Acorn RISC PC 486 co-processor

Costing roughly one-fifth as much as Apple's PC-emulation system, Acorn's new RISC co-processor was either going to prove very clever indeed, or a complete dud. Ian Burley was relieved to be able to give it the thumbs up.

Requests like, So can I run this Request application? or How about a game of Doom? have been bad news for owners of most Acorn computers —until now. Acorn has had the same problem as Apple and Atari's ST and Commodore's Amiga, the lack of "PCcred". No matter how wonderful their exotic proprietary operating systems have been, none have managed to hold back the tide of DOS and, more importantly,

Microsoft Windows, not to mention OS/2. Acorn and Apple have used their non-Intel x86 horsepower to software-emulate lower versions of said processor family, with varying degrees of success. Now, both have produced add-on hardware incorporating real Intel 486-compatible number-crunchers. Acorn's is for its year-old flagship model, the RISC PC — complete with IBM DOS 6.1 but not Windows — and costs a princely £99, while Apple's

is for the PowerMac 6100 only and costs roughly five times as much. So is Acorn's solution very clever, or just no good?

PC enthusiasts love Acorn computers, but Acorn's bread and butter comes from the education market where there has been considerable pressure in recent years for schools loyal to Acorn to switch to PC-compatibles. It's remarkable that Acorn has clung on to its domination of the primary-school sector, where it still has over 50 percent of the market, but three years ago the company prudently accepted that it had to address the issue of PC compatibility head on. Stopping short of building a PC clone, Acorn designed the RISC PC to accept an optional co-processor alongside the native ARM, the RISC chip Acorn designed itself and has nurtured since the early eighties.

Both the ARM and any second co-processor reside on their own separate compact daughtercards and plug in side

by side and vertically into IDC connectors on the main system board. Installation is a cinch — it takes about 15 seconds to twist two snap fittings at the rear of the allpolycarbonate case, lift the lid, slot the card in and replace the lid. It takes longer to remove a monitor from the top of the box. It makes no difference even if the maximum of eight expansion cards is fitted, accessibility is that good.

To keep costs to a minimum, for the first issue of the card, Acorn has chosen a 40MHz Texas Instruments TI486SXLV part, though this is clocked down to 33MHz. The little card also has 128kb second-level cache and a custom ASIC co-developed by Acorn, Future Technologies in Scotland and long-time Acorn developer of PC-compatible hardware solutions, Aleph One. The secret of the 486 card's low cost is that there's no on-card system memory or I/O devices besides host system peripheral access through Acorn's dual-processor 32-bit Open Bus. Acorn, or more accurately, IBM Blue Micro in Italy, is also making a fair number of these cards — 10,000 in the first production run. Estimates suggest this will be enough for 40 percent of the installed base of RISC PCs and Acorn expects to sell out of every single one made.

For three years, Aleph One has sold a PC-hardware expansion card for Acorn users which plugs into the Acorn Archimedes' proprietary 16-bit "podule" (peripheral module) expansion slot. Acorn's podule system has a lot to commend it, although its 16-bit bus has no DMA, isn't very fast and is far from optimal for CPU/memory access.

Aleph One's hard work wasn't entirely wasted however when the RISC PC was being designed. Key elements of the Aleph One PC Card's software were retained and adapted for the new 486 coprocessor. Unlike the old Aleph One PC Cards, the new 486 module has access to a fast 32-bit system bus with direct memory access. In fact, the 486 card masters the bus when it's in use. Like the Aleph One card, the new one shares disk and I/O resources like the serial and parallel ports.The old and frustrating limit of 32Mb PC disk partitions has now been cured, enabling partitions to be as large as a RISC OS drive. Running Windows for WorkGroups you can use 32-bit file access. but not 32-bit disk access
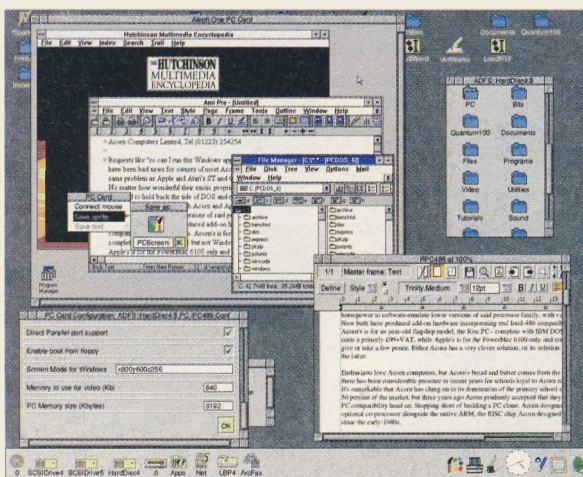
Truly usable PC emulation on Acorn's Archimedes — at last

settings. Disk performance is well within the bounds expected by PC users. The October 1994 beta release of Windows 95 has been successfully tested on a 486 RISC PC.

When you use the card it looks and responds like a real PC. In fact, I'd even challenge a regular PC user to be able to tell if they were using a real PC or not, especially under Windows where the graphics accelerator implementation works very well. Eventual graphics support should range to the 800 x 600 24-bit colour or 1600 x 1200 resolution limits enjoyed by RISC OS applications in a fully equipped RISC PC. There are also tools to enable Ethernet network connections, and I can report that it works very well on my small Windows for Workgroups LAN. Acorn has just released a sound card which provides SoundBlaster compatibility, and a third-party company has already shown an ISA expansion card box.

So the RISC PC 486 is a good, workable 486 PC. But run a few benchmarks and you quickly realise all is not as well as you might expect. The card is a 33MHz 486SX but it performs more like a

25MHz 486SX in a real PC. The primary reason for this is the way RISC PC memory is arranged. On the RISC PC main board there are just two 72-pin SIMM slots, but unlike a conventional PC design, any capacity SIMM you care to choose can be fitted into either slot, say 4Mb in one and 16Mb in the other. On top of this you can add up to 2Mb VRAM which sits in a separate proprietary SIMM slot. All this memory is pooled as a single resource and allocated by the operating system as required, even the VRAM. PCs use interleaved memory which requires matched sets of SIMMs, usually in multiples of two or four. PC RAM is optimised for x86 processors, while RISC PC RAM isn't. The latter works well with 8-bit or 32-bit operations, but an x86 processor does a lot of 16-bit memory operations.

Luckily for Acorn, the inefficiencies of its PC-related architecture don't severely compromise the 486 card as a usable solution for most RISC PC users. There are those who would have preferred a DX chip with its integral maths co-processor, especially as you can't add a separate maths chip to the existing card. Others will be disappointed that a 33MHz 486SX is soldered in rather than socketed — swapping puny 486SXs for beefier DX2, DX4 and even P24T Pentiums will have to wait for the Mk11 card, which probably won't ship before the end of this year. The fact is that the limitations of the architecture make the use of faster 486s less useful. A revised custom ASIC in the Mk11 card will alleviate some of these problems through write-buffering and revised cacheing strategies. At least Acorn has publicly stated that it won't wash its hands of the project, as some had feared, now that the cooking 486SX version is out. Acorn is already working with its partners on the next iteration of the 486 card.