

Acorn A3000

Acorn's A3000 is to become the official new BBC Micro, joining the A series of Archimedes soon to be released. Chris Cain discovered that the machine is both incredibly powerful and very fast, but suggests that its pricing may be slightly misplaced.



In July 1987, a small computer manufacturer stunned people in the APC office with a new machine that it had built. At the heart of this system lay a custom processor based around a 32-bit RISC (Reduced Instruction Set Computer) architecture.

As a direct result of this, the new box was not only the fastest micro in the office at that time, but also the world. The machine was, of course, the Archimedes and the enterprising company, Acorn Computers.

Acorn had some success in the marketplace before with its BBC Micro. This came in several flavours, A, B, B+ and Master. The model B became the standard. Because of its clever design and a concerted campaign by its distributor, it was quickly adopted by schools as an educational instrument.

However, on the home front the situation was slightly different. The machine was far dearer than any of the other home micros on offer. Only those who understood the product or had an incredible bank balance actually bought one.

With the Archimedes, Acorn had a winning chance. It was more powerful than the current offerings from trend-setting companies like Atari and Commodore and schools would surely upgrade. Once again, though, Acorn managed to snatch defeat from the jaws of victory. It produced a range of Archimedes, going from the 512k 305 to the 4Mbyte 440, but their pricing crippled sales. The 305 was twice the price of any competitor. At present, sales are still low.

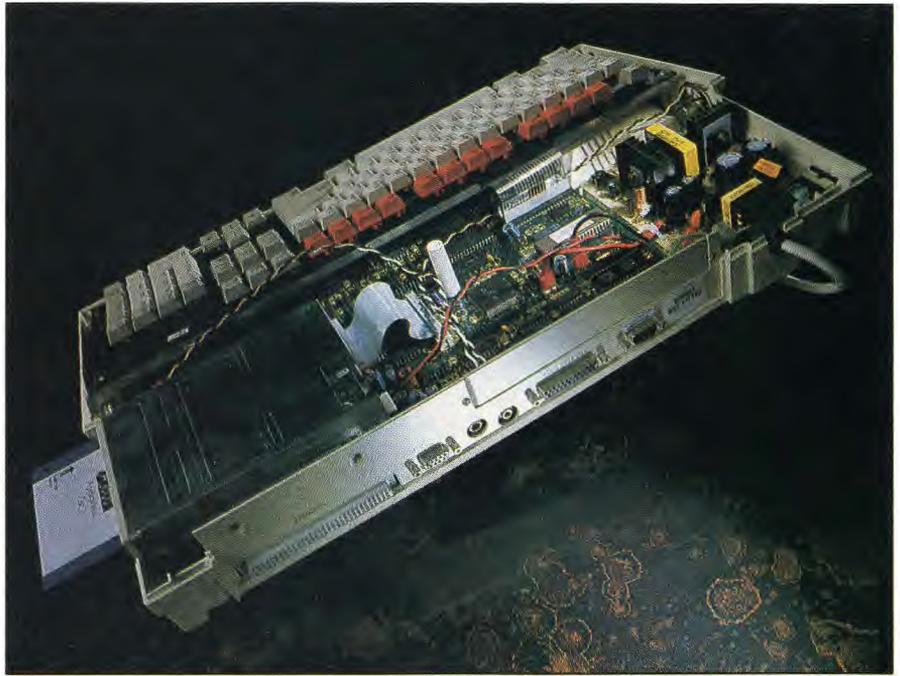
Now, Acorn has given birth to the Archimedes 3000. A low-cost version of the revolutionary hardware, the A3000 is to become the new official BBC Micro and joins a series of new Archimedes which are to be released soon. This machine will finally, Acorn hopes, secure a winning position in the low-end market.

Hardware

The Archimedes 3000 is strangely familiar at first glance — a neat, compact, cream-coloured box with a sloping keyboard and a 3.5in 1Mbyte disk drive built into the right-hand side.

The machine conforms to the styling specifications of today's popular machines. A small Acorn logo has parked itself at the top right-hand corner of the keyboard and above this, riding slightly higher ground, sits the BBC owl watching everything that's going on. The keyboard is of IBM design; a nicely laid out, practical job.

At the rear, several connectors to the outside world are located. There are



Acorn A3000, the innards of the beast

seven in all, but only five of them functioned on the review machine. The first interface, in a left to right order, is a single expansion port. This is perhaps the most important hole at the back. A 96-pin female, straight edge connector awaits the insertion of an expansion podule. These podules can be hard disks, video digitisers, Midi cards and so on. As there is only one port provided, third-party manufacturers will almost certainly come up with boxes that allow four or so devices to be plugged in. Next are the video connectors, one each for analogue RGB and mono video. The RGB socket is a nine-way D-type hole, while the latter is a standard female phono socket. Neither TV nor Multisync monitor connectors are provided on this machine.

Taking a dive several millimetres down and further to the right reveals a 3.5mm 32-ohm headphone socket. An increasingly popular idea, the socket allows users to listen to beeps and whistles without disturbing those around them. The situation can be reversed, though, and connecting a stereo amplifier up to the system can greatly annoy the neighbours. To be honest, I would have liked to have seen standard female phonos replacing the jack socket; but using the current connector doesn't really present too many difficulties.

Finally, we have the parallel, serial and Econet ports. The parallel is a standard 25-way D-type socket which is used to add a printer and other such devices to

the unit. The serial port on the review model didn't work. While it was fitted, it had no controller chips to connect to on the inside. This is because the chief people at Acorn believe that not everybody wants to connect a serial printer or a modem to the machine.

Very true. However, I personally believe removing the chips was a bit of a liberty. The port can be upgraded but it will cost a few dollars more. The last hole at the back is a five-pin DIN which will connect you to an Econet network. That is, if you install extra bits inside.

One more connector is in the casing, buried underneath the box. This is the mouse socket. I really liked the idea of this as it eliminates the half-a-mile of lead normally cluttering up the desk. While this is the last connector, two more switches adorn the case. The left side holds a standard rocker power switch and the right lays claim to a reset button under the disk drive. Getting inside the box is positively simple. In fact, this is the easiest machine to enter I've ever seen. Two screws hold down the casing, one at each end of the rear. Once these have been removed, the casing just comes up. Brilliant! Some day all computers will be made this way.

Once inside, you're greeted by a completely different motherboard from the original A series machines. The board is hardly overloaded with silicon and is certainly not as ugly as the original. It looks as though it has been designed rather than bundled together. The original

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operating system ROMs, containing Arthur and a Basic desktop, have been replaced by the new RISC-OS. However, the famous four custom chips which make up the Archimedes are still there.

First and foremost of these is the ARM (Acorn RISC Machine) processor. Cowering under the keyboard, this is a 32-bit RISC chip and is the brains of the outfit. It has twenty-seven 32-bit registers and 44 simple instructions. The chip was designed as a replacement for the old 8-bit 6502 processor and, in keeping with this, gets its speed from short commands. The ARM present in this machine runs at 8MHz and gives roughly four mips (million instructions per second). However, Acorn already has a new revision, as yet unused, which runs at approximately 33MHz. The ARM is helped out by three other support chips — Arabella (VIDC), Anna (MEMC) and Albion (IOC).

Each plays a specific part in the operation of the machine. Lurking at the rear of the board, hidden beneath the disk drive, Arabella handles the video display. This can be one, two, four or eight bits per pixel; monochrome to 256 colours from a palette of 4096 shades. Arabella can provide resolutions from 160 by 256

to 1152 by 896 pixels depending on your monitor. The highest resolution available on a standard Acorn display is 1056 by 256 in 16 colours. The chip also supports a single hardware sprite.

Another string to Arabella's bow is sound generation. Sound on the A3000 is impressive, at least on paper. Arabella can handle up to eight stereophonic voices, with seven independent positions. On-chip 8-bit logarithmic digital to analogue convertors can handle sampling rates of up to 300KHz. The default is 32KHz. In lay terms, this means that exceptionally clear stereo sound can be produced. In order to show off these sonic capabilities, the unit is equipped with stereo speakers. Unfortunately, I have yet to be impressed by this. I've heard no realistic instrument sounds or speech come from the machine.

Anna, or MEMC, looks after the memory. The A3000 comes as standard with 1Mbyte of RAM expandable to two, though the chip can address and refresh up to 4Mbytes. Having said this, 32Mbytes of virtual memory is supported by the chip — ie, using a hard disk as if it were memory. Anna is also used as a DMA controller for video and audio. The chip inside the 3000 is a revised chip, V.1A, which in conjunction with the new

RISC-OS operating system gives this model a 10 per cent speed increase over current models, even the R140 workstation.

The last of the custom chippery is Albion, commonly known as IOC. Albion controls interrupts and the system bus. It is responsible for communication with peripherals and also handles the keyboard, with a little help. A local general smart management chip (get that?) sits and stares at the keyboard while Albion attends to matters elsewhere. Should a key be struck, the management chip will jump up and inform the controller. This saves Albion from having to keep scanning every key on the keyboard.

System software

The A3000 is supplied with RISC-OS, a powerful multi-tasking operating system held in 512k of ROM. Enough has been written about RISC-OS itself, so I shall only go over the basic outlines. RISC-OS is a WIMP-based system allowing simple control over the machine with a mouse à la Apple Macintosh.

Acorn's mouse has three buttons: Select, Menu and Adjust. Files appear as icons on the screen and these can be

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executed, deleted, examined and generally poked about in numerous ways via the buttons and clever pop-up menus. This is different to most WIMPs as normally menus pull down from the top of the screen. RISC-OS menus just pop up wherever the mouse cursor happens to be. This is, actually, similar to the original WIMP interface designed by Xerox.

An icon bar decorates the bottom of the screen and shows any tools or applications (tasks) loaded in memory. It also holds icons for any connected filing devices such as floppy and hard disks, networks and so on. The display or 'desktop' is normally a light grey colour which is pleasing to the eye. Should this not be to your taste, a palette tool, loaded into RAM when the machine is powered up, will let you customise the screen mode and colours to suit your desires. My favourite is mode 16, 1056 by 256 in 16 colours. Believe it or not, this screen mode only eats up 132k as opposed to the 160k, 640 by 256 in 256 colours display which many people use.

Although RISC-OS is powerful, it does appear to lack certain standard WIMP functions. One such function is file copying. It copies files, yes, but should you want to copy a file from one disk to another you must have source and destination windows open. You can't just drag a file to the disk icon. Neither can you drag one disk icon to another to make a backup. Trivial but annoying. There is also no trashcan or equivalent.

Lying underneath RISC-OS and shielded from the user, is the Arthur supervisor. Much like the BBC Micro's command line, Arthur is where you can access the operating system directly by typing all those * commands. While most users will try not to use this, it is unavoidable at times. Customising the machine to suit your needs requires a venture into Arthur. The system is heavy on customisation and almost everything about the machine can be altered by the *CONFIGURE instruction. The unit has 256 bytes of CMOS RAM in which it stores configurations.

Having used a Beeb, I was familiar with most of the commands used by Arthur but I can see that those who aren't might have trouble. *DIR, for example, does not give a directory of the disk. It is, in fact, for moving around the hierarchical filing system — the equivalent of CD in MS-DOS. Hackers will find Arthur great fun.

Arthur also allows the user to switch in different filing systems as these are separated from the MOS (Machine Operating System). The default is ADFS

(Acorn Disk Filing System) and this can be changed to either ANFS (Acorn Net Filing System) for networks or RAMFS (RAM Filing System).

The latter allows the user to use RAM disks though it does not replace ADFS — both can be used at the same time. Keyboard maps can also be switched, in a rather neat way. Holding down the Ctrl, Shift and Alt keys while pressing F12, with your 'third' hand you type in the international telephone dialling code for a country (ie, 044 for Germany or 033 for France) and you get that particular keymap.

BBC Basic also comes with the system. This is version 5 of the language, known affectionately as 'Roger's Basic' because it was coded by Acorn supremo Roger Wilson. The Archimedes implementation is blindingly fast, so fast that some fully-blown packages, such as Clares proArtisan, are 90 per cent Basic. BBC Basic is becoming a fairly common language in schools nowadays. Just think, in a couple of years you could be using a high-speed database written by a 12-year-old!

In use

Setting up the A3000 only takes around 10 minutes and the procedure is far from complicated. The power pack is built into the machine, as should be standard, and the mains lead protrudes from the case just like a Beeb. Because the top of the machine is flat, a monitor can be stood upon it. However, you may need a stand with some displays and Acorn can supply one. Actually, if you do have a problem setting up the machine it is more than likely to be with the monitor. The lead supplied with it is far too short to easily stretch around and plug into the computer. Funnily enough though, if you buy an Acorn stand the lead is just the right length.

Powered up, the machine beeps and pops up the RISC-OS desktop, ready to go. Acorn gives away two disks full of RISC-OS programs to get the user off to a good start. On disk one, there are three applications: Edit, Draw and Paint. Edit is a text editor. This can be used to create straight text files, edit Basic programs or even to create command files — a series of commands which are executed by Arthur when the file is run, similar to .BAT files in MS-DOS. The program has several word processor-type functions such as search and replace, text formatting and also the ability to open multiple windows each with the same file in it. Anything typed in one window is automatically copied in the next.

Technical specifications

Processor:	32-bit Acorn ARM running at 8MHz
RAM:	1Mbyte expandable to 2Mbytes
ROM:	512k
Storage:	1Mbyte 3.5in floppy drive
Keyboard:	IBM AT-style, 103 keys and a three-button mouse
Video:	28 different screen modes — main resolutions 320 by 256, 640 by 512, 1056 by 256 in 1 to 8 bits per pixel. 4096 colour palette
Standard interfaces:	Expansion, RGB monitor, mono video, headphone, parallel, Econet
Optional interfaces:	Serial
Operating system:	Acorn RiscOS
Bundled software:	RiscOS Applications disks featuring Draw, Edit, Paint, Maestro, 65Host plus other small programs

I could see no real reason to do this but the manual stresses that it is very handy for editing long documents — I'll take their word for it. It can also handle a variety of different fonts for high-quality text. Three are supplied on the disk. All in all, Edit is uncomplicated and simple to use. It does a basic job and it does it well.

Draw and Paint are slightly more complex, yet just as easy to operate. Draw is

a specialised object-orientated graphics editor with which the user can draw diagrams and pictures made up from various kinds of graphical objects. Object-orientated drawing lets you treat every section of a picture as an individual piece, which means editing an image is much easier than with a standard bit-mapped screen. Say, for example, you draw a wheel and it's just right except for one thing, size. Enlarging

or shrinking this image on a bit-mapped package would mean loss of definition and, in many cases, complete loss of shape. With Draw, the wheel could be resized while still retaining its shape and features. It would be redrawn to scale.

The package is mainly suited to be an aid in DTP, where pictures need to be changed around no end to fit holes in pages. However, users could also produce simple diagrams or flowcharts with it.

Paint is the opposite of Draw. It is a bit-mapped art editor which allows you to literally paint sprites and pictures on-screen. It features all the standard art package tools like draw, fill, spray can, geometrical shapes, etc, and is extremely easy to use. Sprites can be anything from one pixel to the entire screen area in size.

Accompanying the simple applications are a few tools to make life easier. First of all, a Configure program lets you set up the machine to your liking without having to go through the daunting *CONFIGURE command in Arthur. Louder or quieter beeps, different desktop screen modes and new mouse speeds are only a click away with this small utility.

Another useful tool is an interactive help program. This sets up a small win-

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dow at the bottom of the screen when executed. When you move the mouse around the desktop, passing over gadgets and menus, the help program tells you what they do. Extremely good for the complete novice.

Some special printer driving programs are also on the disk. Support for many dot matrix and PostScript printers is provided. It even supports high-end devices such as Apple's LaserWriter.

Disk two contains various trivial desktop accessories and another two applications. 65Host is a BBC model B emulator. It sets the Archimedes up so that it acts just like its old brother. As emulators go, this one is fairly slow. However, it does support direct screen addressing which means many BBC programs will run on it. I, unfortunately, had no BBC software on 3.5in disk and so was unable to test this.

The other application is Maestro, a music editor. Maestro lets you compose tunes and melodies with the Archimedes' built-in sounds. These are a rather ordinary, though. Several demonstration tunes are provided to show just what the package can do.

All the current Archimedes software we have here at APC, a grand total of about 12 disks, ran fine on the A3000 including

the aforementioned Zarch and Clares, and the new Rayt-racing program, Render Bender.

On many other computers, disks require swapping almost every five minutes when you only have a one-drive system. The A3000 is, I'm happy to say, perfectly usable with a single unit.

Documentation

The A3000 comes with two manuals: a Welcome Guide and a User Guide. The Welcome Guide takes you through the first steps of learning how to use the machine and was, I thought, a bit slow. Anyone who isn't familiar with computers, however, will find the book a great comfort. It includes some hand-drawn diagrams which are a really nice touch. The guide explains about mice, menus and icons and generally helps you get the feel of RISC-OS.

The User Guide, on the other hand, is of much more use to both the beginner and seasoned user. It gives full tutorials on the application programs provided and includes sections on RISC-OS, the command line and almost everything you need to know. Except Basic.

A Basic manual does not come with the machine. This is another Acornism.

Acorn says most people only want to run pre-programmed software in which case they don't need a manual. Those who do want to program will have to purchase this book separately.

Prices

A standard Archimedes 3000 will set you back \$2754. An Acorn RGB monitor costs \$720.

Conclusion

There is no doubt in my mind that the A3000 is an incredibly powerful and capable machine. It's also blindingly fast, in fact the fastest I have ever used. The hardware is well-designed and the Basic is probably the most rapid there is. The machine deserves to be very successful, but if it isn't then this is by no means any fault of the system. Where the A3000 is likely to fall over is software. There just isn't any at the moment. This is, I believe, due to the current pricing of the A series. Even this new box is more expensive than most. If Acorn reduces the price, the A3000's success would be guaranteed. If it doesn't, Acorn will have kicked itself in the teeth once again.