Dick Smith's new VZ-300: THE BABY SURE HAS GROWN!

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Following its very successful VZ-200 'baby' personal computer, Dick Smith Electronics has just released an improved version called the VZ-300. It has also announced a new low-priced floppy disk system, to go with either model. So for a really penetrating review of these new products, we passed them over to someone who was pretty deeply involved in the development of the original VZ-200 . . .

I HAVE TO ADMIT that I was really quite keen to check out the new VZ-300 personal computer. During my years at Dick Smith Electronics, one of the projects I spent quite some time on was the development and support of the little VZ-200. I believed then, and I still believe now, that the VZ-200 turned out to be an excellent 'first computer' for beginners — cheap, yet surprisingly powerful. Obviously quite a few other people thought so too, because DSE has apparently sold over 30,000 of them.

Perhaps my enthusiasm for the VZ-200 might seem to make me biased, but I don't think so. While on the whole I believe the VZ-200 turned out well, it certainly wasn't perfect. Like every other model on the market it had its shortcomings, and as someone who worked on the project right from the beginning I've probably had more insight into these than most.

Right at the outset, I should say that overall I'm very impressed with the new VZ-300. It is very much better than the VZ-200 in a number of ways, and certainly a worthy successor to it. Considering that DSE is selling it for the same price as the initial price of the VZ-200 — $199 — that makes it even better value for money.

That said, there are a few disappointments. Earlier shortcomings which still haven't been fixed, the odd irritating new one, and areas of incompatibility with the earlier model (some of which were probably unavoidable). Luckily most of these are relatively minor. But let's look at the positive side first.

Improvements

The most obvious improvement over the old VZ-200 is the keyboard. In place of the original array of rather rubbery tablets (the Yanks call them "Chiclets" after the US brand of chewing gum), the VZ-300 sports a much more professional full-size moving key array in the standard typewriter configuration. There's now a normal space bar at the front centre, and two shift keys in the normal positions. These are very big improvements, making the new model much more suitable for word processing. Great!

The case of the VZ-300 is a little bigger than that of its predecessor: 305 x 183 x 56 mm compared with 290 x 163 x 51 mm. It is also made from slightly darker plastic — much the same colour as the IBM-PC. It not only looks better, but is also provided with better ventilation so that it runs cooler.

The other main improvement isn't obvious until you start using it. The new VZ-300 has considerably more inbuilt random access memory to store user programs and their data. This is distinct from the 'video RAM', used to store the information displayed on the video monitor or TV screen; both the new and old models have 2K of video RAM.

Instead of the 6K bytes of user RAM provided in the original VZ-200, the new model sports a full 16K — nearly three times as much. This is a very worthwhile increase, and means that many users won't need to worry about extra RAM.

Of course there is extra RAM available, in the form of plug-in cartridges as there

was for the VZ-200. In fact there are now two RAM cartridges, one to provide a further 16K bytes and the other described as providing 64K.

Another improvement, albeit relatively minor, is that the VZ-300 is fitted with a small switch underneath to disable the colour part of the video signal. This means that if you are using the computer with a monochrome video monitor or TV set which is incapable of displaying colour, you can switch it off to clean up the display.

The VZ-200 was fairly irritating in this respect, with a constantly moving Moire interference pattern on the screen. The main cause of the pattern was a beat between the 3.58 MHz clock signal used for the computer itself, and the 4.43 MHz signal used for the video colour subcarrier. Early VZ-200s were particularly effected, but later machines used a reverse video format (ie, dark lettering on a bright screen) and improved internal shielding, which made quite a difference.

The new VZ-300 still has the reverse video format, and also has a completely reworked main circuit board inside — so the shielding may be further improved. The DSE catalogue blurb suggests that the main system clock frequency has been shifted from 3.58 MHz to 3.54 MHz, although I haven't had a chance to check this. If this is so, it was presumably done to reduce the Moire problem.

One way or another there does seem to be less pattern evident on the screen, although it is still there and mildly irritating even with the colour switched off.

By the way, the DSE catalogue suggests that the VZ-300 has additional colour display capabilities compared with the earlier model. This doesn't seem to be evident from the user manual, and some quick tests certainly didn't show up any extra display modes. So if there are any, they're well hidden.

Like the later versions of the VZ-200, you can swing between the 'green characters on black' and 'black characters on

green' modes for text and lo-res graphics if you wish, by using POKE statements (POKE 30744,0 and POKE 30744,1). Doing this in a program in conjunction with the COLOR statement effectively gives you another pair of background colours, and one more character colour: black.

Could be more

Now for the disappointments. I suppose the first of these is the one already noted, that the Moire problem is still evident. But I recall that this problem was a particularly difficult one to solve, so perhaps we should be tolerant here.

Frankly I was more disappointed to find that the internal BASIC in ROM is unchanged from that in the later VZ-200s. It is still a partly nobbled version of Microsoft Level II, with useful things like ON GOTO, ON GOSUB, DEL, STRING$, TRON, TROFF, AUTO, VARPTR, DEFINT, DEFDBL, DEFSNG, DEFSTR, and double precision maths still all disabled. Since the BASIC is fully licensed from Microsoft, I know of no reason why these functions could not have been activated for the VZ-300. It would have made it much more powerful, even more powerful than the original TRS-80 and System 80 for only one quarter the price. What a pity this wasn't done.

Other disappointments come to light when we look at the VZ-300's RAM expansion cartridges. And it's here that things start to get a little complicated.

First there's the matter of compatibility with the VZ-200. In its latest catalogue, DSE says that both modules will also work with the VZ-300. While it's true that they'll both plug into the VZ-200, this is really quite misleading — particularly for the 16K cartridge.

With the original VZ-200, the internal 6K of user RAM extends to address 8FFF hexadecimal, or 36863 decimal. The VZ-200's 16K expansion cartridge provides as you'd
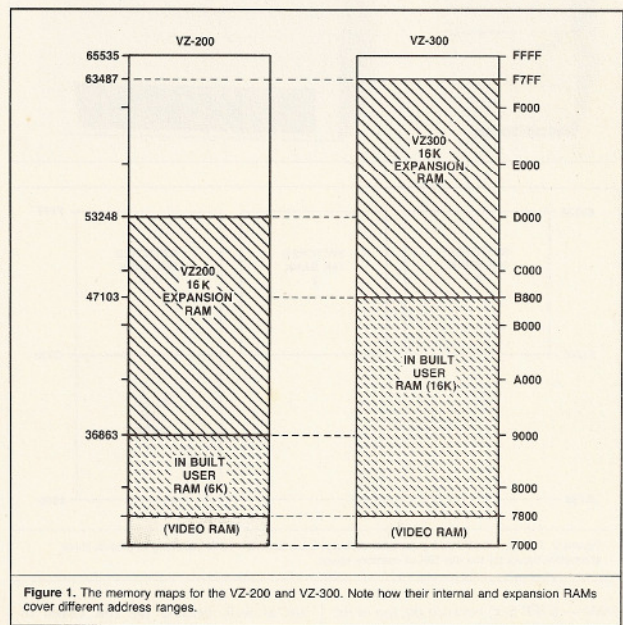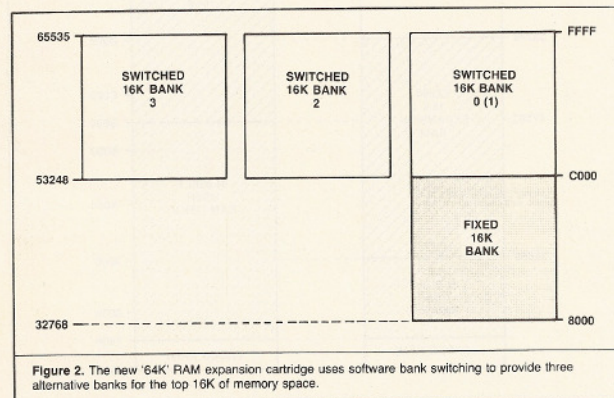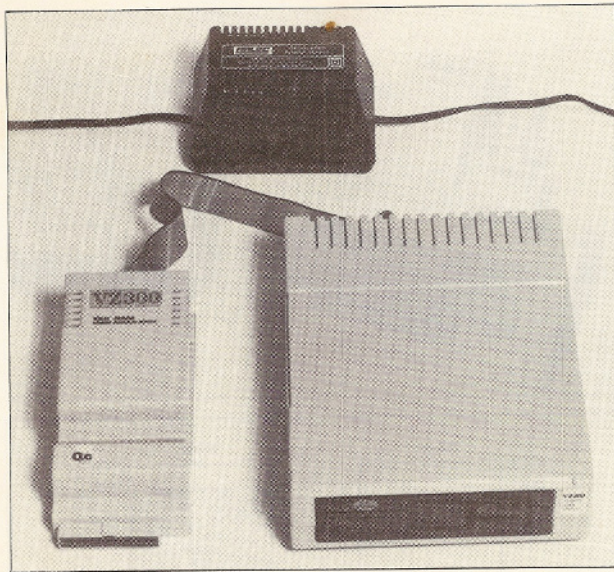
expect 16K of extra RAM, starting at 9000 hex or 36864 decimal and extending to CFFF hex or 53247 decimal.

However because the new VZ-300 has 16K of internal user RAM, the internal memory already extends up to B7FF hex, or 47103 decimal. So naturally the VZ-300's 16K expansion cartridge starts at B800 hex or 47104 decimal, and extends up to F7FF hex or 63487 decimal — only 2K short of the top of

memory space. This means that the two 16K memory expansion cartridges cover different address ranges, making them at least partially incompatible (see Figure 1).

If you plug the VZ-300 cartridge into the older model it will function electrically, but the BASIC interpreter won't be able to use it. In fact it won't even know the extra memory is present, because there will be a 10K 'hole' of unoccupied memory addresses ▶

Figure 1. The memory maps for the VZ-200 and VZ-300. Note how their internal and expansion RAMs cover different address ranges.

(9000 — B7FF hex) between the top of the internal RAM and the start of the expansion RAM.

When the VZ-200 powers up, its operating system checks how much RAM memory is fitted by running up the addresses with a quick write/read test. As soon as the test fails, it calls the address of the last successful test the 'top of RAM'; in other words, it tests for the top of *contiguous* RAM.

So if you try this out, as I did, you find that the VZ-200 completely ignores the extra RAM and makes no use of it. Which is

just as well, because the 10K chasm in memory space could cause all sorts of crashes and weird software problems!

The VZ-200's 16K expansion cartridge won't work properly with the VZ-300 either, although in this case it does give *some* extra RAM — not 16K, but a measly 6K. Again Figure 1 shows why: the only additional addresses it provides are from B800 to CFFF hex, or 47104 to 53247 decimal.

In a way this is a bit of a pity, because people with the original VZ-200 won't

really be able to make full use of their old 16K cartridge if they 'trade up' to a new VZ-300. If they use it, they'll still only get a total of 22K of user RAM — exactly the same as they had before (ie, 24K overall counting the 2K video RAM).

Of course this really arises from the fact that the VZ-300 already has an extra 10K of internal RAM, occupying the extra memory addresses. I guess it's one of the prices you pay for having an improved model with much more RAM in it already!

It would have been nice if the original 16K cartridge had been fitted with a switch, for changing its memory addresses to suit either model. Why didn't we all think of that at the time? (Alright, nobody's perfect!)

But to summarize, the old and new 16K RAM expansion cartridges are NOT interchangeable. Each is really only suitable for use with its own model — although you *may* be able to use the old one with the new computer if you don't mind getting only 6K of extra RAM.

When it comes to the '64K' cartridge, there isn't so much a compatibility problem as one of functionality.

Because of the way the VZ-200/VZ-300 memory space is allocated, with user RAM starting at address 7800 hex or 30720 decimal, both models can only have a total of 34K bytes of user RAM effectively functional at any instant. So the designers of the computer had a problem when it came to providing a '64K' expansion cartridge.

They solved it by using a technique known as "bank switching". The 64K of available RAM is divided into four 16K chunks or banks, one of which is arranged to permanently occupy addresses 8000 to BFFF hex (32768 — 49151 decimal); this largely overlaps the existing internal RAM. The other three banks are all arranged to occupy the remaining 16K of addresses, from C000 to FFFF hex (49152 - 65535 decimal); see Figure 2.

Of course there isn't much point in having all three banks simply working in parallel, so a pair of flip-flops at a special address (7F hex) in I/O (input-output) space is used to switch only one of the three banks on at any particular time, under software control. By writing a code number to this I/O address, a program can switch from one bank to another. The code numbers for the three banks are 0 (or 1), 2 and 3 respectively.

So although the whole 64K can't be written to or read from at any particular instant, programs can turn the banks on and off. Or to be more exact, *machine language* programs can do this. BASIC programs can't, because the VZ-200/VZ-300 BASIC interpreter keeps its stack and string variable buffer at the top of available RAM. So if a BASIC program tried to switch memory banks, vital information would be whisked

away from the interpreter, and the system would 'crash'.

In other words, only machine language programs can take advantage of the extra 32K of RAM available in the 64K cartridge. With BASIC programs, the cartridge can effectively only be used as a 32K cartridge. This applies with both the VZ-200 and the new VZ-300.

There is a difference, though, because of the way the 64K cartridge's RAM starts at 8000 hex and overlaps the internal RAMs. With the VZ-200, you get an additional 28K bytes over the basic machine. Whereas with the VZ-300 you only get an additional 18K, a mere 2K more than you get with the new 16K cartridge.

So for BASIC programmers (probably the vast majority) the 64K cartridge is really only worthwhile for the VZ-200. With the new VZ-300 it only gives you 2K more than the 16K cartridge. Worth remembering, when you consider that it's nearly double the price!

The only other mildly disappointing thing about the VZ-300 is the user manual. Instead of the three separate original manuals, all user material has now been jammed into a single overstuffed comb binding. No doubt this saves a few cents, but it also makes the manual very much harder to open flat for use. It's one of those silly little things that could easily have been avoided.

Despite all of these little disappointments and irritations, the new VZ-300 is still a very good little computer. Hence my comment earlier that I believe it's even better value for money than the VZ-200. In fact it must surely be the cheapest possible way to get a complete colour computer, suitable not only for learning the fundamentals, but then for being expanded and put to practical use.

By the way, the other VZ expansion items all seem to work just as happily with the new VZ-300 as they did with the earlier model. This includes the Centronics printer interface, 4-colour printer/plotter, joysticks and data cassette recorder. As far as I can see there are no compatibility problems with these at all.

Disk drive and controller

Talking of expansion, this leads me to the other new release from DSE, the VZ disk drive and controller. Here again the news is good not only for buyers of the new VZ-300, but for owners of the VZ-200 as well; because the new disk system does indeed seem to work equally well with both models. And it brings a whole new order of operating convenience and efficiency to both.

The basic disk system consists of three items of hardware: the controller cartridge, the disk drive itself, and a power supply

adaptor for the disk drive.

The controller cartridge plugs into the rear of the computer, into the same connector normally used by the expansion RAM cartridges. However, so that you can still use a RAM expansion cartridge with the disk controller fitted, it has a further connector on the top to receive the RAM cartridge. It's quite a neat arrangement.

On the back of the disk controller cartridge are two 20-way sockets, each of which can receive the ribbon cable from a disk drive. In other words, the controller is designed to handle not just one, but two drives if you wish. The sockets are marked "D1" and "D2", and naturally enough if you have only one drive, its cable plugs into the D1 socket.

The disk drive is a compact half-height 5¼-inch unit, in a moulded plastic case which matches the VZ-300 and the controller cartridge cases. The ribbon cable leading to the controller cartridge is permanently attached to the drive case. The only other connection is a 5-pin DIN socket which takes the power for the drive, from an in-line type power adaptor. Each drive needs its own adaptor, while the power for the controller cartridge comes from the computer supply.

So much for the hardware for the disk system, which is quite neat and straightforward. Now for the interesting part: how it works. The manual and brochures are very sketchy about this, but after a bit of detective work and checking it out with a few test routines, I think I've worked out the basics.

As far as I can discover, the disk drives and controller use a simplified storage encoding system something like that used in the Apple II computer family. There doesn't seem to be a dedicated disk controller chip in the controller cartridge, just an 8K byte ROM and a few housekeeping chips. And the disk drive electronics is simpler than for the usual SA-400 type, with only a few basic signals conveyed each way along the cable to the controller. For example the drive has no opto-detector for the disk index holes, so there is no index signal.

So far so good, of course. The simple disk system used in the Apple II family has proved a particularly reliable one over the years, and if the VZ system is similar then it too could well turn out to be just as reliable. And the lack of a detector for the disk index holes means that like the Apple disk system, the VZ system can use either soft or hard sectored disks equally well. I tried this out in fact, and both types of disk worked beautifully. Great!

DOS

By now, the more experienced readers are no doubt starting to ask "OK, OK, but what about the DOS?" (For the not-so-ex-

perienced, a DOS is a disk operating system, or the program needed to look after all of the housekeeping jobs involved in storing information on the disk, and then retrieving it again.)

Glad you asked. Inside the controller's 8K ROM, along with the machine language routines used to control the disk drive itself, there looks to be quite a tidy little DOS — or more accurately, a little disk BASIC. In other words, a set of routines which patch themselves into the existing VZ ROM BASIC, to provide it with the extra BASIC commands to cope with basic disk operations. You get these disk BASIC commands as soon as you turn on the computer with the disk controller plugged in; they don't have to be loaded into RAM from a system disk.

The controller's 8K ROM doesn't gobble up valuable memory addresses normally used by RAM, either. It occupies a range of otherwise vacant addresses down below the RAM area, between the top of the BASIC ROMs at 4000 hex (16384 decimal), and the VZ's keyboard array at 6800 hex (26624 decimal). So when the disk system is installed, you still have as much RAM as before. It's very neat and efficient.

Now if you're an experienced old pro or hacker looking for a really fancy bells-and-whistles DOS, forget it. VZ disk BASIC has a pretty modest set of commands. But on the other hand if you're a newcomer who's never used a disk system before, it has all the disk commands you're likely to need for a long, long time. And they're nice and simple to use, as they should be.

The commands are listed in Table 2. As you can see, they provide all of the basic things needed for preparing disks, loading and saving both BASIC and machine language programs, maintaining disks, checking disk status and doing simple sequential data storage from BASIC programs.

How does the VZ disk system check out? Not bad at all; in fact considering what it is designed to do, it does it particularly well.

First of all, I tried formatting a few blank disks using the INIT command. It took about 75 seconds per disk, which compares quite well with most other disk systems. Then I tried loading in a few decent-sized BASIC programs from cassette tape, saving them on disk and re-loading them, to compare these disk operations with doing the same things via tape. That's the ultimate test.

The results were fine. Take for example a program of a little over 6K, which took about 82 seconds to save to tape and another 82 seconds — after the start of the program had been found — to verify or load again. With the disk system this program took only about 12 seconds to SAVE (including an automatic verify), and only 7.5 seconds to LOAD again. So the disk system ▶

is about 14 times faster than tape for saving, and about 11 times faster for loading. And very much more convenient, of course.

By the way, the VZ disk system uses a fairly standard single density storage format with 40 tracks each of sixteen 128-byte sectors. This gives 624 sectors, or 78K bytes of formatted storage per disk. Not enormous, but quite practical.

I tried out just about all of the disk commands and functions, which all seemed to operate very reliably. In fact it all worked without a hitch of any kind, not only with the new VZ-300 but with my son's original model VZ-200 as well.

Of course the more experienced user will tend to be a little disappointed at the lack of some of the fancier DOS functions like those for random access (PUT, GET, FIELD, MKD$/I$/S$ and CVD/I/S etc). But that's not really relevant here. This system was designed for the typical user, who mainly wants to load and save programs quickly and easily. It does that, and it does it well.

All in all, I'm quite impressed with the VZ disk system. Of course compared with the basic VZ-300 it's not cheap; the disk drive and its power adaptor alone will cost you $249, more than the computer itself. And you still need the controller cartridge, at $79 more. But it's still very modest compared with the cost of other disk systems.

So there you have it. A new and improved VZ-300 computer, and a beaut little disk drive system for both models. Despite a few minor disappointments, they're both really good products.

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TABLE 2. VZ DISK SYSTEM — COMMANDS
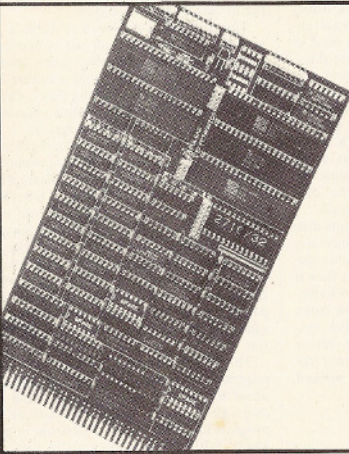
INIT	Formats a blank diskette for use (either soft or hard sector)
DIR	Lists the files on a disk
STATUS	Gives available storage space on disk (in both sectors and bytes)
SAVE"filename"	Saves BASIC program to disk with filename given (8 chars maximum)
LOAD"filename"	Loads named program into memory without executing
RUN"filename"	Loads named program and starts execution
REN"oldname","newname"	Rename disk file
ERA"filename"	Erase disk file
DRIVE n	Change currently used disk drive (n = 1 or 2)
BSAVE"filename",s,e	Save binary file (eg, machine language program), with filename given, starting at address s and ending at address e (both in hex)
BLOAD"filename"	Load named binary file into memory
BRUN"filename"	Load named machine language program into memory and begin execution
DCOPY"filename"	Copy named disk file from one disk to another
OPEN"filename"	Open a data file for write or read
PR#"filename"	Write data to opened disk file
IN#"filename"	Read data from opened disk file
CLOSE"filename"	Close disk file