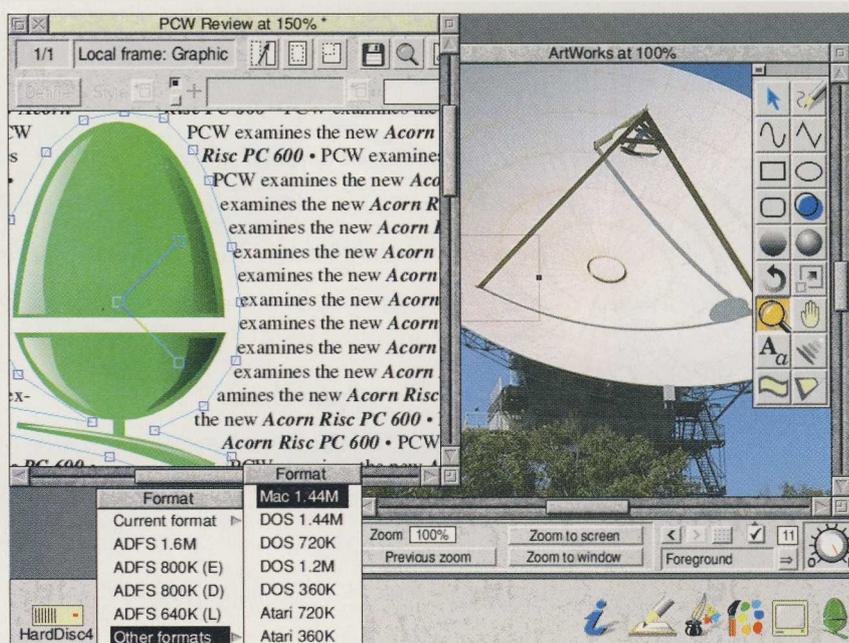




Acorn RISC PC 600

Acorn's retort to the PowerMacs is an example of innovative design, with extensive expansion, the promise of better cross-platform compatibility and graphics performance Archimedes owners only dreamed about. Ian Burley gets a slice of the action.



^ RISC PC 600s get the latest release of RISC OS. This is a 24-bit colour 800 x 600 desktop featuring Computer Concepts' Impression Publisher DTP package

Acorn Computers of Cambridge, and not their colleagues from Cupertino, were the first to bring affordable RISC computing to the masses. The company's answer to the PowerMacs and 486DX2/66 PCs is the latest in a long line of Acorn RISC PCs. It has fast graphics, a novel approach to expansion options, it looks striking and it's British.

The new RISC PC 600 is stuffed with innovation, from its unusual case design down to some motherboard features aimed at minimising obsolescence. There's an ARM RISC processor inside the box, an ARM610 clocked at a modest 30MHz. Apple uses the same chip at 20MHz in the Newton MessagePad. There's no need for fancy heatsinks

and CPU fans as the chip generates less than 1W of heat. Current ARM610s are 0.8 micron parts, and sample 0.6 micron parts are testing at 40MHz.

One of the most striking aspects of the new RISC PC is its case, designed under the auspices of Allen Boothroyd, who designed the original BBC Micro and was a force behind hi-fi manufacturer Meridian. It is made of tough Bayer Bayblend ABS/Polycarbonate, which is used to make riot shields. Internal surfaces are coated to reduce radio frequency interference (RFI) but the external surface is an unpainted light grey. There is provision for screw-mounted peripherals inside but devices like CD-ROMs and hard disks will be clip-mounted Apple-style. Two twist-locking pins need to be turned 90° to get the case lid off. These can be padlocked and the case tethered. It takes less than a minute to open the case, swap processor modules and refit the lid, without any tools.

Standard models have a slimline base case with a two-expansion slot backplane; the front panel has a spring-loaded door to hide the floppy drive. If you need more expansion space, all you do is swap a two-slot backplane for a four-slot one and add a new case mid-section which Acorn calls a 'slice'. Extra slices also have spring-loaded doors.

An eight-slot backplane gives twice as many slots as any previous Archimedes. It requires two more case slices than the four-slot version. The case can be expanded to take up to six slices, the end result being a cube. Each slice can accommodate one half-height 3.5in and one 5.25in form factor device and you can introduce extra internal slice-mounted power supply units. Clip-on

feet give the option of turning the whole case 90° into a mini-tower although this can sometimes make caddyless CD-ROM drives difficult to load.

The RISC PC dual-processor Open Bus was created with DOS and Windows compatibility in mind. A new bus controller chip, IOMD, looks after the Open Bus on the motherboard side and replaces the old IOC and MemC chips. With the right bus arbitration and memory management logic, practically any foreign CPU can be mounted on a daughterboard and plugged into an Open Bus slot. A second CPU is given practically the same access to memory, peripheral interfaces and buses as the main ARM one, so all that is needed is an external CPU cache which will keep second processor modules relatively cheap. Acorn suggests third parties might develop Pentium modules, second ARM processor modules and even DSPs, while a 486 module is due in the Autumn.

Until now, Archimedes users have had to pay £500 or more for a 486SLC PC expansion card to run DOS and Windows side by side with RISC OS, Acorn's native operating system and GUI. Acorn will be charging £99 extra for a machine bundled with a 486 module including DOS and Windows screen drivers, while £249 buys an after-market upgrade with Windows. Performance should improve without an expansion bus bottleneck.

Later this year, RISC PC users will be able to swap their ARM610s for 0.8 micron ARM700 series processors clocked in the region of 40- 45MHz. They should almost double available computing power and add floating-point maths. The ARM700 differs from the 610 in having a maths co-processor interface, an instruction cache doubled in size from 4kb to 8kb, an enhanced write buffer and a bigger translation look-aside buffer. Looking further ahead, the 0.6 micron ARM700 should bring clock speeds above 60MHz and take the RISC PC into Pentium performance territory. It will be upgradable to an even more powerful ARM800 sometime in late 1995. Acorn is devising a scheme for trading in old ARM modules.

The entry-level 30MHz ARM610 isn't exactly spectacular. Acorn's figures put it at roughly the same speed as a 66MHz 486DX2 with a benchmark of about 26mips. Running a variety of different applications, the RISC PC was between 50 percent faster and double the speed of my 25MHz Arm3 Archimedes A440. Speed merchants may be disappointed with these results but faster silicon in easily upgradable modules is promised. Acorn had hoped to launch its new baby with faster ARM700s but the first production release couldn't reliably be clocked fast enough. ARM is confident of big improvements later this year.

Where the RISC PC scores is in graphics performance. The old Archimedes suffered from architecture limitations and more recent models have enabled up to four MemC1a controllers to be daisy-chained, giving a maximum of 16Mb DRAM, but it was expensive and messy. Archimedes computers have had local bus graphics as standard but wasted processor power because the more screen memory you used, the longer the processor had to wait for the video



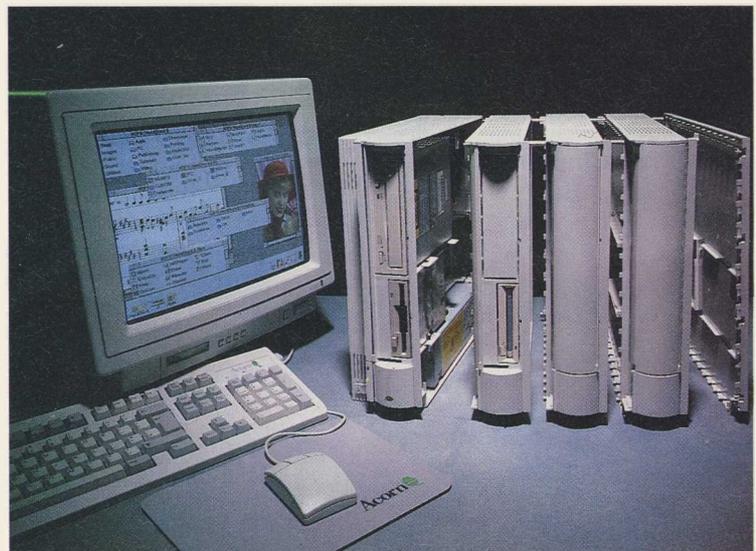
chip to access the screen memory. The RISC PC has solved most of these problems. Two 72-way SIMM sockets can be fitted with 128Mb DRAM in currently available packages, RISC OS 3.60 can address up to 256Mb and sound circuitry is cleaner. Up to 2Mb of on-board dual-ported VRAM is now addressable by a new ARM VidC20 chip, curing the ARM CPU wait state power drain.

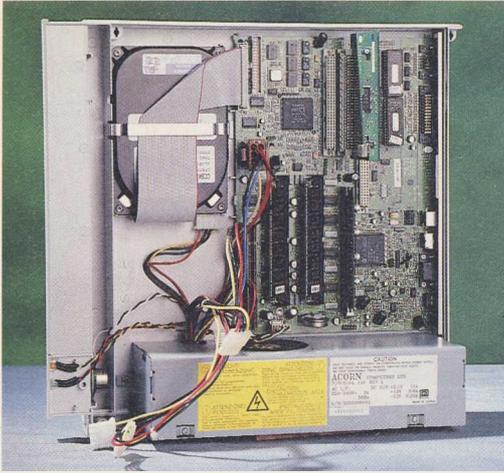
Screen modes of up to 16.7 million colours at 800 x 600 are possible, with VESA-standard refresh rates up to 75Hz. A 1280 x 1024 resolution mode in up to 256 colours is also possible, as is 1600 x 1200 in up to 256 colours. With the latter, some users may need to tinker with their monitor definition data file to increase the VidC20 pixel rate and the refresh rate comfortably. With just 1Mb VRAM fitted, you can still have 24-bit modes at lower resolutions, 32,000 colours at 800 x 600 resolution, 1280 x 1024 pixels in 16 colours and even 1600 x 1200 in 16 colours.

You don't need VRAM — the cheaper models don't have any — but you can still have 1280 x 1024 in four greys or 256 colours at 800 x 600 at reasonable refresh rates. A screen mode picker lets you choose from a huge selection of colour

Above:
The base single-slice RISC PC fitted with three additional slices. The top two have their doors closed hiding the 5.25in and 3.5in form factor expansion bays each holds

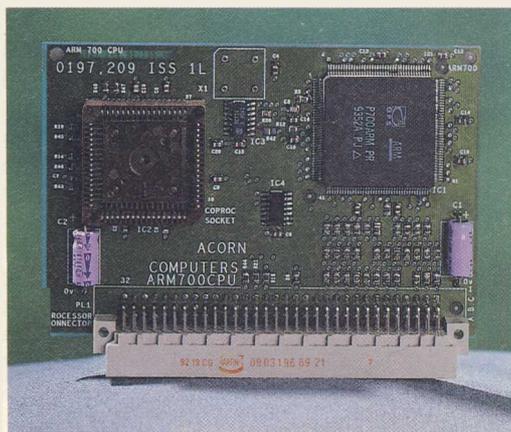
Below:
Exploding the slices shows the RISC PC's Lego-like expandability





Above: Inside the PC. Two ROMs hold 2Mb of RISC OS operating system. The daughtercard is the standard 30MHz ARM 610 CPU. Just next to it is the empty open bus dual processor slot

Below: They really do exist... An ARM CPU module with empty FPA socket. We tried one clocked at 36MHz; production ones will be 50 percent faster. Spot the heatsink? There isn't one!



depths and pixel resolutions while modes can be changed on the fly without rebooting. A point to note is that 24-bit colour data is stored as 32 bits per pixel with the eight extra bits used for control purposes: handy for special effects. A library of 100 24-bit 768 x 512 Corel Photo CD sample images and a shot of the RISC PC development team

are supplied on the hard disk to show off the new graphics capabilities and features like slideshow fades. Initially, machines will be fitted with up to 1Mb VRAM. Acorn expects third parties and dealers to develop business in upgrades and part exchanges to 2Mb. The 2Mb VRAM modules are expected to cost around £200 and unused VRAM space is available to application programs. To demonstrate how fast RISC PC graphics are, it's possible to re-render a complex full-screen CorelDraw! picture, like the classic Snow Barn sample drawing, in as little as three seconds.

All RISC PCs are supplied with Replay, Acorn's digital video movie player, which can play 12.5 and 25 frame per second movies in large window dimensions without hardware assistance. Third-party company Eidos has developed an Acorn-specific digital movie-making system which can grab and compress 12.5 frames per second in realtime off an A/V source without hardware compression. Movies can even be played off floppies. Twenty six megabytes of Replay movie samples come as standard on the hard disk, along with a further 3.5Mb of Replay audio-only files.

There is no Mac-like DSP for generating sounds. Having been rejected from the specifications at an advanced stage, it will be supplied as a third-party add-on card which will also deal with Windows MPC/business audio and Sound Blaster compatibility for the 486 co-processor module. Developers have been rankled by the decision not to include a SCSI controller as standard since an increasing number of peripherals used on

Acorn kit rely on SCSI connections. But existing SCSI cards will work on the new expansion bus and RISC PCs do have a PC-style bi-directional parallel port, a 16550 buffered specification serial port with OS support to the maximum 115.2kbps data rate, and a mouse and keyboard port. Any

PC replacement keyboard or three-button mouse can now be used, whereas users were previously limited to proprietary implementations. There's also user-programmable inactivity time-outs to spin down the hard drive and power control the monitor using VESA-DPMS signalling.

Acorn insists you buy one of its multiple scanning colour monitors. The 14in AKF60, made in the UK by Microvitec, is a no-frills design with the minimum of picture controls and a conventional 0.28mm dot pitch tube, although it is DPMS-compatible and MPRII-compliant. Acorn says extra picture controls are not needed because the monitor has been tuned to auto-size any RISC PC screen mode. If you like as many controls as possible, the 17in AKF85 made by Philips is a more attractive bet. It has an anti-glare coated FST tube, 0.26mm dot pitch, digital settings and memories.

All RISC PC expansion slots are hardware compatible with original 16-bit/8MHz bus 'pmodules', expansion cards which work with the old Archimedes range. Software considerations mean some cards need software patches to work properly while future hardware expansion can take advantage of a new DEBI (DMA Extended Bus Interface) 32-bit expansion bus which can be DMA accessed via 16Mb of memory address space for each card. From a software point of view, RISC OS has had some internal reworking and a facelift in the RISC PC release 3.50, but there are no major functional additions from release 3.11.

The RISC PC has better expansion capabilities than the Archimedes, looks striking, is better value and is future-proofed. PC compatibility is better but remains a concern until we see the 486 upgrade module. Software is less limited than it was a few years ago, but Acorn needs to make RISC OS applications easier to write.

Users were hoping for more competitive pricing but Acorn is confident its target market will appreciate the bangs per buck offered. An entry level model with a 210Mb hard drive, 2Mb RAM expandable to 128Mb, no VRAM (expandable to 2Mb), keyboard, mouse and 14in monitor costs £1249. This looks pretty poor when you consider a PowerMac with 8Mb RAM costs about the same. The RISC PC 600 with 1Mb VRAM and 4Mb DRAM is a little better priced at £1399. With a 17in monitor, 1Mb VRAM, 8Mb DRAM and a 416Mb hard drive the asking price is £2099, which takes it into entry-level Pentium territory.

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Acorn and ARM

Acorn launched its ARM RISC family of desktop computers in 1987 as the Acorn Archimedes. Its ARM (which used to stand for Acorn RISC Machine) 32-bit RISC processor had been designed in-house four years previously using a simulation which ran using BBC Basic on BBC Micro. The company has sold over 300,000 Archimedes to schools, hobbyists, technical and even business users. Acorn is now an equal partner with Apple in ARM, which now stands for Advanced RISC Machines.