# Aleph One's 386 PC Card

Reviewed by Andrew Benham

W hen Acorn launched the Archimedes in 1987, one of the intended upgrades was an 80186 co-processor card. Unfortunately this product never reached the marketplace, and so for users wishing to use a DOS environment with the Archimedes the only route available has been Acorn's software PC Emulator. Until now....

Five years on, Aleph One has produced an upgrade similar in concept, although with a more powerful processor. This upgrade has caused considerable discussion and interest, mainly concerned with speed, compatibility, and comparisons with Acorn's PC Emulator. I was therefore pleased to be offered the chance to put the product through its paces.

The product supplied for review was supplied with pre-production software. The Aleph One upgrade requires that the Acorn PC Emulator is present on the Archimedes, and it appears that Aleph One are working together with Acorn to finalise the production software. The software offers both single tasking and multi-tasking (even on a 1 Mb machine) options.

The 386PC upgrade comprises a single half-width podule card, accompaning software on a single 3.5" disc, and (for the review version) an 8 page A5 User Guide.

The podule card comprises an 80386SX processor running at 20MHz, 8 socketed RAM ICs (providing 1 Mb of RAM on the review product, although these ICs can be replaced to provide 4 Mb of RAM), a

parallel port, a serial port, a socket for an 80387SX numeric co-processor, a "single chip PC motherboard", and sundry support hardware. The software supplied might be pre-production, but the podule itself seemed to be of production build quality, with none of the all too common cuts and straps that often accompany pre-production boards (and some production boards too!).

The accompaning software includes version 0.1 of the ARCMouse Archimedes mouse driver ("AMOUSE.COM"). The review software did not support Acorn's GETFILE and PUTFILE utilities (Aleph One are working on this), and so one of the well known Desktop PC transfer programs would had to be used to install the mouse driver.

For review purposes, I installed the 386PC in an early Archimedes 310 (ARM2 not ARM3). This has an 8 Mb DOS partition on a 20 Megabyte ST506 Hard Disc, and is equipped with version 1.60 of Acorn's PC Emulator running version 5.0 of MS-DOS. Using the PC Emulator, the total conventional memory available is 568K (with the configuration used).

Installation of the 386PC is simple: the podule has to be inserted into a free backplane slot, and the software copied to the hard disc. The application's "Config" file needs to have the pathname of the hard disc partition entered, and then the 386PC can be started by the normal RISC OS method.

## IN USE

From comments received, it is the twin issues of speed and PC compatibility that interest potential purchasers most. I'll deal with them in that order. References to 'PC Emulator' are to Acorn's software emulation; references to 386PC are to Aleph One's hardware.

## SPEED

In order to test the speed of the 386PC, I

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Archimedes:
   Aleph One 20MHz 386PC      850%
   Acorn Emulator 1.60         65%
Real PCs:
   8MHz 286 PC AT             375%
   20MHz 386SX PC            1140%
```

endeavoured to run the same tests on a range of machines. I was not keen on using benchmarks for the review, if only for the fact that these would be dependent to some degree on how well the PC Emulator managed to emulate the PC's internal hardware timers. Nevertheless I include the

```
Archimedes:
   Aleph One 20MHz 386PC 3714Dhrystones/second
   Acorn Emulator 1.60      229 Dhrystones/second
Real PCs:
   8MHz 286 PC AT          1700 Dhrystones/second
   20MHz 386SX PC          5688 Dhrystones/second
```

results of the benchmarks run, but would advise readers to treat the results for the PC Emulator with caution.

Firstly, Central Point Software's well known PC utility "PC Tools" offers a speed rating for the processing power of machines, giving a percentage based on the speed of the original 4.77MHz 8086 based PC. The results are:

The result for the Aleph One 386PC is

slightly (1.3 times) lower than that of a real 20MHz 386SX machine. The figure for the Acorn Emulator looks suspiciously low.

I also ran the well-known "Dhrystone" Benchmark (compiled from C source code using Borland's "Turbo C") on a range of machines. The results for this benchmark are:

The results of these two tests seem to indicate that the 386PC is executing some 12 - 16 times faster than the emulator, but somewhat (1.3 - 1.5 times) slower than the speed of a real 20MHz 386SX. The tests are concerned solely with the processing power of the machine, do not involve disc accesses whilst running, and should not be affected by screen output.

The speed of the PC Emulator did not appear to be affected by the presence of the 386PC podule in the machine.

Both of these tests give very poor results for the PC Emulator. Once again, I must stress that the tests are dependent on the PC's internal hardware timers, and thus the emulation of them in the PC Emulator. On the principle that the best test is to use the machine, I tried some PC applications.

Many of the applications I tried worked under the PC Emulator, but would take an age (tens of seconds) to start execution after all the disc access had stopped. In contrast, Aleph One's 386PC was very much faster, and whilst some very processor intensive applications made the 386PC work quite seriously, it was most definitely in a completely different league to the PC Emulator.

I can't imagine anyone wanting to use the 386PC to play games, but I tried a couple

of PC games on the 386PC and the PC Emulator (on the grounds that games programs often are quite taxing on the machine's capabilities). The difference was as marked as the previous comments would indicate. As one example, the cult game "Lemmings" was all but impossible on the PC Emulator, but ran perfectly normally on the 386PC.

One very interesting test would have been the compilation of a large DOS application I have (in fact the source code for an Amateur Radio TCP/IP Networking suite), written using over 100 C source code files, the whole application (source, object, and executable files) occupying some 4 Mb of disc space. I have never before dared to compile this under the PC Emulator: a 33MHz 486 based PC takes about 15 minutes to compile the program, and an 8MHz 286 based PC takes 1 hour 20 minutes to do the same job. Using the 386PC to compile the application took 1 hour 20 minutes as well. My 8MHz 286 PC has a similar 20 Mb ST-506 hard disc to that in the Archimedes so this probably indicates that the compilation time for both these machines is limited by the disc performance. In some trepidation I tried the same task on the PC Emulator - after 30 minutes nothing seemed to have happened so I aborted the exercise. The MAKE process had started but no files had been processed (nor had any error messages appeared), so I put this down to another of those annoying compatibility problems.

COMPATIBILITY

The other bugbear of the PC Emulator is compatibility. With the 386PC, the compatibility problems that beset the PC Emulator are greatly reduced, although not entirely eliminated. The compatibility problems with the PC Emulator can be broken down into several categories, and one of these categories remains.

**1.** The "Internal Stack Failure, System Halted" problem. This is usually the result of the emulator simply not running fast enough to service a device (e.g. the serial port). I have not seen this problem with the 386PC.

**2.** The "Invalid Opcode Error, System Halted" problem. This is because of a problem in the software emulation of the processor. (During the course of the review I discovered 2 causes of this error, and I have advised Acorn of the causes and the suggested solutions. This may enable some more programs to run under a later version of the Emulator). This problem does not occur with the 386PC, since a genuine processor is being used.

**3.** The "wrong or missing hardware" problem. The PC Emulator has to emulate various hardware devices that would be present in a "real" PC, and also interface the Archimedes devices (drives, screen, serial port, parallel port, keyboard, mouse etc) to the Emulator in such a way that they appear to be PC devices to a program running on the Emulator.

The 386PC has genuine hardware to handle much of the PC environment, but still has to interface the Archimedes drives, video display, keyboard and mouse. This can still cause programs to fail to run on the 386PC (as it can on genuine PCs). For example, some PC backup programs directly access the disc hardware. The emulation of the disc interfaces in the PC

Emulator (and used by the 386PC) is only at the BIOS (i.e. system call) level, and so these programs do not work. Another problem area is that of sound: almost all the programs tried on the Archimedes ran silently - the only sound that is produced is from programs which ring the console bell.

Programs which require high resolution graphics also experience problems, as the Archimedes cannot emulate some of the more recent PC graphics modes. The 386PC also has no provision for adding IBM bus cards to expand the system or provide enhanced features.

PROBLEMS
The 386PC was not entirely without problems. However, most of these were resolved by a later version of the software supplied by Aleph One, and the remaing problems may be resolved too by the time you read this.

The 386PC seems to become rather fragile when the AMOUSE.COM mouse driver is installed. For example, running the MS-DOS V5.0 Editor and initiating a drag operation on the title box causes the screen to return to the RISC OS style, with a single error box informing the user "ERROR: (internal) Resume, bad stop code 1". Aleph One say this has been fixed, but I have not yet been able to confirm this.

On the 1 Mb review product I was unable to access the High Memory Area or the Upper Memory Blocks using MS-DOS version 5, despite the indications in the DOS User's Guide "Optimising your system" chapter. This presumably means that the extra 384K of memory (over and above the conventional 640K) is not readily available to the user. Aleph One are working on this.

DELIGHTS
In general, the 386PC performed so well that it was perfectly possible to believe that one was using a real PC. Occasionally I was brought back to earth with a bump - for example, several times I automatically put a 1.44 Mb 3.5" disc into my Archimedes drive, forgetting that the Archimedes hardware (except for the A5000) cannot cope with them.

The "real" serial and parallel ports work just as on a PC. I needed to transfer some files to the 386PC as part of the testing process, but a disc transfer was foiled because the 386PC could not access drive B:. I simply connected the serial port of the real PC to the serial port of the 386PC and ran the "Kermit" file transfer package on both machines. With both machines set to the maximum PC serial speed of 115200 baud (yes, 115.2 kilobaud!) the transfer zipped along quite happily. The serial port with the PC Emulator is limited to the maximum Archimedes speed of 19200 baud, and anyway has problems running at lower speeds than this maximum. The parallel port of the 386PC was also pressed into service to connect a PC tape streamer. Once again, this worked perfectly and I was able to back up and restore directories and files at high speed. The PC Emulator was unable to find the tape streamer - a problem with incomplete emulation of the parallel port.

The emulation of the CGA screen was very much better than that of the PC Emulator. All the text editors I tried worked perfectly under 386PC, whereas under the PC Emulator many of them had screen updating problems (characters not erased and lines out of sync when scrolling

backwards). The video attributes seem to be well catered for with the 386PC CGA screen, although the blink attribute is implemented as a "low brightness" attribute instead. Enhancement to cater for the VGA standard is promised for the future.

## CONCLUSIONS

Technically, the 386PC wins against the PC Emulator hands down. The PC Emulator, whilst a spectacular achievement, is just not in the same category. Commercially, however, the product must be up against some serious opposition - genuine PC systems. Even with the recently announced price cut by Aleph One (£495 ex. VAT for a 1 Mb version) the cost of the upgrade is on a par with that of a complete PC system, especially as PC prices are currently tumbling - for example, a 25MHz 386SX system with 1 Mb of RAM (but less hard disc, and only mono VGA graphics) is advertised for £460 ex. VAT.

If one has a need to run the occasional PC software, then (provided it is compatible) the PC Emulator seems a reasonable route for a modest outlay. But if one wishes to run PC software on a more regular and serious basis, then one ought to think carefully as to whether the sensible solution would be to buy a genuine PC. A real PC would have no compatibility problems, and offer better disc drive and graphics screen options than can be achieved with the Archimedes. A real PC would also provide perfect "multi-tasking" with an Archimedes. It would however require desk space for two machines.

The Archimedes is a fine machine, but it is not a PC. It will, however, never achieve the huge popularity and user base of the PC family of machines, and it would negate the purpose of having an Archimedes if its main use was to run PC applications. Nevertheless, the 386PC does provide a fast PC environment amazingly well. For owners of Archimedes machines who need to have better PC compatibility than can be offered by the PC Emulator, the Aleph One 386PC must be worthy of consideration.

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Product    386PC Card
Supplier   Aleph One
           The Old Courthouse,
           Bottisham,
           Cambridge CB5 9BA.
           Tel. (0223) 811679
Price      £495 ex. VAT (1 Mb)
           £625 ex. VAT (4 Mb)
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