

NEW DIMENSION IN TIME AND SPACE ?

Clive Williamson rides on the high-speed 6502

AT LAST the 6502 second processor is here to relieve us of the major drawback of the BBC micro — its lack of memory space when high-resolution graphics are used (ie, modes 0, 1 and 2). This problem is compounded when a filing system such as disc, Telesoftware or Econet is fitted, because each claims more space from the Beeb's memory map. The addition of a second processor immediately solves the problem because, once connected to the Beeb via the Tube interface, Basic programs are passed over, leaving the main machine to act merely as an input/output processor, handling all the operating system functions, outputs to peripherals and the screen display, and any necessary inputs from the keyboard, joysticks and so on.

Because the workload is shared between two processors, some programs will run nearly twice as fast, particularly those using a lot of graphics. Acorn claims the combination of a BBC B and the 6502 add-on is the second-fastest microcomputer system, beaten only by a 16-bit Sage!

The 6502 second processor has 64k of RAM. Storage space for programs is effectively made independent of screen mode, and there is a minimum of 30k free! This figure can be higher, as will be explained in a moment.

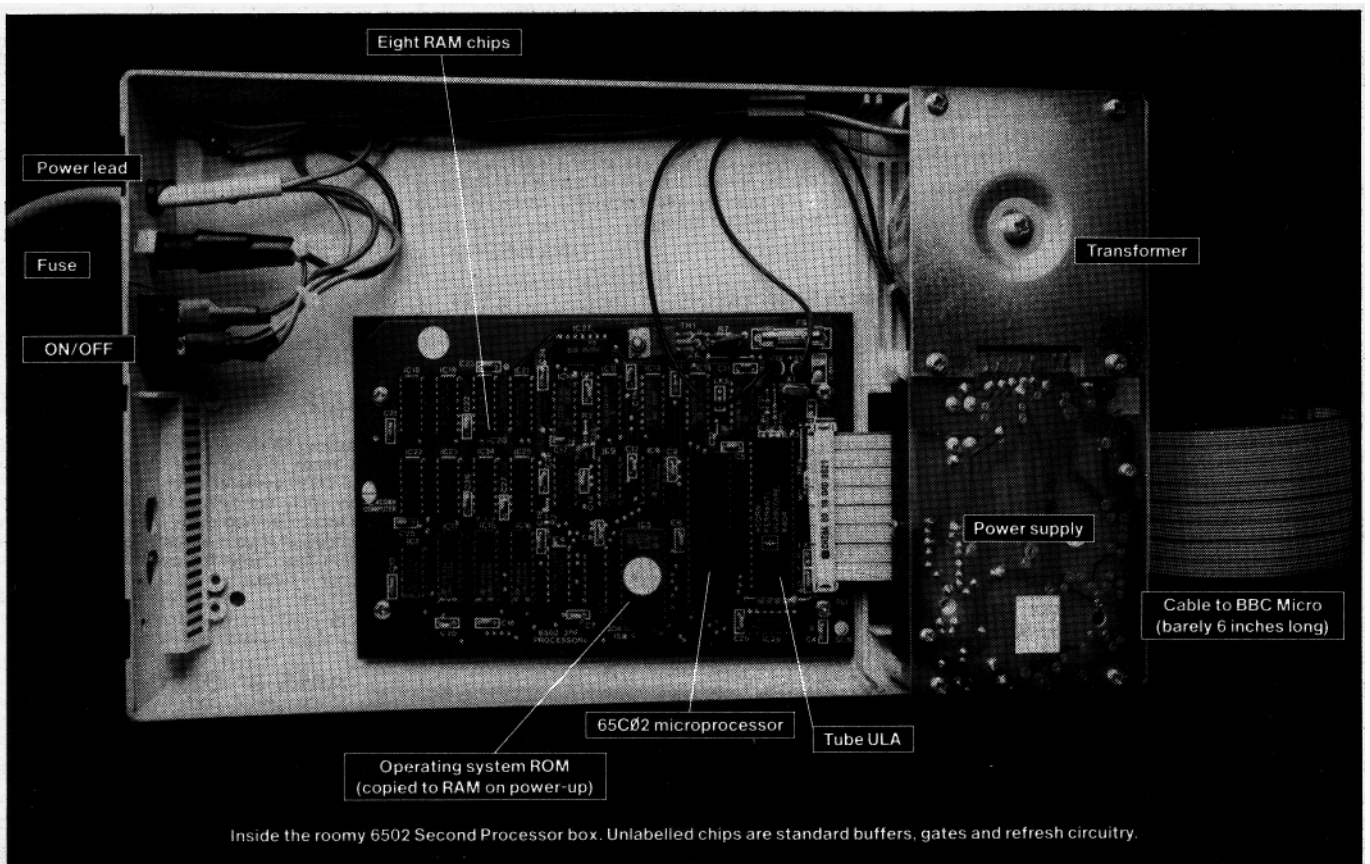
The 6502 comes in a cream plastic case that matches the BBC micro and has its own power supply. Only one processor

can be connected to the Tube at a time.

Acorn's patented Tube interface is a high-speed data link that passes information between the second processor and the Beeb's processor at 2MHz. The connection is made through a Tube U LA and 'first in, first out' buffers, which allow instructions from the second processor to be stored until they can be acted on by the main processor. This leaves the second processor free to run software without having to wait until relatively slow functions have been performed, such as drawing graphics on the screen.

The second processor is based on a 6502B chip, running at 3MHz — half as fast again as the 6502A in the BBC model B. Unfortunately, the chip's full 64k of RAM is not available for running programs, and the amount of RAM left free depends on the language in use.

When the second processor is switched on it takes a copy, or 'image', of whatever language is currently on the BBC micro (eg, Basic, View, BCPL). In most circumstances this image is placed in the same position in the add-on processor's memory map — from &8000 to &C000 — that the language would normally occupy in the host machine. This is right in the middle of the 64k RAM, so the space above it (from &C000 to &FFFF) is wasted except for storing machine code routines, leaving about 30k for programs.



Inside the roomy 6502 Second Processor box. Unlabelled chips are standard buffers, gates and refresh circuitry.

However, things are better with Basic, as Acorn has produced a 'Hi' version that fits right at the top of the memory map, leaving 44k of RAM free. This is possible because operating system calls are dealt with in the BBC micro, so there is no need to copy the operating system over from the main machine to the second processor.

Even 30k of RAM, though, is a terrific improvement over the 5.75k left to anyone using Mode 0, 1 or 2 in a model B with discs fitted, and Hi-Basic allows masses of room for programs. We will doubtless see much more complex software for the Beeb as a result!

Apart from the increase in speed, the BBC micro appears to function normally when using the 6502 second processor, and all legally written Basic programs should run without difficulty. Software written using PEEKS and POKES (eg, bypassing the operating system to speed up games graphics) will not work, as these activities cannot be carried across the Tube. Unfortunately, the Acorn boffins seem to have kept details of the Tube very close to their chests, so many of the languages available in ROM will not work with the second processor switched on, including Ultracalc, Wordwise and Termi. Computer Concepts' Communicator will work, however, and it will be no surprise to learn that the Acornsoft languages—View, Viewsheet and BCPL — all function normally, although there are no firm plans to produce 'Hi' versions.

Useful features have been included in the second processor's design. The most unusual is that once a language is in place in the processor it can be saved using the *SAVE command. You might want to save a language onto disc to free an extra ROM socket in your machine. For example, Hi-Basic is positioned from &B800 to &F800, so to save this onto disc (or cassette, if you don't mind the wait), you should enter:

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*SAVE HIBASIC 0000B800 0000F800
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The four zeros are needed before the start and end address of the block of memory to be saved to specify that 'second processor' memory is being saved — not the main machine's. Four Fs must be used to specify memory locations in the BBC micro itself for screen images, key and character definitions and so on.

Powering up the micro with the 6502 connected will automatically allocate the area above PAGE in the Beeb's memory needed for the 'soft key' character definitions. The whole character set, of course, has to be redefined. This facility would normally take up valuable memory space in the main machine, but it makes sense to use spare RAM in this way on the Beeb/6502 combination.

The system can be reset to run programs not suited for second processor operation simply by switching the processor off and pressing CTRL and BREAK to 'hard reset' the micro.

The second processor adds greatly to the power of the BBC micro, allowing longer programs to be developed and running software much faster. It will help realise the terrific graphics potential of the BBC B with software such as the Bitstik system, and we can expect other sophisticated applications programs to be developed to take advantage of the increased processing power. There is now tremendous scope for extensive adventure-style games with graphics, 3D arcade games and serious business packages. Acorn is already working on program development tools to run on the 6502, and the appearance of the unit should please Econet customers, as a second processor is needed in the network's Level 2 file-server.

The processor upgrade, costing £199, includes Tube software and the latest versions of the disc filing system (DFS), NFS (for Econet) in a 16k ROM called DNFS, and the ROM containing Hi-Basic. The user guide for the system has useful details of the differences between Basic I and Basic II (ie, Hi-Basic), with examples of how the improvements in Issue 2 affect programming.