

```
DIM code% &200  
FOR pass%=4 TO 7  
P%=0: O%=code%  
[ OPT pass%
```

We need to do offset assembly as the module is a relocatable one, and all internal addresses must be calculated from the base of the module. This is done by using `pass% 4 TO 7` and setting `P%` to 0 and `O%` to the buffer (`code%`) for our code inside the FOR..NEXT loop.

The code for the module

Now we can start the coding of the module. The header must be defined first, and all fields must be filled in, though sometimes only with zeros.

```
.begin equd start  
equd initialise_code  
equd finalise  
equd service  
equd title  
equd help  
equd commands  
equd swi_chunk  
equd swi_entry  
equd swi_names  
equd swi_decode
```

Well, that was easy, wasn't it? ("equd" allows for a 32 bit word) Next, we'll do the Help String.

```
.help  
equs swi_head$+CHR$(9)+version$+  
("+date$+") " +type$
```

```

equb 0
align

```

We have to include the instruction “align” to make sure that if we have an uneven number of bytes in our string (defined by “equis”), the assembler knows to align the program counter to the next word boundary — otherwise the poor ARM chip will not understand where it is and what it should be doing. NB: all the strings must be terminates with a 0 byte (defined by ‘equb 0’).

Already you can see how easy it is to use variables at the top of the program. So, on to the next bit, the SWI name and header and tail...

```

.swi_names
.title
equis    swi_head$+CHR$(0)
equis    switail0$+CHR$(0)
equb     0
align

```

Now we can move on to our error messages for the module.

```

.error_bad_swi
    equd    &110
    equs    badswi$
    equb    0
    align

```

and...

```

.error_bad_joystick
    equd    &43F41
    equs    toobig$
    equb    0
    align

```

Right, onward we go, into the depths of the module — .swi_entry is where the game will enter our real code. So we need our error checking bits first, then the load of the byte from the hardware, followed by the testing of bits code and our exit code.

```

.swi_entry
teq      r11, #0; bad swi check code

```

```

adrne    r0, error_bad_swi
orrnes   r15, r14, #V_flag%
bics     r11, r0, #1
        ; bad joystick check code
adrne    r0, error_bad_joystick
orrnes   r15, r14, #V_flag%
ldr      r11, serial_address
        ; load the byte from hardware
ldrb     r11, [r11]
mov      r0, #0
        ; test the bits and make r0
tst      r11, #hw_right
orreq    r0, r0, #swi_right
tst      r11, #hw_down
orreq    r0, r0, #swi_down
tst      r11, #hw_fire
orreq    r0, r0, #swi_fire
tst      r11, #hw_left
orreq    r0, r0, #swi_left
tst      r11, #hw_up
orreq    r0, r0, #swi_up
bics     r15, r14, #V_flag%
        ; and exit with no error.

```

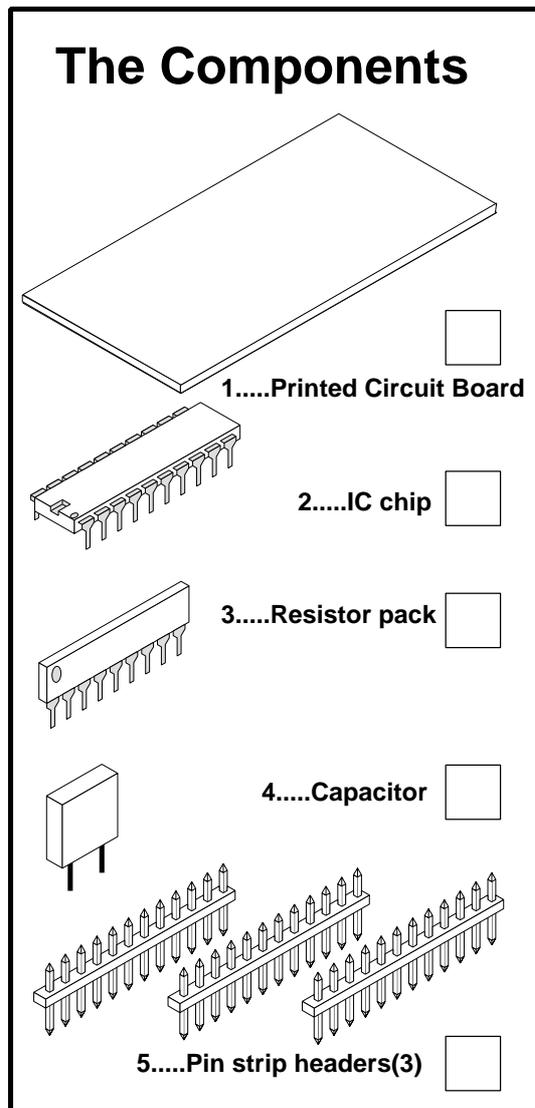
Because we want the module to tell us that it is loaded, we now have a little initialisation code, which is called when the module is initialised, upon loading or by someone issuing the *RMReInit Joystick command. All this routine does, is to tell the user that the module is installed. We have used the XOS version of the SWIs so that errors are returned to us and conditioned the whole lot with a check on the oVerflow bit in the program counter (r15). (SWIs return with the V bit set if the last call had an error). It also gives me a chance to explain another couple of instructions...

```

.initialise_code
    stmfd   r13!, {r14}
    adr     r0, installed
    swi     "XOS_Write0"
    swivc   "XOS_NewLine"
    movvc   r0, #7
    swivc   "XOS_WriteC"
    ldmfd   r13!, {r15}

```

The instruction stmfd r13!, {r14} will stick



the contents of the link register (r14) on the stack (r13) and update the pointer in r13. This is necessary because r14 holds the address of where we are supposed to go back to when the module initialisation is finished. However, these other SWI calls also use r14, so we need a copy of r14 before we call them, otherwise we could lose our return address. The easiest way to get a copy is to stuff it on the stack. Likewise, when we have finished with our SWI calls we want to get our return address off the stack, so we use the instruction `ldmfd r13!, {r15}`, this will not only get the value off the stack but it will also put it directly into minimal and very simple to explain. Each of the different switches in the Atari® type joystick are mapped via a Tri-State buffer, into a memory

location in the A3000 memory map, when we access this memory location, a line on the chip called Chip Select (CS) turns on the gates in the chip and any signals on the input are presented to the computer data bus from the chip outputs. each direction/button has a designated data bit in this byte and this is then read and interpreted by the software module.

So, let's look at the the inside of the A3000. If, like me, all the normal expansion routes available are full, the only space not taken is the serial chip upgrade sockets. Hence this upgrade fits to the serial chip upgrade sockets... It also has the convenience of being attached to a 9 pin 'D' type plug on the back of the machine. This makes for a very low-cost but effective upgrade.

Building the board

Building the Hardware PCB should not present anyone with any problems, so a kit is available from The ARM Club at the address given below. If you can't solder, the board can be supplied built and tested at a slightly higher cost. for those of you with access to your own components, the bare PCB can be supplied with full instructions on assembly. The completed board simply plugs into the currently empty 6551 and LT1133 (serial) sockets on your A3000.

Full diagrammatical and physical drawings are supplied with the AC Joystick kit and the AC Joystick bare-PCB versions. In all, it should take no longer than 15 to 20 minutes to build and test. The kit version comes with another BASIC program for testing the board you have built, thus giving you confidence in your soldering ability.

David A Reid

For full details on availability and pricing of joystick interfaces and kits, please read the text file included on the Eureka Magazine Disc.



Acorn News

The main developments announced by Acorn have already been covered in

Eureka, namely everything to do with the Risc PC and also the announcement by Acorn of its new division, Online Media, to target the interactive multimedia market.

Back in April when the Risc PC was launched Acorn did something it has never done before by organising a launch event for Acorn Enthusiasts, ordinary users with an interest in what Acorn is doing. This event, colloquially known as the *Anorak Day*, was held at the Cumberland Hotel in Central London, during which time a large number of people were treated to the launch experience normally reserved for press, developers, dealers and VIPs. Everybody present seemed to react very favourably, not only to the Risc PC but also the work which had been put into the event by Acorn.

Since April Acorn has been having a significant internal shakeup, and responsibility for marketing to Enthusiasts has been transferred from the Consumer Business Unit to the Product Marketing Department. This has resulted in a number of announcements being made relating to Enthusiasts, in particular a new scheme which is currently being set up whereby individuals may register as Enthusiasts with Acorn and receive various benefits in return. Full details of these benefits are not yet available, but are likely to include discounts and priority ordering on certain items, special documentation & merchandise, direct support for Enthusiasts (for example by electronic mail) and possibly even special Enthusiast events.

Back in June Acorn Computer Group plc announced its Annual Results for the year ended December 31st 1993. Revenue for the year increased 13% to £54.3M, but the operating profit was a mere £0.1M (1992: £1.6M). Two factors were officially linked with the fall in profit by Gary Johnson, Financial Director of Acorn Computers Ltd, namely a significant cut in gross margins on Acorn products, and also investment in projects such as the establishment of Acorn's subsidiary in Germany.

The Acorn/Tesco *Computers for Schools* Scheme was extended until 16th June, with schools around the country collecting vouchers to exchange for free computer equipment. Interestingly Research Machines (Acorn's biggest rival in the UK Education Market) encouraged its schools to collect and exchange the vouchers for Pocket Book computers — perhaps to avoid them being exchanged for Risc PCs or other desktop Acorn computers?

Acorn's expansion in international markets has continued with the appointment of Oak Tree Technologies as its sole distributor in South Africa. According to Bob Coates, General Manager in charge of Acorn's International Business Unit, the Risc PC has been very well received in all countries where Acorn computers are sold; a rolling launch programme took place across Europe and a significant number of Risc PCs have already been sold overseas.

Finally Acorn has announced a new Hardware Conformance Scheme which means that upgrades which meet Acorn specifications may bear a special logo, offering greater peace of mind to customers.

Simon Burrows

Final Thoughts

One of the key aims of The ARM Club has always been to encourage Acorn users to get in contact with one another. It is easy to be a passive user of your computer but you will get much more out of it if you share your experiences with other people!

At a recent ARM Club Open Day in Kent a group of Acorn users were showing off their particular skills in using their computers — do you have skills which could be shared with others?

The Risc PC appears to have injected a new spark of enthusiasm into the Acorn world with large numbers of existing users taking the opportunity to upgrade their machines. This has the knock-on effect that second-hand Acorn computers become more readily and cheaply available, attracting more people to own their own Archimedes computer.

Eureka Magazine is published quarterly by The ARM Club. Copyright © 1994 The ARM Club. All Rights Reserved. All material in this magazine has been produced by Club Members. All opinions expressed are those of the individual authors, and may not reflect those of The ARM Club or its Committee. Articles and other submissions are most welcome.

**Please address all correspondence
to The ARM Club Secretary at:**

**The ARM Club
FREEPOST ND6573
London
N12 0BR**

**Tel 071 624 9918 Fax 081 446 3020
Affiliated to the British Association
of Computer Clubs**