

This portable Archimedes, with RiscOS 3.0 and 4Mb capability, is a pint-sized version of Acorn's successful venture in the education market. If you're a committed Archie fan it won't let you down, but Graham Bell wasn't convinced.




Acorn has been developing its Archimedes line since 1987, selling successfully into the education market niche that it has dominated since the days of the BBC B and inspiring a loyal following from the more technical end of the home computing market. More recently, the company has had some success with the A5000, by far the best all-round Archimedes yet. The upturn in Acorn's share price, from a low of 6p to a more realistic value of around 30p, has been prompted by a set of good financial results, encouraging early A5000 sales and tales of new machines to come this year.

'It's a small world,' they say. But no, it's the

things in it that are shrinking. One tiny new machine has now arrived as Acorn rounds out the Archimedes range with its first portable, the A4. Strong rumours suggest that there's more to come in the autumn, including a replacement for the ageing school favourite, the A3000.

At first sight, the Acorn A4 looks remarkably familiar. It uses the same case design as Olivetti's notebook S20 or the Triumph Adler Walkstation, Acorn's Italian ownership no doubt having some bearing on the matter. But under the skin is something quite different — a pint-sized Archimedes.

The case is moulded in polycarbonate, with copper and nickel plating to reduce interference, and finished in a grey textured epoxy. And yes, it really is A4 sized. It opens clamshell-style, with two not very positive catches to either side. The lid flips up to reveal the 9in LCD screen and the keyboard. It can't flop all the way back as some tend to do when the hinges wear, but while the fixed angle is fine for working on a handy table, it's a little too upright to use comfortably on your lap.



Underneath the display is a standard 83-key PC keyboard, which has reasonable key travel but a rather light and springy feel. Although it lacks a number pad, the keys around L serve in combination with a new FN key. This replaces the left-hand Alt key, which means the skills of a concert pianist are needed to enter specialised characters like ¶ (Alt-215, the paragraph sign) or © (Alt-169). A further annoyance for habitual Archimedes users is that Caps Lock and Ctrl are switched around from their usual PC locations. And because this is a PC keyboard, there are only 10 function keys, not 12: F11 and F12 are reached with FN-F1 and FN-F2. The FN key is also used for mouse emulation.

The screen is bordered by a number of lights and two thumbwheels, which are the controls for screen contrast and brightness of the fluorescent edgelight. Five LEDs show where the power is coming from (battery or mains adaptor) and the usual disk activity. These also show on the outside of the case, providing one useful indication that you've left the machine on.

Under the keyboard, the whole of the left of the case is battery, the usual chunky 1.8Ahour NiCad. On the right is the floppy disk drive, which is capable of reading and writing any Archimedes disk, including the older 640K and 800K double density standards and the latest 1.6Mb high density disks. It can also read and write DOS disks ancient and modern, 360K to 1.4Mb, without the need for any extra software. Inside, behind the floppy drive is a Conner 60Mb 2.5in IDE hard disk, cute as a button and not much bigger. On the outside is a flap concealing connectors for an external PC-style keyboard and a mouse, a 9-pin serial port and a stereo Walkman-style headphone socket. Any normal PC key-

board with a PS/2 style mini-DIN connector can be plugged straight in without problems.

A larger flap on the rear of the machine hides the parallel port, an external video port for almost any TV standard, VGA, SVGA or multisync monitor, plus the connector for the mains adaptor. Both the adaptor and mouse are supplied. The former is a 'world' supply, adjusting itself for any mains supply between 100v and 250v. The mouse is standard Logitech, the familiar curved design rather than the more angular model used on other Acorn machines.

Thankfully, Acorn has avoided the touchpad pointing device built into the Walkstation. It just doesn't have the necessary delicacy of control and the Olivetti version sports two mouse buttons rather than the three required for full use of an Archimedes. But the Olivetti does have provision for external expansion via a desktop docking station. While other Archimedes computers like the A5000 contain a backplane for plugging in expansion cards (quikily termed 'pmodules'), the A4 is devoid of such potential. That rules out a number of potential

uses like data logging, where analog-to-digital conversion or a GPIB card would be needed. There isn't even provision for an internal modem, although of course external ones can be used via the serial port. The only internal device that can be added is a promised connection to Econet, Acorn's proprietary networking system that is widely used in schools.

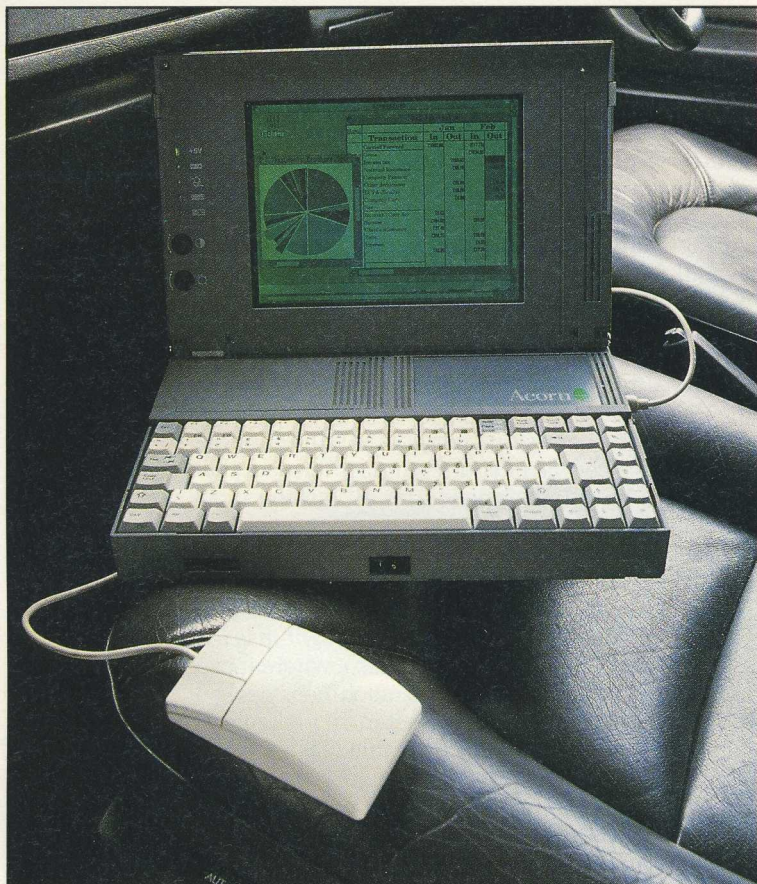
The ready-to-go machine weighs in at a touch over 3kg, although if you pack a spare battery and mains adaptor the whole lot fights in the 4kg division. This isn't the lightest computer around, nor is it the heaviest; bantamweight portables are usually slimmed down by omitting one or other of the disk drives.

The A4 is Acorn's first portable and the external design has a couple of shortcomings. The fact that both flaps have to be opened for all but the most casual use means they'll be the first bits to fall off. Neither the mouse nor the adaptor are colour-matched to the computer, and the textured finish of the case can tend to get a bit grubby after a few weeks' hard use. And the main power switch is too exposed on the front edge of the case, where it can easily be switched on while the machine is packed away. The rest of it is very competent: it looks good, feels robust and is eminently usable.

Internally, the A4 follows the architecture established in successive models of Archimedes: an ARM 3 central RISC processor surrounded by an MEMC memory controller, a VIDC video chip and IOC which integrates a slower peripheral bus. The ARM is a RISC processor with a 4K on-chip cache and a 32-bit data bus, but it lacks any floating-point hardware. MEMC handles the 4Mb RAM array, translating and checking all addresses to protect one task from another in the Archimedes' multitasking operating system. VIDC is a DMA controller responsible for taking sound and video data from the memory. It's capable of generating a huge number of screen modes (at least via the external monitor connection), each with a different combination of pixel resolution, pixel colour depth and refresh rate. VIDC also controls a single hardware sprite, which is used for the mouse pointer.

The ARM chipset has long included several features that PC designers are now beginning to exploit, for example clock-doubling and local bus memory mapped video. The ARM 3 in the A4 is normally clocked at 24MHz, while the memory is standard 80ns 12MHz access. Most of the time, instructions and data are drawn at full speed from the ARM's cache, while external memory accesses are at the slower speed. This works in exactly the same way as clock-doubled chips like Intel's 486DX2. The ARM is also responsible for drawing graphics directly into the video RAM and there's no slow expansion bus to get in the way. Unlike in PCs, however, there's no separate graphics co-processor and the video RAM is not dual-ported: VIDC uses the same memory data and address bus as ARM. As a consequence, the processing speed of the ARM chip is lowered slightly if a high resolution screen mode is chosen, as ARM and VIDC contend for use of the bus on a cycle by cycle basis.

Electronically, the A4 is virtually the same as the A5000, Acorn's previous ARM 3 based Archimedes. In addition to the four-member ARM chipset and



4Mb RAM, plus 2Mb of operating system ROM, there's a PC-style Chips & Technologies 82C711 controller to look after the hard and floppy disk drives and the parallel and serial ports. Finally, there is a new Acorn-designed controller for the LCD panel and a separate battery management processor to deal with recharging the battery and estimating the remaining charge when the machine is in use. All this is packed onto a 10-layer motherboard two-fifths the size of an A4 sheet. The only significant part of the A5000 that has been omitted is a FPA socket (floating-point maths coprocessor). Hardly a great loss, as FPA is still not available.

Comparing the A4 with other portables

Acorn invites comparison of the A4 with the Apple PowerBook 170, claiming similar performance at half the price. Put that baldly, Acorn may have a point, but why is the PowerBook so expensive? Much of the extra cost is in the active matrix LCD that has the beating of the Acorn screen — and every other passive screen too. Compare the A4 with a PowerBook 140 and the price differences are less clear-cut. Apple's built-in trackball is a wonderful solution, easy to use and a considerable improvement on carrying a plug-in mouse or relying on the cursor keys for mouse control. The PowerBook also has networking, a microphone input, external expansion via SCSI and space for an internal fax modem. It adds up to a compelling argument, if you need anything more than basic functionality. If basic is all you need, then the litter of laptop PCs hides the real bargains. And with prices on name-brand items from Compaq and Toshiba looking like a red-tag sale, Acorn needs to do some fancy talking to justify the ticket on the A4. In a world that is buying PCs and Windows, the promise that you can run RISCOS just isn't enough.

The LCD controller uses a time domain multiplexing technique to generate a greyscaled display on a standard 640 x 480 pixel monochrome display. It flashes the individual pixels on and off so rapidly that a grey results, and varying the ratio between on and off time alters the shade. A total of 15 shades can be generated and the contrast seems better than that seen on most PC-style passive LCD screens, even though the panel itself is essentially the same as that used in other portables. Certainly the viewing angle is limited, any moving display smears badly and the contrast and the brightness of the backlight needs to be adjusted carefully. It doesn't approach the quality of display of an active matrix screen such as that on the Apple PowerBook 170, but Acorn's patented display chip does make impressive use of cheaper, passive LCDs.

The Archimedes uses a highly regarded outline font system, using a single outline for both the screen display and for printing. Rasterising is done on demand to any particular size, angle and colour, with anti-aliasing where the available colours allow. And on the LCD screen, the anti-aliased text looks truly wonderful — crisp, readable and smoothly shaped. Occasionally there is a little flickering on screen, as a result of the way greys are generated. Scanned pictures are the worst offenders but it's more unexpected than unpleasant. Overall, the screen gets good marks.

The pointer is somewhat more problematic. There's the typical LCD disappearing problem: move the mouse too quickly and it just winks out. Without plugging in a mouse, you can use FN with the cursor keys to move the pointer and FN plus Q, W and E to emulate the mouse buttons. This method gives precise control but it is hard to get used to and requires a great deal of dexterity to master. It works, but it isn't the way you want to work for very long.

There will be, in theory, a basic 2Mb, hard diskless version of the A4, although this wasn't available for review. It promises to be almost entirely useless as the stack of floppy disks on the table of the Yorkshire Pullman becomes the scatter of floppy disks on the floor. Luckily, the 2Mb model also promises to be upgradable.

A key usability point for portables is their battery life. For the moment, nickel cadmium batteries are pretty much the only choice and there's little that can be done to increase the amount of energy they hold: the trick is to make good use of what you've got. Acorn has gone to some lengths to conserve power, short of using expensive items like static RAM. The ARM is known as a very low power processor and nothing special has been done there as it's exactly the same chip that is fitted in desktop Archimedes machines. But all the other elements of the system drain the battery, too. Since the most power is consumed by the backlight on the screen and the hard drive motor to tune the inactivity periods before switch-off to match your pattern of work, if you glance at the screen only once every 10 minutes you might as well switch it off immediately to save as much power as possible. Conversely, it's not worth switching off the hard disk for less than two minutes, as the extra current surge for a few seconds during spin-up more than outweighs the two minutes of power saving. The delay must be long enough to avoid spinning down the

The benefits of RiscOS

RiscOS 3.0, supplied in ROM on the A4, is Acorn's proprietary multi-tasking operating system for the Archimedes range. It provides a consistent graphical user interface with the usual windows, icons and menus and a mouse controlled pointer. But there are a number of differences between the RiscOS GUI and its relatives on the Mac, or PCs running Windows. The first is the icon bar. Booting the machine produces a desktop display with a row of icons for the machine's facilities: disk drives, printers and built-in software like the task manager. Loading extra applications into memory installs them on the icon bar ready for use. The second difference is that there are no menus on screen, which tends to give a less cluttered and intimidating screen display as well as making the best use of small, affordable monitors. Clicking the middle of three mouse buttons pops up the menu for the object

you're pointing at, so to delete a file you point at it and choose Delete from the menu.

A mouse click on a disk drive icon produces a window showing the files and directories on the disk, and you can double-click on applications to run them or on directories to open them. Data files can also be double-clicked: each belongs to an application, so the application is automatically installed on the icon bar and the data file loaded. Because of this, RiscOS is essentially datacentric: you don't collect your data files in the same directory as the application to which they belong. It's more natural to create directories for projects and group the relevant files together irrespective of application. A double-click on the file calls up the right application for you if it isn't already installed.

A strong feature of RiscOS is drag and drop. Files can be dropped onto the printer icon to print them and data files can be loaded by dragging them to an application on the icon bar. Files can be dragged from one directory

window to another, to rename or copy them on disk. But these are only the more simple examples. More important is the fact that data can be saved from an application by choosing Save from the menu: a file icon appears, ready to drag and drop into the disk directory window you want. This is much more direct than choosing the folder to save into from a scrolling list, as with the Mac or Windows. You can even pipe data between two applications by saving from one and dragging the file icon to a second application window. The convenience of this is quite unmatched by either the Mac or Windows clipboards.

Unlike Windows, RiscOS relies on co-operation between the many applications running: it's not pre-emptive. Unlike System 7 on the Mac, it doesn't offer virtual memory. And it doesn't usually have the aesthetic sophistication of either. But its usability and convenience is on a par with the Mac and streets ahead of Windows 3.1.

disk during the natural short pauses in your work.

Another technique in common use on portables is to vary the clock speed and the A4 can reduce both the processor and memory clocks to a quarter of their normal speed, 6MHz and 3MHz respectively. It does this in an exceedingly simple way, counting the number of WIMP idle events per second. If there are few idle events, the machine is busy, but if they exceed three quarters of the theoretical maximum, it is not doing much except idling so it's safe to slow down the clock to quarter speed. Any external events like a keypress or mouse movement kick the speed back up immediately. You can also prod the A4 into inaction: pressing FN-F10 blanks the screen, stops the hard disk and slows down the processor.

Other areas which have received attention are the sound and Econet systems. The power-hungry passive sound filtering of the A5000 has been replaced with more economical circuitry and the forthcoming Econet card switches itself off to save power if the network is not plugged in. However, Acorn judges that other subsystems like the serial and parallel ports use so little power it's not worth turning them off.

On the supply side of the equation, the NiCad battery is charged in the machine using the mains adaptor. A separate processor monitors the battery (the current flowing in or out, the temperature and so on) and makes judgements about the state of charge. During charging, it detects the voltage peak when the battery is full and sets a small LCD bargraph on the front of the machine to show 100% charge, which can be shown on the screen too. As the battery is drained, the bargraph shows the charge dropping and a screen message pops up to warn of impending battery failure. With the power saving features working (and they weren't on the review machine), Acorn claims a battery life of

between two and a half and four hours. But a longer term test is needed to confirm that this is realistic with typical workloads.

Conclusion

The A4 runs, jumps and sings like an Archimedes, and with 4Mb of memory you can stack the icon bar with all your favourite RiscOS applications. One or two compatibility problems arise from the recent update from RiscOS 2.0 to 3.0, but every major application and game runs fast, within a whisker of the A5000 and A540.

But why has Acorn poured such development effort into a computer when it has not the haziest notion who is going to buy it? Acorn claims its targets for the A4 include concerned parents and it

expects it to be used as a teachers' personal machine in schools. This amounts to tacit acceptance that the machine is too expensive for schools to buy in large numbers. The lack of expansion and in particular any podule bus makes it hard to see it as a replacement for a desktop machine. And for businessmen wanting a portable second machine, who can ignore good PC portables for half the dosh? But if you're already committed to the Archimedes, there's no doubt the A4 is a desirable machine. It's Acorn's way of saying 'We're ready' and it does this remarkably well. But it remains unconvincing, conservative and not well fitted to any particular market. That's particularly ironic in the month that Apple begins to show off the Newton, complete with its own ARM chip.

Specifications

Acorn A4

Processor

ARM3 at 24MHz

RAM

2Mb expandable to 4Mb

Mass Storage

60Mb

Storage options

1.44/1.6Mb floppy

Keyboard

83 keys

Monitor/display modes

LCD: 640 x 480 x16

On monitor: 800 x 600 x 256

Standard Interfaces

Serial, Parallel, Mouse

Price

(RRP) 4Mb RAM 60Mb HD

£1599; £1399 schools

Manufacturer

Acorn (0223) 245200