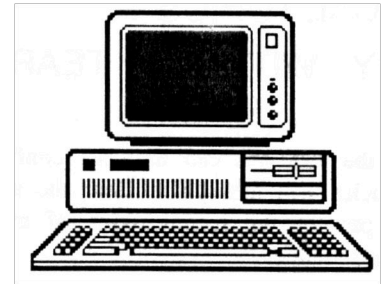


HOT KEY

Journal of the IW PCUSER GROUP - (IBM COMPATIBLE)

NOVEMBER 1991 - Issue 2



EDITORIAL

This month's edition of HOT KEY looks more like a journal of David Broughton. If that is what you like, then it will reflect my own interests which are: Mathematical recreations, programming, computer science, electronics, chess, Esperanto, etc. These are probably very untypical of the membership at large so it is up to you to redress the balance.

I don't use Windows, nor data bases, nor spreadsheets or any commercial software, preferring to write my own (and I can tell you, the more shareware I buy, the more I wish I did!). I am currently being strongly tempted to buy DesQview but have resisted so far.

My profession is a microprocessor consultant and programmer, mainly for embedded systems. These are pieces of electronic equipment with built in microprocessors such as video recorders, games machines, etc. The work is scientific and mathematical. I have a speciality in writing chess programs for chess playing machines. Most of my chess programs play better chess than I.

I joined the club to find out more about the mysteries of what goes on inside IBM compatible computers and to meet people. When I joined I did not own an IBM compatible, having a very ancient MS-DOS 1.1 based twin floppy. I recently bought an 80386-25 machine with a 40 Mbyte hard disk.

That's enough of me. Why not send me a brief resume of *your* interests, profession and reasons for joining the club? I'm sure other members would like to know more about you.

PUZZLE CORNER

Last month's edition had a diagram with the enigmatic caption: "What is this?". Hold your breath: it is a diagram that uses every one of the IBM line drawing characters once and once only (except for the four straight lines without junctions) in a neat rectangle without any trailing ends. More of a solution to a problem than a problem.

This month's problem is to find the dates of birth of Mary, Ann and Julia who were born in that order each on Thursday 24th August, six years apart.

THE EDITOR'S PROGRAM OF THE MONTH

This month's program is a new version of the well known shareware program WI. "Where Is" is a program which finds a given file or directory name anywhere in your directory tree structure, but it suffers from a few problems. The new version, FINDALL, is better. The two problems with WI are: 1. If used for directed output to a file you will find that CR/LF are produced back to front. This doesn't usually matter, but will confuse the batch processor and some text editors. 2. WI finds directory names as well as file names and there is no way to prevent this. If you use WI to produce lists of files for use in a batch file, you will find the presence of directory names embarrassing. FINDALL cures both these problems and is freeware, available from your editor.

This space is reserved for you. Please send your letters, software reviews, book reviews, comments on the Club Organisation and any other material on floppy disk to: Hot Key Editorial. ## ***** ***, Freshwater, IOW, PO40 #**. Tel: #####.

Notice for the Computer Show: by now you must know this is on Sunday 24th November at the Royal York Hotel, George Street, Ryde, IW. All day starting at 10.00am (or 7.00am if you're Jonathan Burt!)

The AGM for the PCUser group is on December 4th, 7.30pm at the Riverside Centre. Including election of officers and re-arrangement of the committee subject to YOUR vote!

TECHNICAL TOPICS 1

MEMORY WITHOUT TEARS. (part one)

Memory in the IBM-PC can be very confusing. These series of articles will attempt to clear the air of all the jargon and present the technicalities of memory in a straightforward manner.

Memory in the IBM-PC and compatibles is organised in units called *bytes*. Roughly speaking, a byte may be regarded as the storage required to store a single character such as letters, digits and punctuation symbols. There are 8 binary digits (bits) in a byte, which means to say that, with all possible combinations of 1's and 0's, up to 256 different character codes may be represented.

The relationship between the number 8 and the number 256 is that $256 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2$ which may be represented in a shorthand form as 2^8 (pronounced "two to the power eight"). This relationship is crucial in understanding memory.

Each byte has an ADDRESS. Just as houses have an address to enable the postman to find each house, so each byte in memory has an address, which is simply a number. The original microprocessor, upon which the Intel 8088 and 8086 Central Processing Units (CPUs) is based, was the Intel 8080. Although the Intel 8080 was an 8-bit microprocessor, it had 16 bits for addressing memory.

Now ten bits can address up to $2^{10} = 1024$ memory bytes (from zero to 1023). That number of bytes is called a kilobyte or Kb (sometimes abbreviated simply to K). The other 6 bits of the 8080 address allows a memory size of $2^6 \text{ Kb} = 64 \text{ Kb}$. So the 8080 could address 64 K of memory. ($64 \text{ K} = 65536$.)

When the 8086 CPU was designed, 64 Kb of memory was already too small for many applications but there was a large amount of 8080 software around (using the CP/M operating system) and this huge software base was too valuable to sacrifice.

The 8086 had to be able to convert 8080 programs whilst making much more memory available for a future generation of programs. The designers did this in rather a neat way: each old-style 16-bit memory address would be added to a base register by hardware. These base registers are called SEGMENT REGISTERS. Segment registers are also 16 bits but instead of addressing BYTES they address PARAGRAPHS of size 16 bytes. To form this address, an extra four binary zeros are appended to the right of the segment base address number making a total of 20 bits.

$2^{20} = 1$ Megabyte (1,048,576 bytes). SO THE 8088 and 8086 CPU's CAN ADDRESS 1 MEGABYTE OF MEMORY.

In the 8088 and 8086 there is more than one segment register. This allows program code and data, for example, to use separate segments if required, each of 64 Kb.

It was not long, however, before the 8080 software had been converted to 8086 and been overtaken by new

software that was able to make use of the extra memory space. By the mid 1980's it was becoming apparent that the 1 Mb limit had been shortsighted and that the segment registers should have had not four, but 8, 12 or even 16 extra zero binary digits added to the right, to allow address ranges to rise to as much as $2^{32} = 4$ Gigabytes. But by then the IBM-PC had become the standard PC for the 8086 family and there was a considerable amount of software around that depended on the segmentation philosophy. The problem that the 8086 designers had had in regard to the 8080 had come full circle: adding extra memory was not going to solve the problem if the CPU could not address it. A new CPU was required that would have to take on board all the existing 8086 software unchanged and yet be capable of addressing more than the 1 Mb limit.

Matters were not improved by the coming of the IBM-PC which split the 1 Mb space into two chunks: the first was 640 Kb for the operating system and application programs, and the higher chunk of 384 Kb would be used for hardware interfacing (e.g. video RAM) and ROM. So although the CPU of the IBM-PC can address 1 Mb, in practice normal application programs plus DOS and other utilities must be made to fit into this 640 Kb space.

There are several schemes for improving this situation:

1. Addresses beginning at 640 K are not always used. The space for application programs could be increased if this boundary line were shifted up to the address used for video RAM.

2. Some of the address space above the video RAM could be used for special programs or DOS itself, leaving more space for application programs. (The IBM-PC design left more space in this region than it need have.) These spaces are called UMBs (Upper Memory Blocks).

3. Memory could be banked, as was done on some 8080 systems, and switched in and out of the CPU address space as required. This is called EXPANDED MEMORY.

4. Extra memory could be installed beyond the 1 Mb limit, expanding the 20-bit address lines. This is called EXTENDED MEMORY. But of course we know that the 8088 and 8086 cannot address this space: or can it? Actually, there is a small region, called HIMEM, of nearly 64 Kb, that can be addressed above the 1 Mb limit which is a result of the segmentation scheme. This will be explained in greater detail later.

So far we have not introduced the 80x86 family of CPUs. The problem does not go away simply by designing bigger and better CPUs because just as the 8080 software could not be abandoned entirely in the late 1970's, so now we have the IBM-PC with its even vaster range of software operating under DOS (or MS-DOS) with its 640 Kb limit. New CPUs and memory management systems have to work within these constraints until another generation of software has been designed. WINDOWS 3 and DESQview are a stage in this process. More on all these things in part 2.

David Broughton.

FAST MEMORY VIDEO

On Wednesday 6 November Simon Clarke of Island Computer Systems presented a video on DesQview. The video, made in the USA, was presented by Gary Saxon of Quarterdeck Office Systems. It was in three parts, each of about 25 minutes. Breathtaking is the word to describe them! The talks were fast indeed. If you were not into the technicalities of memory for the IBM in the first place you would have found it difficult to keep up. Nevertheless the presentation was clear, logical and well thought out I personally found it very interesting indeed.

Part one was entitled "Understanding P.C. Memory" and dealt mainly with the differences between extended and expanded memory. Part two was "Optimising P.C. Memory" and described the programs QEMM, QRAM, Manifest and Optimise, available from Quarterdeck for managing memory. Part three was on DESQview and showed how this software can make ordinary DOS-based programs multitask with their own windows, each using large conventional memories of up to 490 K in machines using 8088 CPUs right up to 80486 CPUs.

However, there still seems to be ambiguity in the terms CONVENTIONAL memory and HIGH memory. The video contradicted itself by introducing "conventional memory" as the first | Mbyte and later saying it was, in fact, only the first 640 K. Also the term "high memory" was not strictly used correctly. To be consistent with most other publications the term high memory should be reserved for the first 64 K of extended memory: the region below that and above 640 K is more usually referred to as 'upper memory'. But these are quibbles.

Despite these minor points the subject was put across very well and I'm sure many of us went away better informed, if not somewhat dizzy.

David Broughton.

[Note: the article on memory this issue was prepared before the above video was shown.]

BUG OF THE MONTH

One of the most astonishing bug discoveries I have made in recent weeks was to find that the 80386 processor has a bug in its microcode! On running a program I was developing, my computer refused to respond to keys other than to place them in its internal buffer until it became full, and thence to sound the buzzer if I tried to put in any more. It took me a long time to debug the cause, which was in the 80386 when trying to move a word that was split into two bytes: one at the top of a segment and one at address zero. The 80286 and 8086 CPUs do not have this bug. DCB.

Notes from your outgoing secretary:

Well, I had a column to fill so that seemed a reasonable excuse to potter on about something. These notes are being prepared in TimeWorks ver 2.0 on a 386 25Mhz PC and speed is not a problem. I have dabbled with a number of budget DTP packages and without doubt the fastest and easiest to use is Timeworks. Version 2.0 is nice but the old version 1.2 is for all practical purposes as good. I have also tried Avagio, but I would recommend this only for a 33Mhz 486 as its screen re-write time is S-L-O-W. LTS who market it have all sorts of advice on speeding it up, which means they KNOW that it's slow. Avagio does have lots of kinky DTP features to play with, while Timeworks simply makes sensible assumptions about what you want, which by and large suits me fine. If you're a Windows type of person there's PagePlus, but also now Microsoft have their own budget DTP package which is probably worth a look first. Express Publisher is also worth a look, and like Avagio and PagePlus has its own system of scalable fonts. Timeworks lacks this feature but you can get along very well with the selection of fixed fonts supplied.

Since the world seems to be changing to Windows one must be aware of the near-DTP capabilities of the new big-time Windows wordprocessors. Microsoft Word version 2 has just been launched, we already have WordStar for Windows (awarded a Gold Medal by PCUser magazine) and then there is the long-awaited WordPerfect for Windows. For the Windows WP's which use the windows Print Manager there are the new generation of scalable font generators. MoreFonts version 3, Glyphix and Bitstream's Facelift for Windows will all give you scalable on-the-fly downloadable fonts in a variety of fonts, styles, background and fancy fillings. ('Scalable' means you get to choose the size you want; 'on-the-fly' means that the font description as understood by your printer is downloaded on demand prior to the ASCII code for the required letters. This applies to printers with memories, e.g. lasers and deskjets, or dot matrix printers with intelligent print buffering).

How are we doing? A note about DeskJets. Having just bought one for someone else I must say I am impressed. A Hewlett-Packard DeskJet 500 for £300 + VAT with a nice selection of on-board fonts, a fairly nippy print rate better than any dot matrix printer and a 300 dots-per-inch definition to rival a laser printer is not to be sneezed at. The HP DeskJet has a disposable inkjet cartridge which whizzes up and down like a dot matrix print-head but is very quiet. It has a built-in paper cartridge but will take single sheets. I don't think there is very much point in buying a dot matrix printer after seeing the DeskJet in action, certainly not if you're at all interested in graphics. You can add memory for downloading soft fonts or add a font cartridge - but if you're going to do that then you might as well buy a laser to start with. (Lasers are getting CHEAPER by the day).

Roger Skidmore