NOVEMBER 1982 95p

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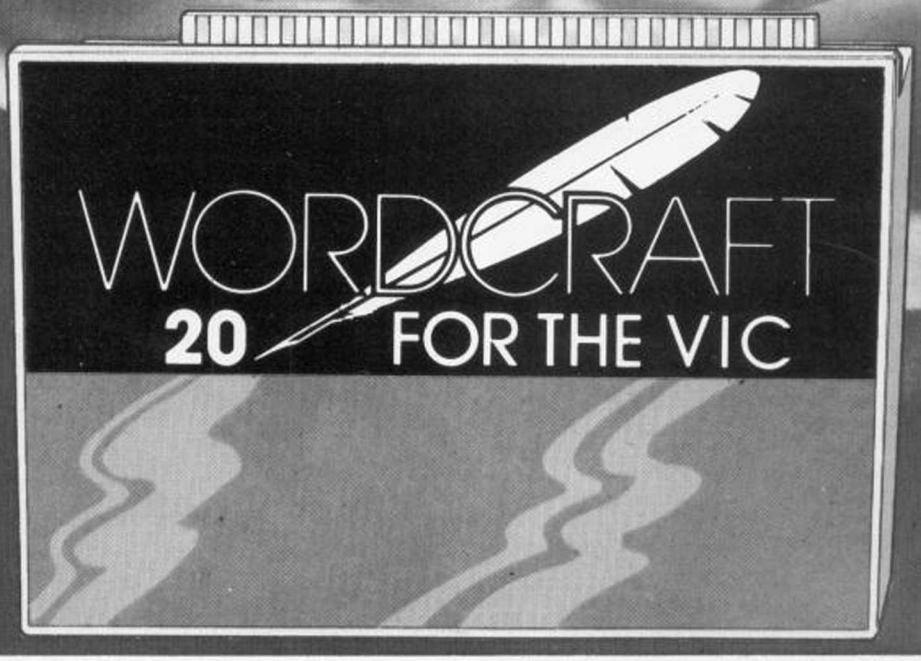

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FRONTLINE

Over the past couple of years, we have been asked for advice on which computer to purchase, by many hundreds of readers. We've found that the same misunderstandings and difficulties come up again and again. The purpose of our beginner's series is to answer the most common questions one after the other.

The **Free Poster**, for example is not just designed to liven up your aging wallpaper, but is intended to form the starting point for anyone considering the purchase of a microcomputer. A frequent misconception arises because the term *microcomputer* or *personal computer* can refer to anything from a £50 'learning machine' to a £5000 business system. Once you've gained some computing experience, it becomes obvious that the former can't handle a mailing list of several thousand addresses – but to the newcomer it is very difficult to discern what level of system is required.

We have devised a method of classifying microcomputers into one of eight categories. It doesn't cover everything: 'single-board' computers, pocket machines and over-priced business systems don't fit in, but these eight different applications areas should cover 99% of all micro's sold. We shall be making use of this classification system in future issues of the magazine, so keep the poster up on a convenient wall!

Also for **beginners** – whether in home or business computing – we look at the whole area of **manufacturers' brochures**. Can you extract anything of value from amongst the sales talk? Yes, you can – from the specification sheet, but you will need our guide to interpret the boffins' jargon!

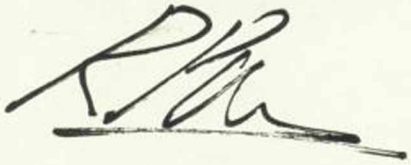
For purely **business users** we've catalogued the **Seven Deadly Sins** of running a computer installation. Paying careful attention to things like: supplies, cleanliness, back-ups and security will prevent the most common disasters which can afflict a micro.

Whatever your disposition, I can strongly recommend reading our investigation into the ominous Fifth Generation of computers currently under development in **Japan**. In a word, the Japanese are already saying that most of the development in the computer world so far has been in totally the wrong direction.

And finally, see if you can identify yourself from amongst our rogues gallery of **Computer People**, as depicted by our cartoonist. If you think you are above all this – wait till our next issue when we shall be spotlighting 'non-computer people'.

P.S.

Starting next month, we shall be considering in detail the question – 'How much can you learn about business computing, by purchasing a home computer?' The answer is surprisingly – a lot! We start off with a look at business programs that run on home micro's, (Word Processing and Database, for example) – followed by a look at ways of expanding a small system with peripherals.
Speech recognition, light pens and bar codes are all ways of getting round this bottleneck



Richard Pawson – Editor

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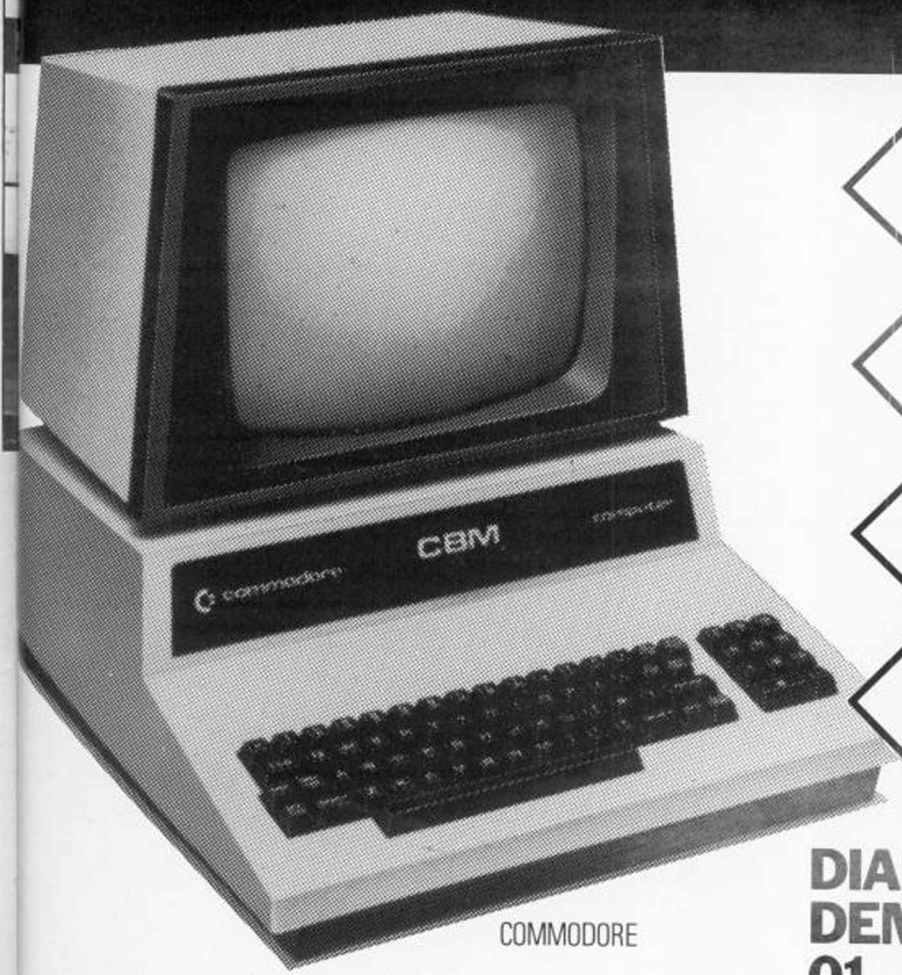

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Number Chaser has superb graphics and sound—you would not want more than a few of these in a classroom at any one time since the level of excitement, as well as learning, is very high.

FACEMAKER. This is designed to improve spelling, to expand vocabulary and also sharpen observational skills. Designed for 5-12 year olds this is an interactive program where you draw people's faces.

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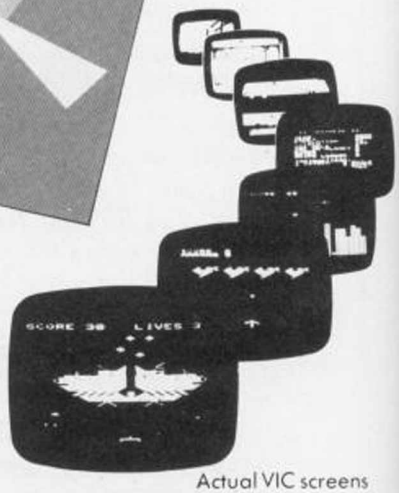

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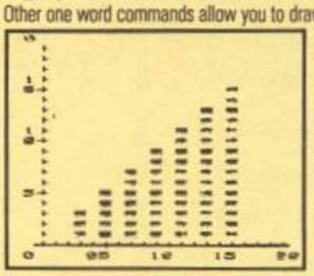

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RUNNING A BUSINESS INSTALLATION

THE SEVEN DEADLY SINS

Having purchased and installed your first business microcomputer, there still remains a right and a wrong way to run it. Careful management can give great efficiency, whilst stopping proceedures can result in expensive disasters. Charles Christian outlines the Seven Deadly Sins of running a computer – and their Seven Saving Graces!

In previous articles in this series, I have taken the opportunity to preach to you about some of the difficulties and temptations that can beset the unsuspecting business man or woman, as they wend their weary way towards the nirvana of buyiing that all important first microcomputer systemn.

But the completion of the purchase transaction is by no means the end of the road as far as the user's problems go. Instead the transition between installing the computer of your dreams in your office and the grim reality of actually trying to run a smooth steady operation can often be a pretty hellish experience.

Or as one disgrunteld user put it "It was just one damned thing after another".

For practical purposes the number of problems that can be encountered in trying to run a successful microcomputer installation can probably be divided into seven distinct categories. So bretheren, gather round for the text for my next sermon today will be *Microcomputer Printout's* version of the Seven Deadly Sins.

1 Filth

Allowing too much dust and dirt to get into a computer could result in expensive repairs.

The more devout amongst you will readily recall that the Bible devotes a lot of space to the importance of cleanliness. Well, just as it was important for the Twelve Tribes of Israel during their wanderings around the Sinai Desert, to always remember to wash their hands, so the same applies today to the computer operator.

Despite what you may read in advertisements and brochures about modern computers being "rugged", "go anywhere" machines, they are in fact still very sensitive pieces of equipment which can, quite literally, be ruined if they are not kept clean.

At a fairly obvious level cigarette ash, crumbs from sandwiches, drips and spills from hot drinks, and so on, are not going to do a computer any good if they get in amongst moving parts, such as the keyboard or printer. Likewise, if you allow a VDU screen to become contaminated by dust or finger-print smudges, you are likely to find your operators complaining (and there is medical support for this) that the impairment to vision is inducing eye strain.

Problems like these can be overcome relatively easily by regularly cleaning external surfaces and shrouding the system with dust covers when it is not in use. There are however, other forms of dirt that are far harder to detect and which can cause much more serious damage.

For example, on the average microcomputer, the read/write head on a floppy disk drive unit "flies" at about 100 millionths of an inch above the disk surface. By comparison, a fingerprint smudge or a smoke particle causes a blemish on the disk surface of about 250 millionths of an inch, whilst the average human hair creates an obstruction 3000 millionths of an inch in diameter.

The result of all this micro-mathematics is that when a disk head encounters pollution of this sort, it can, at worst, cause a "head crash", ruining your disk drives and perhaps costing several hundred pounds to repair, as well as preventing you from using your system in the meantime; and, at the very least, can lead to researched data being lost and errors appearing in your programs.

The problem is that both disks and disk drives, just like hi-fi systems, generate static electricity which attracts dirt and contaminants. Thus, to ensure the efficient functioning of a system, a user should adopt a fairly rigid regime regarding cleanliness to minimise the risk of contamination during both the handling and storage of disks as well as the operation of the hardware. Excessive smoking near a microcomputer, incidentally, is not only hazardous to the disk drives, but is also one of the fastest routes to a dirty screen. Various companies, Inmac is one that springs to mind, supply a range of cleaning materials and anti-static aids, and a first-time user would be well advised to consider buying some of them. But be warned, as you will find with most of the deadly sins, it is not cheap to fight dirt and filth.

2

Microcomputers 'eat' paper, ribbons and disks – keep well stocked up.

One of the most frightening features of any computer system is the amount of paper a printer can get through in a day. This is because most programs are designed to ensure that the printer only prints out the contents of one individual report on each individual sheet of listing paper or "continuous stationery" as some catalogues prefer to call it.

But, whilst this is all very good in theory, if you habitually produce just one or two line reports, then you will soon find yourself getting through paper at a furious rate. A busy company therefore should always ensure that it has ample stocks of listing paper to hand. If not you can almost guarantee that you will run out of paper just when you need it most. The same obviously holds true for any other stationery your system might use.

Paper then is one problem, but computers also consume a prodigious amount of other materials. Despite what the manufacturers say, printer "daisywheels" and "thimbles" lose characters and get broken with monotonous regularity. Printers also consume nylon and carbon ribbons at a rapid rate. And of course as your computer installation gets underway there will be a growing need for spare floppy disks as you key in more data.

With all these items it is possible to get hold of replacement stocks, but three things must be borne in mind:

– some parts of the country computer stationery supply companies are still very thin on the ground, so make sure you always have adequate stocks or else you could be sitting around twiddling your thumbs with your system idle whilst you wait for a delivery to reach you.

– ensure that you specify exactly what you want when you order your supplies. There are for example, literally dozens of different types of printer ribbon currently available. Many may look the same, but possibly only one will actually fit your printer. And the same applies with floppy disks – do you know whether you use "single sided, single density, soft sector" or "dual sided, double density, hard sector" disks?

– finally beware, once again, of the cost factor. It is a sad fact of life that stationery and supplies of things like printer ribbons for computer users cost around double that of the price of more conventional office supplies.

And do shop around – computer supplies, as with traditional office supplies vary considerably in price. Furthermore, there is no shortage of commission-inspired salesmen eager to get you to sign permanent supply contracts for quantities way in excess of your real needs!

3

Keep regular back-ups of your disks, or you could lose a whole database of information.

In any computer or software manual you will see frequent reference being made to the importance of regular back-up procedures, and in particular the need to keep up-to-date copies of both paper printouts and floppy disks.

The reason for this is not that the computer companies are looking for yet another excuse to sell you their supplies, but is in fact based on the quite commonsense principle that if disaster does befall your installation with, for example, a sudden power cut wiping clean your system's memory, or even something as mundane as the cleaning lady's Beddlington terrier running amok and tearing your customer name and address files to shreds, it will not be the end of the world for you or your company. Instead, you can smugly resort to your back-up copies and have your business once more running smoothly again within a couple of minutes.

With paper printout, probably one back-up copy of essential documents is all you need – indeed to have anymore would most likely start causing you storage problems. With floppy disks however, it is not unreasonable to keep up to three copies of each data and program disk. This is because a problem with a computer may be caused by something more serious than just a power cut, such as, for example, a damaged recording head, and it may take you a couple of times, with disks being ruined in the process, to discover it.

The one great problem with back-up procedures, particularly when it comes to duplicating disks, is that from the point of view of your operators it is "a fiddly, time-consuming drag". The result is many operators resent going through back-up procedures because it delays them from getting on with other jobs. And, human nature being what it is, this in turn leads to back-up procedures not being strictly complied with or even ignored.

As long as no disasters befall your system to doom your programs to oblivion, then this is no real problem, but if one does occur – then you are well and truly sunk.

4

Security against fire and fraud is essential to safeguard your business.

Closely allied to the previous Sin is the problem of computer security, for, having got all your back-up disks and printout, it is essential to have somewhere safe to store them, in particular against the risks of theft or destruction by fire.

To this end there are now a number of fireproof lockable cabinets available on the market purpose-built for the secure storage of all the documentation and data media associated with running a computer system. But, as no doubt you would expect, these cabinets can be very pricey. If however, you have an old safe in the office this will probably suffice.

Obviously fire is a risk any business must be wary of, but what about theft? I know we read a lot about computer fraud in the press, but who you ask would want to steal or tamper with the data related to your business?

In fact there are two aspects to this problem.

First of all there is the danger that something physical will be stolen. In one recent case a company connected with the aerospace industry found that a number of digital cassettes, which their computer used, had been stolen. The cassettes contained mathematical data relating to wind-tunnel tests which it had taken the company months to gather. This however was not a case of industrial espionage, it simply turned out that a passing window-cleaner had taken them under the impression he could use them in his car stereo system.

The second side of the problem relates to the contents of the data store on your computer. In most cases this will be both valueless and meaningless to anyone not connected with the management of your company. But even the most sedantry of companies have some secrets which could cause embarrassment if revealed to unauthorised personnel. For example, do you really want everyone to know just how profitable your business really is, or how parsimonious you have been with the annual salary review?

To tackle this sort of problem what you need is not physical protection for your floppy disks, but some form of in-built software protection. As regards this an increasingly popular remedy is to incorporate special user "passwords" into the programming so that only trusted employees can gain access to certain sensitive data.

5

Regular preventive main tenance can work out cheaper than waiting for the first major fault.

Having got your computer up and running, hopefully you will soon find that it comes to play a valuable role in your business. But as you grow increasingly reliant upon it, so it becomes increasingly important that it remains in perfect working order. For this reason no user should try to scrimp or save when it comes to computer maintenance, for in the long run it is very much a false economy.

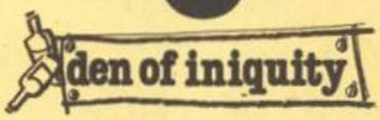
As one advertising slogan puts it "Why let a broken £6 item shut down £10,000 worth of computer equipment?"

Under normal terms of the contract by which you purchased your system you should be able to obtain assistance in the case of a breakdown. But this can lead to difficulties – it is not unknown for a computer user to find his or herself caught in the middle between rival engineers. Perhaps you recognise the situation – the computer engineer says that it is a printer fault, the printer engineer blames the software, the software engineer blames the hardware, and so on.

To counter against this type of dispute it is probably worthwhile taking out a maintenace contract with just one reputable computer "field service" company who can handle all aspects of the problem. And, while you are spending all this money – the annual fee for a maintenance contract is usually based upon a percentage, between 10-15%, of the total cost of the system – it is worth investing in a contract that will give you both emergency repair and routine maintenance cover.

As with any piece of equipment, prevention is the best type of cure so, rather than wait until a floppy drive head is so badly oxidised that you get a head crash, get the disk drive regularly serviced instead.

6



Microcomputers are happiest when kept in a healthy environment.

For many years the image of the computer room was that depicted in the Michael Caine film "The Billion Dollar Brain" – an enclosed sterile area peopled by well-scrubbed and white- coated programmers. In recent years the advent of the desk-top mircocomputer has changed all this, but the environment in which your system operates is still something that cannot be altogether overlooked.

Reference has already been made to the importance of cleanlinesss and in this respect it obviously follows that the best place to site a computer installation is in a clean and as far as possible dust-free room.

But there are also other factors to be taken into account. Through constant use a computer can start to run very hot and this can lead to mechanical failures occuring. It is therefore essential to ensure that your computer room has adequate ventillation to prevent an excessive heat build-up, or "thermal runaway" as the computer industry prefers to call it.

Closely allied to heat is the problem of humidity, for if a computer room becomes too dry and the humidity level falls too low, you can in addition encounter a build up of static electricity. Mention has already been made of the way static attracts dust, but rather more importantly it can also result in shock discharges which can disrupt your entire computer system, damaging hardware, erasing programs and contaminating data.

Currently the best way of dealing with low humidity induced static is to employ humidity meters coupled with humidifiers and anti-static sprays. Unfortunately there is another form of static around – that generated by your feet. In fact a 10-second stroll across an office carpet can generate in the region of 10,000 volts of electrostatic energy. Considering that 3,000 volt discharge is sufficient to wreck a computer system, as well as the obvious discomfort to the individual concerned, this can be quite a problem.

One remedy is for the computer operator to wear rubber-foam soled shoes. But these are hardly the most attractive form of footwear around and besides not everyone wants to look like a refugee from a gang of teddy-boys. Consequently, a better solution may be to invest in shock absorbant carpetting or earthed matting. Needless to say these are not cheap but there again neither is the alternative of risking your system being damaged by a static discharge.

7

To get the highest productivity, computers need 'managing'as much as people.

Anyone who has ever been involved with the more traditional end of the computer industry – the world of mainframes – will know that the average installation has a very intricate managerial hierachy. In fact it is a common criticism that many data processing departments tend to go over the top with their adherance to rigid "running procedures".

Look at any brochure for a microcomputer on the otherhand and you will see a totally different world of "laid-back Larrys" happily jumping around from task to task. A few minutes spent here processing a few wages, then slip in a different program and run off a few management reports. Then another change of program for a bit of wordprocessing, that is the image of running a microcomputer.

Well it is possible and many companies do it. And the result is that they often get themselves into the most horrendous of messes. Data gets filed on the wrong disks, vital pieces of information go astray and all those much-loathed back-up procedures get completely forgotten.

Thus at the end of the day the computer system fails to deliver the hoped for improvements in efficiency. Indeed some companies discover that the opposite occurs and that whatever department they have newly computerised actually gets through less work than it used to do during the course of a week. It always sounds like an apocryphal story, but there really are companies where the introduction of computerisation, far from creating redundancies, has resulted in new staff having to be employed to deal with all the queries and complaints created by the computer's work.

The Seventh Deadly Sin therefore is that whether you run a mainframe, a mini or a micro you ignore the management aspect of running a computer installation at your peril.

Despite their inherent flexibility, to get your best from a microcomputer you must organise your workload well in advance. You can dodge about from task to task, but it is far more efficient to devise a system whereby work is arranged either in "batches" – thus everytime you get twenty-five invoices to pay you process them; or upon a temporal basis – in otherwords if its Tuesday it must be payroll day.

Either way the fact still remains – a computer is not the panacea for a disorganised office. You must help it to help you.

And that bretheren brings us to the end of the Seventh Sin and closes the lesson for this month.

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machine code:
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PLUS Large screen versions of Invaders and Maze of Death, ready for when you get 16k.
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CASSETTE 2

Ten games in Basic for 16k ZX81

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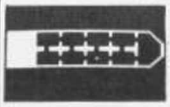
Cassette 2 costs £5.

CASSETTE 3

8 programs for 16k ZX81

STARSHIP TROJAN



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An adventure game.
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CUBE Rubik Cube simulator, with lots of functions including 'Backstep'.
SECRET MESSAGES This message coding program is very txlp qexi jf.
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CASSETTE 4

8 games for 16k

ZX-SCRAMBLE (machine code)

Bomb and shoot your way through the fortified caves.

GUNFIGHT (machine code)

INVADERS (machine code)

FUNGALOIDS (machine code)
GALAXY INVADERS (machine code)
Fleets of swooping and diving alien craft.
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Eat the snake before it eats you. Variable speed (very fast at top speed)
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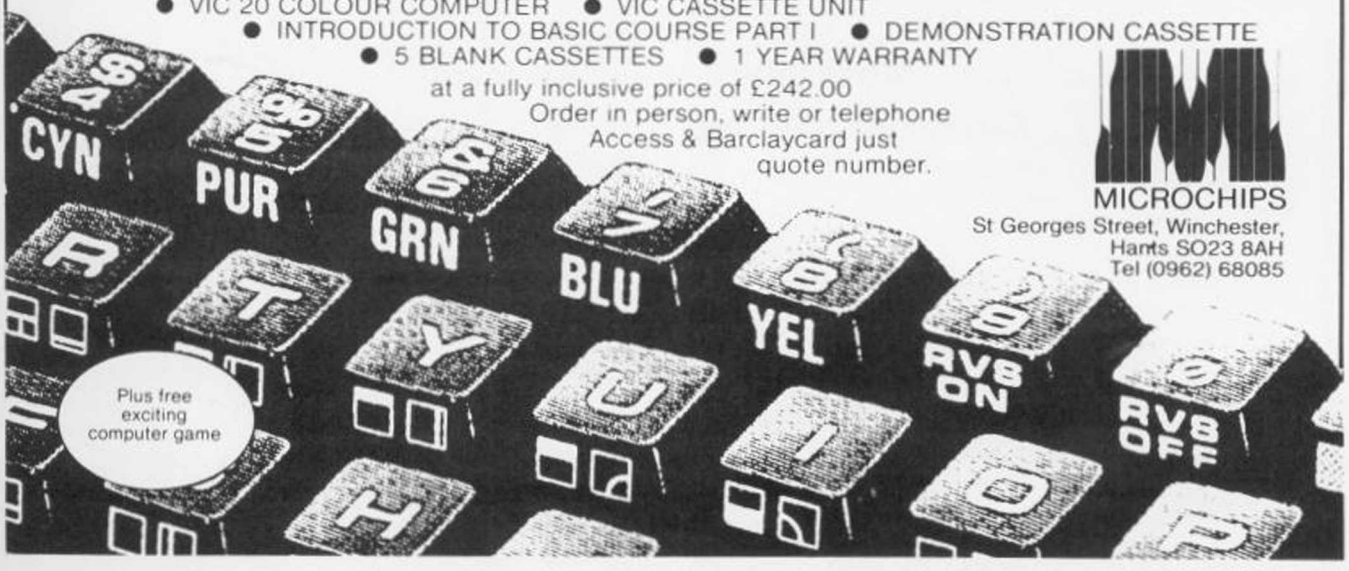

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TOMMY'S TIPS

Programming Problems Solved

Before we get down to the meat this month, I thought those of you who share my warped sense of humour might be amused by a little tale I have to tell. One of the drawbacks of my position is that I tend to receive large amounts of advertising bumph through the post. Some of it is interesting technically, but most of it is fit only for keeping my draughty garrett warm. However, from time to time, a little gem arrives which brightens up my day no end, such as a poster I had from Acorn, pushing their networking system for the Atom. The basis of this system is a number of terminals sharing a common disk unit under the control of a "'file server", and the poster shows a series of diagrams illustrating how the network can be used in the home, office, etc. The slight typo is in the section on use in the school, where the disk control unit is described as a "file *sewer*"! Perhaps this is a reflection on the sort of things school children use their micros for?

Highly accurate

Dear Tommy
Is there any way to increase the numerical accuracy of the PET? I find being limited to 9 digits rather limiting for the kind of work I do.
T. R. Greene

I am afraid that there is not much you can do without spending a lot of money or putting in an awful lot of work. Visicalc offers 11–12 digit accuracy, which is an improvement. One possibility is to add the CP/M system available from Small Systems Ltd., which allows you to use MBASIC, which can calculate to 16–17 digits. The problem is that calculating to a higher accuracy unfortunately means that your programs run more slowly, and occupy more space.

Protection racket

Dear Tommy,
I have written a suite of programs in CBASIC on the Research Machines 380Z and wish to protect these programs from being copied using PIP or copy programs under CP/M.
Perhaps you know of some machine code routine which disables any attempt at copying?
J.H.Bell

There is a huge amount of time and money spent each year by software houses trying to protect their products. Unfortunately, there is an equally large amount of time and money spent by people trying to crack these systems. It is unfortunately true that there is no country in the world whose copyright laws have kept up with technology over the past twenty or thirty years, and this applies to audio and video recordings as much as computer programs. Indeed, some countries have also no copyright or patent laws whatsoever!

Protecting programs is quite difficult. If you change the CP/M on your disk to inhibit the COPY program, what is to stop someone using the COPY program from another source? Even if you change the disk format, it is still possible to write a program to copy a disk. However, some bright spark amongst our readers may have come up with a system which he is prepared to share with us. The problem is that people who think they have discovered the secret are very reluctant to pass it on, because once somebody else knows how it is done, it can easily be undone!

Unnatural occurrences

Dear Tommy,
I have an Apple II 48K microcomputer, which incidentally I think is greatly under rated. That however is beside the point. My problem is that I am teaching myself BASIC programming, and I was writing a program which did some calculations for me, when I wanted to take the log of a number. To my horror I found that the machine only has a natural log! Also I can find no mention of an antilog! Am I missing something fundamental or is there a reason why these functions cannot be implemented on a micro?
D.Jarvis

Yes, this puzzled me for a while when I first had this problem! However, you can very often use natural logs instead of logs to the base 10. If you really do need a log to the base 10, you can use this formula:

LOG10 (X) = LOG (X) / 2·3026

where LOG10 (X) is the log to the base 10 of X and LOG (X) is the natural log of X. As for the antilog, EXP is just a natural antilog! If

Y = LOG (X)

Then

X = EXP (Y)

Simple once it's explained, eh? The trouble is not many people bother to explain it in their manuals.

Remaindering

Dear Tommy
Some BASICs provide special symbols to do integer division and remaindering, but my VIC does not. I have sussed the integer division part, but the remainder has got me stumped. Can you help?
T.Schofield

If we have two numbers, X and Y and want to do an integer division on them (that is like dividing four apples between three people: then get one each and one left over), we can say:

```
100 Q = INT (X/Y)
```

Having done this, we can find the remainder by adding line 110:

```
100 R = X – Y * Q
```

I must recommend this routine to the Editor for the *MicroComputer Printout* payroll: I always seem to get the remainder!

READ/WRITE

Arm Twisting

Dear Mr. Doyle,

I am writing to you regarding your article in the October issue of *MicroComputer Printout*, which concerns the Armdroid from Colne Robotics. Yes, a fellow sufferer, I too have constructed one of these things and I've not been without my problems.

Last year I decided to investigate robotics as my Engineering 'A' level project. Research showed that the Armdroid was probably the most suitable cheap mini Robot on the market. Therefore, we here at K.E.S ordered a kit (26.11.81). When, at the beginning of the Easter school term, it hadn't arrived we phoned Colne.

"Having some trouble; coming soon" was what we got (15.1.82). The kit still hadn't arrived on 1st February and so we phoned again. This time we had despatch guaranteed. The Robot did arrive 12 days later, but had some parts missing. Colne were informed of these missing parts as soon as they were found to be missing, and on 11th March we had a visit from Colne and obtained what we thought was the rest of our kit.

Asssembly of the mechancial components was then completed, (I, too, needed to buy a special pair of circlips) and so I started on the Interface and Motor (face?) boards.

Because of the difficulty in obtaining the correct ICs from Colne by writing, and phoning, the robot was taken up to Colne. Alas not by me.

Eventually the robot was working and we were given a cassette tape called MEMROB 4.0 which runs the robot from the PET.

For a few days all was well, until I wanted to know how the program worked. We were unable to break the program down into any comprehendable sections, so I wrote to Colne asking if I could visit them. I phoned to confirm this only to find that they had moved. I eventually got through to them and arranged to meet them.

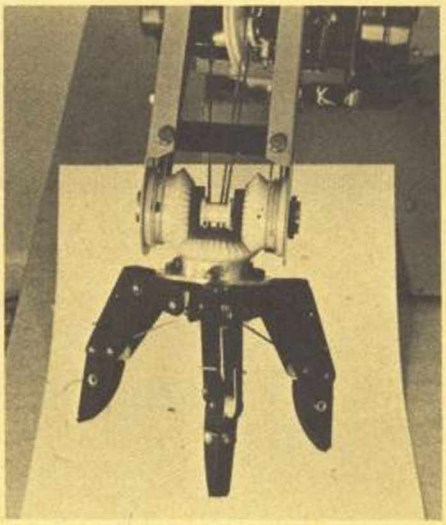
So I arrived last Wednesday afternoon with the Robot tucked under my arm, hoping for a simple BASIC PET Program to control the arm. Which is exactly what I got. Indeed, I got more: the Robots requirements from the computer I/O Port were explained (it helps when trying to write programs) and I learnt a lot about software requirement and the speed limitations of BASIC. I was given a demonstration of the robot working from a TRS-80, the smoothflowingness of the movements from this more highly developed software was impressive.

In all I spent a very worthwhile afternoon at Colne and am now able to write my own, unfortunately slow, BASIC programs to control the arm.

David Rix
King Edwards School
Witley, Godalming, Surrey

Makes you wonder how they ever made Star Wars, doesn't it? It would certainly appear that these home robot kits aren't quite as easy to manipulate as they seem.

We would like to hear from other robot arm users – particularly if anyone has come up with a useful applications program, or robot programming language. Mr. Rix did send us a copy of a short BASIC program which Colne now include in their manual.



Oaks of Righteousness

Can I risk the wrath to come by saying something nice about the BBC Micro in response to Mr. Steen's letter in the September issue? I was fortunate to be sent on one of Acorn's service training courses by my employers, and learnt at first hand about some of the early problems that delayed the model B. As a one time electronic equipment designer I have experienced similar horrors. There is nothing you can do when a prototype batch of components work perfectly, but none of the production components work. In my opinion Acorn did a fine detective job in locating the fault and correcting it.

There is a solution to Mr. Steen's problem, Model A Machines are available almost ex stock, (BBC Oracle p705), and most dealers can readily convert these to Model Bs in a few days. (I have used Oakleaf Computers at Grantham for machines purchased by my employers, and can heartiy reccomend them).

I have used both Apples and the BBC Micro, and for my money it really is a one horse race, with Apple left at the post. I do hope this is some consolation; we waited seven months for the first machine we ordered.

Geoff Cox
Gillingham, Kent

Agressive Programming

Ref: *MicroComputer Printout* October 1982 AGRESSION SIMULATION by H.Walwyn.

It was more an aggression STIMULATION, mainly because I had to debug this program for the better part of an evening!

If you drop 'GOSUB 2100' from line 4000 then you can see this unfriendly world in action on your screen. Enjoy yourself!!

E. De Ceukelaire
Belgium

Though you're not the only reader to have queried AGGRESSION, Mr. De Ceukelaire, we have double checked and it runs correctly as printed.

We can only suppose that you have an 8000 series PET and have interpreted the reversed 'S' in line 2100 as a Clear Screen. It is in fact a 'Home' cursor control.

Free stencil

Having been shown the free flow chart stencil which was distributed with your magazine this month, I did wonder if it would be possible in any way to obtain a quantity of these for use in the school. They represent a simple basic stencil which would be ideal for use in our computer studies and first year introductory course.

Perhaps you could let me know if it would be possible to obtain a quantity and the costs involved, or failing this I would be gateful if you could let me know the manufacturer so that I could contact them directly with a view to arranging a supply.

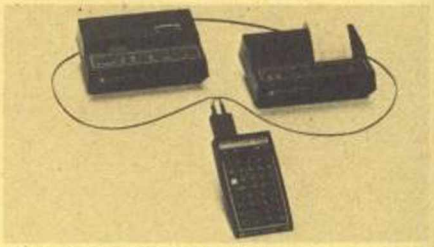
I.W.Stratford
Acting Deputy Head,
Bristol

First the good news: we do have a quantity of the flowchart stencils left over, and are prepared to send 30 free to any school or training organization. Just send a stout s.a.e to MicroComputer Printout *– marked 'Flowchart Stencils'. We do incidentally have some of the Programmers Crib Cards left, too, so indicate if you require these.*

Now the bad news: stocks are limited, so it's strictly first-come, first-served until we run out.

Pocket Power

I am about to pursue a degree course in computer studies and would be grateful if you would advise me on a micro I could use at home to complement my studies. The budget limit is £200 and I have made a short list of prospective candidates:- Sharp PC-1500, Sinclair ZX-Spectrum, Hewlett-Packard HP-41CV, Panasonic HHC also known as RLH-1000 and the Link, Epson HC-20.



I would be pleased if you would advice me on which of these would suit my needs best.

J. Williams
Merthyr Tydfil

No offence, Mr. Williams, but we really can't advise you on the best computer for your needs if you don't tell us what your needs are.

Presumably, as a budding computer scientist you will require the machine for programming – all the models listed are acceptable, but to be honest, you would be better off with a desktop machine that has good screen editing and can run more than one language. Portable machines can be great fun at first, but the novelty soon wears off as you get tired of the tiny keyboard. Unless, that is, you have a genuine need for pocket power. The Panasonic and Epson, incidentally, aren't generally available in this country.

Our advice: look at the wide range of colour home computers at £200, as indicated on our poster.

READ/WRITE

The Editor welcomes your letters, but if you require a personal reply please enclose an S.A.E.

Atari, Sweet & Sour

Having read Terry Hope's articles on the virtues of the Atari 400, I recently took a second mortgage out on my grden shed in an effort to purchase one. This decision was reached, after some 18 months of magazine reading (including your own), which finally left me in a state of confusion.

"Dixons" were the "victims" of my enquiry. Having just jumped on the snail-paced Atari bandwagon, their assistants were obviously completely void of any knowledge of the 'thing' other than you could 'RAM' in a 'ROM, cartridge, and pull away on the stick like it was 'Excalibur in the stone' and destroy the Universe with a few hundred 'photon balls'.

I told them that I already had a games console, so what else could it do? After reading all the available advertising, I purchased a 400 console and a 410 recorder and was told I would have to wait a few days for 'it' to arrive.

During this time, my son bought the September issue of another magazine (sorry about that), in which an article was printed comparing Atari with Texas instrument. From this article I realized for the first time I had not joined the ever-growing band of illiterate programmers, but had accquired an over-priced electric typewriter with no-where to stick the paper. On returning to the shop and realising that the 'BASIC ROM' cartridge was absolutely necessary to carry out any program at all, I complained that they could not sell the console at £199 claiming it to be a computer, because it could not compute until it had a 'BASIC' cartridge, which would bring the total price to £250.

Receiving no joy and plenty of stick, I took my case to the Consumer's Advice Bureau, from whom I have since received a letter supporting Atari and Dixons in the fact that no present advertising claims to supply the 'BASIC' cartridge with the console at £199, which was not my original argument, but one I must concede as fact. The following day I collected my Atari from Dixons, being forced to fork out another £49.95 for the 'BASIC' cartridge.

I wish to raise the following questions:-

1. Why are Atari damaging their chances in this competitive market by selling in this 'deceitful' way, when the product is so good that with proper promotion and a few more facts revealed, it would outsell all others even at £250?
2. Why can't magazines such as yours, present a guide to show 'laymen' such as myself, how much additional outlay is required to bring Home Micro's to a 'standard' level?

Finally having used the Atari for almost a month, the 'edge of my sword' has been almost blunted, and refer you to a 1981 advert which said "Give your child an unfair advantage at school". This statement is proving to be true, as my children are already beginning to stretch their minds beyond their years. I would not hesitate in recomminding the Atari 400 to any first time buyer, but you won't get it for £199.

ATARI I FORGIVE YOU.

K. Humphreys
Swindon, Wilts

Your letter raises a number of moot points, Mr. Humphreys, but let us set the record straight by pointing out that this situation is a relatively recent one. When Terry Hope began his series on Atari, the '400' was priced at £345 including *the BASIC cartridge. You cannot really blame Atari for quoting a price of £200 (a substantial drop in price) because this is the most competitive sector of the market.*

However, are they justified in calling a device which cannot be directly programmed in BASIC a computer? Well, yes they are – however much you dislike the idea. Many business computers require you to purchase the programming language and applications packages separately. And with the Atari 400, quite a few people purchase it purely to run prepackaged software.

As for the comment about the function of the magazine, we take that very much to heart. We do try to give as much practical guidance as possible – such as our article on sales brochures this issue, and the series on installing a business system. Evidently we must try harder!

Finally, your experience highlights what is going to become a widespread problem – Microcomputers being sold by shop assistants with relatively little training. We had some flak from dealers regarding our hideous September front cover, but maybe it wasn't far from the truth!

Cheap Words

I was disappointed with the Article on Word Processing in the September, 1982, issue of *MicroComputer Printout*.

It mentioned that a person could expect to get a pretty good program for around the £250 mark. However, in June 1982 at the Commodore Show I purchased, for £150, a program called Wordform 11, which has most of the advanced features mentioned in this Article. It has Maths function, Document Orientation, concurrent printing etc., and is very user friendly, as I required no support when using it.

Perhaps John Derrick could do justice to this program, by examining it and commenting on it.

Albert Dawson
Dublin 14, Ireland

Several readers phoned or wrote to ask why we hadn't covered their particular favourite program. There are, in fact, a number of excellent packages costing less than £100.

We felt, however, that low-cost Word Processing is generally a different subject to business WP. The overlap between the two types of package is considerable – so we make the distinction on the kind of printer you intend to use.

WP packages under £100 tend to go hand in hand with dot-matrix printers, while more expensive programs are usually treated to proper daisy-wheel printers.

We shall be doing a major feature on the whole subject of budget WP shortly – in addition to the series on business applications for home computers.

Scissors and Paste

Your colleague John Derrick with anonymous helpers did a good job on daisy-wheel printers for under £1000 – I wonder if I might have some advice on a word-processing system for under £1500? My first application involves my work as a TV writer and Director. Reports, treatments and scripts drafted first (Parker 61 on Conqueror culled gratis from other peoples' mail-shots – beautifully tactile) and until utterly illegible. Then a first type, much scissoring and a second and third and so on. A classic case of the text-editing requirement.

But not of heavy duty – so why the disparagement of the tinplate Smith-Corona? It should cope with a twelve-page four-typings job once a fortnight, should it not? And then why not a light-duty computer and VDU – all I can see the need for is 80-character lines and being able to handle the necessary program – and a single disc drive looks as if it would do? Please bear with me if this a lot of naive rubbish, but I should appreciate a view.

Second application is of about ten semi-personal sales letters per week, accompanied by two completely standardised fact sheets. The local WP bureau charges 50p a time for that, including named addresses and envelopes – £250 p.a. to be saved there. Is that other than light duty? – notwithstanding that a second disc would make it easier.

Third application is minimal accounting, currently occupying my wife for about an hour a week.

Is this feasible?

John Morris
Solihull, West Midlands

The guideline for low-cost daisy-wheel printers is: are you expecting more from what is really a converted typewriter than you would from a finger driven typewriter.

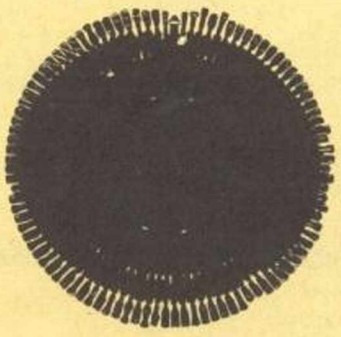
In your case, the answer is no – you are really using the word processor for its editing facilities, so you will be alright with the Smith-Corona.

Semi-personal sales letters would be no problem to most WP packages – you don't even have to have a disk at first if your needs are very light. Accounting, too, should be straight forward – but check that a package exists to do exactly what you want.

One of our contributors is currently evaluating a system comprised of the following:-

Vic-20 & Cassette Deck
Wordcraft 20
T/P 35 Printer

With the whole system coming out at less than £1000 this represents a very good low-cost entry into word processing.



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Gives extra commands: Auto, Number, Help, Delete, Change, Trace, Step, Light Pen, Break etc.
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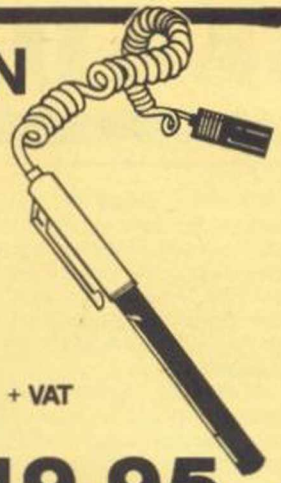
Gives Save, Memory Display, Load, Verify etc.
Similar to TIM on PET.

Examine the VICS ROM

Needs DAMS RAM/ROM board or similar

£19.95 + VAT

LIGHT PEN



VIC LIGHT PEN

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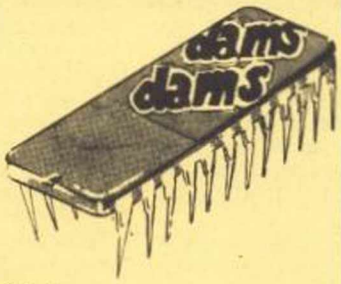
£17.35 + VAT

FOR PET 12" SCREEN **£19.95** + VAT

VICMON

THE ULTIMATE PROGRAMING AID FOR THE VIC



Full machine code package with:
Assembler, Dissassembler, Fill, Re-locate, Identify, Exchange, Compare, Printing, Dissassembler etc., etc.

Needs DAMS RAM/ROM board or similar

£19.95 + VAT

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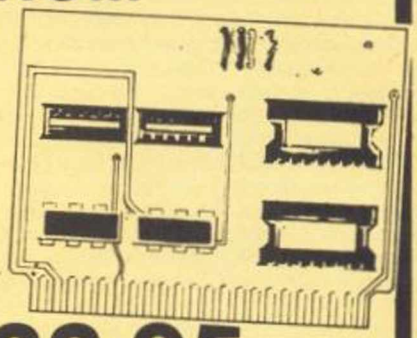

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40 Column
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C2N Cassette Deck, 10 Blank Cassettes, User Manual, Vic Programmers Reference Guide, 1 Joystick.
Worth £238.30 ONLY £214.00 +VAT

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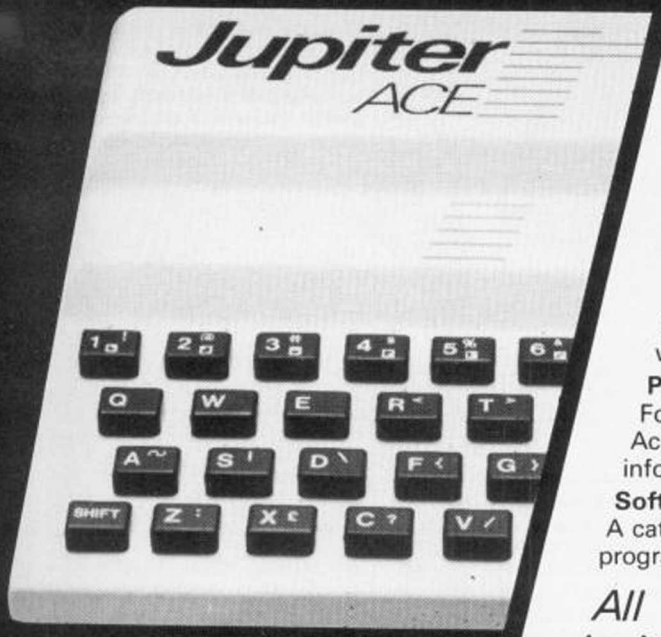
Jupiter ACE



The Jupiter Ace uses FORTH

The Jupiter Ace personal computer runs in FORTH, an easily understood language, typically four times as compact and ten times as fast as BASIC. Before the Ace all personal computers used BASIC and FORTH was only available to a privileged few. The Jupiter Ace also features a full-size moving-key keyboard, high-resolution graphics, sound, floating point arithmetic, a fast and reliable cassette interface and 3K of RAM.

Available soon

Plug-on parallel printer interface.
For around £20.00 this will connect your Jupiter Ace to anything from high-speed dot matrix to letter-quality daisy wheel printers.

Plug-on 16K Memory Expansion
For around £30.00 you will increase the memory of your Jupiter Ace to 19K giving you instant access to enormous amounts of information.

Software
A catalogue will be sent with every machines, and includes, initially, programs for education and entertainment.

All inclusive price

For £89.95 you receive your Jupiter Ace, a mains adaptor, all the leads needed to connect to most cassette recorders and T.V.s (colour or black and white), a software catalogue and a manual.

The manual is a complete introduction to the world of personal computing and a course in FORTH programming on the Ace.

Even if you are a complete newcomer to computers, the manual will guide you step by step from first principles to confident programming.

The price includes postage, packing and V.A.T.

The Jupiter Ace is backed by a full 12 month warranty.

only £89.95

The **Jupiter Ace** is available only by mail order.
Please allow up to 28 days for delivery.
Send cheque or postal order with the form to:—
JUPITER CANTAB, 22 FOXHOLLOW
BAR HILL, CAMBRIDGE CB3 8EP

Technical Information

Hardware
Z80A running at 3.25 MHz.
8K bytes ROM
3K bytes RAM

Keyboard 40 Moving-key keyboard with auto repeat on every key and Caps Lock.

Screen Memory mapped 32 column x 24 line flicker-free display with upper and lower case ascii character set.

Graphics Chunky graphics (64 x 46 pixels) may be plotted, unplotted or over-plotted (XOR operation). Also, the entire character set (128 characters and their video inverses) may be redefined allowing intricate shapes to be drawn with a resolution equivalent to 256 x 192 pixels.

Sound Internal loudspeaker may be programmed to operate over the entire audio spectrum.

Cassette Programs and data in the compact dictionary format may be saved, verified, loaded and merged. Blocks of memory can be saved, verified, loaded and relocated. All tape files are named. Running at 1500 baud, the Ace will connect to most portable tape recorders.

Expansion Port Contains D.C. power rails and full Z80 Address, data and control signals. May be used to connect extra memory and other peripherals. IN and OUT words allow port-based peripherals to be addressed.

Data Structures Integer, Floating point and String data may be held as constants, variables or arrays with multiple dimensions and mixed data types. There are no restrictions on names.

Control Structures **IF–ELSE–THEN, DO–LOOP DO–+LOOP, BEGIN–WHILE–REPEAT, BEGIN–UNTIL,** all may be mixed and nested to any depth.

The Jupiter Ace closely follows the FORTH 79 standard with extensions for floating point, sound and cassette. It has a unique and remarkable editor that allows you to list and alter words that have been previously compiled into the dictionary. This avoids the need to store screens of source, allowing the dictionary itself to be saved on cassette. Comprehensive error checking removes the worry of accidentally crashing your programs.

ORDER NOW!

Please send me:—

☐ JUPITER ACE MICROCOMPUTER(S) @ £89.95.

Name. Mr/Mrs/Miss

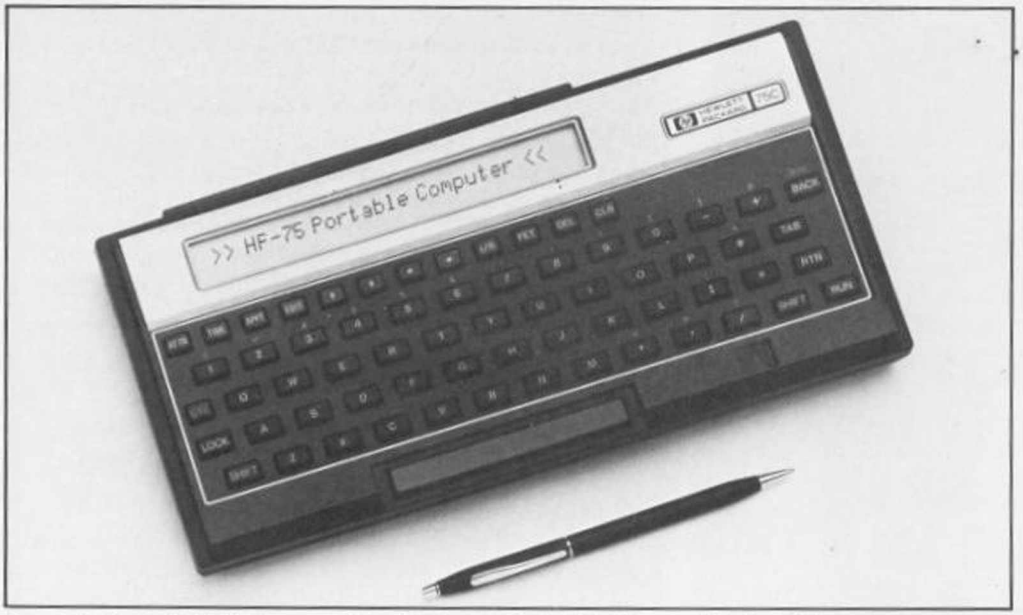
Address

B

Designed by Jupiter Cantab

Computer Designers Steven Vickers and Richard Altwasser played a major role in creating the ZX Spectrum and then formed Jupiter Cantab to develop advanced ideas in personal computing. The Ace is the result, another all-British computer to lead the world.

Small is Beautiful



Dunno about you, but this is the pocket computer I have been waiting for.

It is small: 10 by 5 by 1 1/4 inches.

It is light: just 26 ounces.

And best of all it comes from Hewlett-Packard. Which – alas – means it won't be cheap. And at £693.71 it isn't.

H-P aim their calculators and computers at engineers, as hard-to-please a bunch as you are likely to find anywhere. In consequence the hallmark of their products is extraordinary attention to detail.

The HP-75C is no exception. Take a few points at random.

Turn it off and you don't lose the contents of the 16K RAM memory.

The operating system and BASIC – what makes it actually compute – are permanently there in ROM memory. There is also room for up to three more ROM modules to be plugged in to customize it for dedicated applications.

Despite its size, the keyboard design is such that you can actually touch type on it. Every key is 'soft', so you can re-define the layout if you don't care for it.

My one reservation is the screen, a 32-character window that can be moved along a 96-character line. As liquid crystal displays go, this is the best quality. The characters even have true descenders.

But for me, 32 characters isn't enough for one line, and one line isn't enough for a screen. But no doubt within the limits of existing technology, this was the best that could be done.

H-P's solution to the problem of keeping off-line mass storage portable was to use a magnetic card-reader. You pull the card through and up to 1.3K bytes of program or data are loaded into RAM per card.

An interface loop has been built in so connection to other Hewlett Packard peripherals and, indeed, computers will be possible. A T.V interface will also be available.

Another nice touch is the provision of a real time clock. So you can key in appointments, and the HP-75C will keep and flash a reminder at the correct time and date.

Power comes from rechargable nickel-cadmium batteries for which H-P have promised a range of plug-in 'software-pacs' of programs covering finance, surveying, data analysis and electrical engineering. It is also likely we will see VisiCalc and several other generic applications programs.

Church of England — jape

My jolly jape at the expense of the Church of England (*C of E to adopt Space Invaders*) in the last issue seems to have taken on a life of its own.

Being the only piece of apparently straight reporting in the whole column, I had rather assumed that its tongue in cheek nature would be readily apparent. Not so.

My trespass upon clerical territory has been justly punished by a barrage of telephone calls from Angry of East Grinstead (anti-ecclesiastical space invasion), Progressive Clergyman (pro invaders) and national newspapers (professional curiosity).

What set me thinking was the refusal by several of the aforementioned worthies to accept that it was no more than a gentle jest. One churchman, at least, remains convinced that a cover-up is in progress.

So how feasible is the computerization of the Church of England? Rather more than I had dared to imagine, it seems.

And to add injury to insult, a working party apparently has been considering certain aspects of this. Not that they were about to admit it to us however.

Not to be outdone, we set up our own working party, soliciting contributions from such well known ecclesiastical experts as Desperate Dave Tebbutt and Martin Legless Banks. It will be some time before the working party is clever enough to report, but I can reveal that a sermon generator is entirely practicable and that Compass Design really do have the Bible stored on floppy disks (on an ACT Sirius 1, since you ask).

Similarly Russett Instruments genuinely do have printers that can generate old English text.

The solemnizing of marriages is, as the Reverend Apple has shown, possible, if not legal in this country.

Furthermore, Martin assures me that his trusty TI99/4 does a passable bazaar opening when the speech synthesizer is working.

In fact, the only clerical function we have been unable to computerize satisfactorily is the drinking of tea.

Life, the Universe & everything

There is nothing a boffin likes better than bewailing a lack of standards. Indeed there is a thriving industry solely devoted to said lack, which merrily churns out books, seminas and conferences on the subject.

It is all balls, of course.

The microcomputer industry has plenty of standards, thank you very much. CP/M continues to dominate the 8-bit world; MSDOS looks set to do the same for 16-bit; while UNIX is pretty clearly going to be the sine-qua-non of multi-user systems. And that's just the operating systems.

No matter which of these operating systems you choose, versions of the superstar applications programs will be available. The publishers of *Word Star, VisiCalc, MicroModeller,* and *dBASE II* all acknowledge the existence of standards, so why can't the pundits?

It is no longer even true to claim that hardware standards don't exist. Every other press release that thuds on to the editorial desk, describes a very wonderful new 8-bit computer. And you know what? Those press releases all *seem* to be describing the same system: a Z80 A-based machine with 64Kbytes of RAM twin mini floppies, CP/M operating system, and Microsoft BASIC.

Except, of course, they are all from different manufacturers. And if that isn't a standard, I don't know what is.

There are several powerful reasons for buying a standard system. If so many manufacturers think it is the right route to go, then there is at least a fighting chance it is.

With all that competition, prices should be pretty keen too.

And with lots of compatible systems on the market, there should be lots of applications programs to choose from. In fact there is no *should be* about it at all. At the last count there were more than 250 packages running under the newish MSDOS, and perhaps ten times that many for the old established CP/M.

A case in point is the new *CP/Genie* just out from Lowe Electronics. Sure enough it boasts 64K of RAM, 13.5K of ROM, a twelve inch monitor with a 64 character by 16-line format, and CP/M.

The *Genie* having started life as a Chinese copy (literally; it is made in Hong Kong) of the Tandy TRS-80, it is no great surprise to discover that the *CP/Genie* still runs TRS-80 programs, themselves a sort of mini-standard. Price £1175 + VAT or £999 + VAT for the single disk version.

So next time someone blames anything on a lack of standards in the industry, punch him in the mouth!

by Julian Allason

A bit of a needle

Nothing is better calculated to enrage a microcomputer distributor than an announcement that another distributor is being appointed to his supposedly exclusive territory.

At one time Intertec had almost as many 'exclusive' distributors for its *SuperBrain* as it had dealers. Even Apple indulged in distributor-bashing in the early days.

Last month it was ACT's turn to discover that their *Sirius* distributorship was rather less exclusive than had been thought.

This discovery was prompted by the arrival of a near identical computer called the *Victor 9000* from D.R.G Business Systems. The Victor is in fact the very same machine as the ACT Sirius 1, made in the same factory, but given a different case. It will sell here for the same price – £2395 + VAT

When Chuck Peddle was setting up his Sirius Systems Technology company, $6m of the investment came from a massive American conglomerate called Kidde Inc. In return Kidde's subsidiary Victor Business Systems got the rights to distribute the Sirius under the name Victor 9000.

Victor, it must be said, have not been notably successful in promoting the system in the US. Great hopes are pinned on the UK , however, where as the ACT Sirius 1, it has become the best-selling 16-bit computer.

D.R.G's first move after being appointed Victor distributors, was to offer a bigger discount to dealers. ACT's response was to commit to matching any terms offered by D.R.G.

ACT agree that Chuck Peddle has promised that they will get new peripherals and software four months before Victor distributors.

As if to underline this claim, ACT have unveiled a new low-cost high-capacity *Winchester Sirius* for business users. It offers a 10 Megabyte hard disk built-in alongside a single 1.2 Megabyte floppy. Price ? A modest (by Winchester standards) £4395 + VAT.

According to the over-the-top press release I have here, the *Winchester Sirius* will simultaneously store the entire literary output of Kafka, Witgenstein, Machiavelli and Enid Blyton.

Look familiar? Victor 9000 – a Sirius by any other name.

Piracy gets expensive

Your columnist's innocent slumbers were rudely interruped by a transatlantic telephone shortly before we went to press.

The caller was the delightful Mary Miller of MicroPro, with news of an historic legal vitory over software piracy. [Yankee Legal Note: all *truly* expensive lawsuits are considered historic in America, until the judgement is overturned in a higher court].

MicroPro, publishers of *Word Star*, together with Digital Research, had alledged copyright infringement based on unauthorised copying of their programs in a suit against Data Equipment Inc. of Sunnyvale, California.

Federal Judge William W. Scharzer handed down a stipulated final judgement of $250,000 plus legal costs, which must have made Data Equipment's eyes water. Their Chairman, one Daniel M. O'Rourke, was ordered to pay MicroPro and Digital Research $30,000 personally.

The flood gates will now be open for a tidal wave of piracy suits thinks MicroPro's President Seymour Rubinstein. "Piracy is an ominous cloud on an otherwise profitable industry horizon", he said. "Our success in Federal Court should be taken as a sign that software manufacturers will now act aggressively to protect their own products against all unauthorized duplication".

In plain English that means they will sue the pirates pants off.

Polaroid's Colour Graphics Printer

"What," asked my friend, Electric John, "is the most interesting thing about this story?" His nicotine stained finger tapped a recent *Inside Trader* report about Sony's forthcoming Marcia camera.

"First time anyone has tried to store photographs on floppy disk?" I ventured.

"Wrong!" ruled Electric John. "It is the first time *Sony* have put their name on a camera. That's the real significance."

Now Electric John is a man who knows a transistor from a transducer, and indeed is something of a pathfinder in his particular branch of electronics he is also a considerable camera buff.

So it will be interesting to know what he makes of my next piece of news, once he gets back from Parkhurst, where a small matter relating to £600,000 and an electronic alarm which mysteriously failed to go off, temporarily detains him.

Suppose for a minute you were Dr. Edwin H. Land: you had pioneered instant photography, first in black and white, and latterly in colour. Your Polaroid system had succeeded so well that with a little help from Kodak, it had saturated the instant photography market. What would you do then? Damn right! You would investigate computers, after video piracy, the fastest growing market in the world. And you would look for a gap in it.

Well, that is exactly what Dr. Edwin H. did, and he spotted a gap the size of the Mexican National debt, and set about filling it. *Hard Copy Colour Graphics.* If you have ever thought how nice it would be to have a permanent record of a colour screen display, and then discovered just how difficult hard copy is to achieve in colour, well then you have blundered into the same gap as Dr. Land.

The worthy doctor's solution is the Polaroid *Video Printer* Instant Colour Film Recorder Model 4.

Plug it into the back of your computer, load a pack of 4x5 inch film, or even the impending Polaroid autoprocess 35mm film, and you are in business.

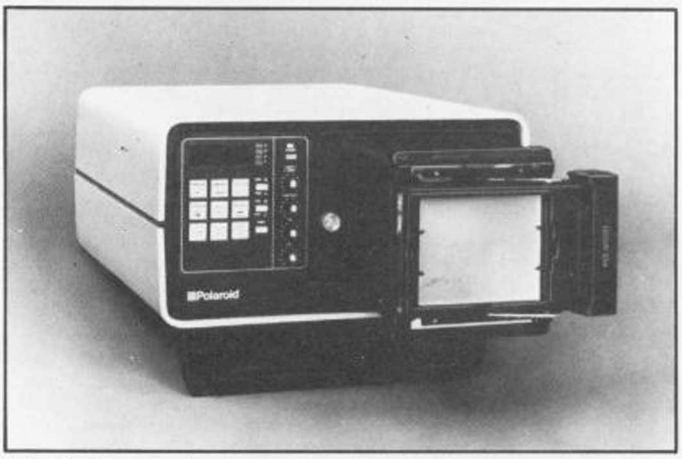
The problems of raster scan lines, unfocussed colours overlapping and so on have been overcome by feeding your computer's video signal directly into the Video Printer. What you are *not* doing is photographing your own screen, which is probably way out of adjustment anyway.

Since it is the video signal that is being used to generate the photograph, albeit in an analogue rather than digital technology, it should be possible to generate colour photographs from black and white images.

That, I have it on good authority, is precisely what the American National Security Agency have been doing to black and white sattelite pictures using the *Video Printer Model 4's* big brother, the *Model 8.* At the moment both systems look like bearing a £3500 price tag – or thereabouts – when they make their appearance here shortly. Not exactly a petty cash item. But despair not, as Polaroid prices have a way of coming down to consumer level once the initial demand from the Scientific community has been met.

Of course, the real signifance of this story is that it is the first time Polaroid have put their name on a computer peripheral.

Am I right, Electrtic John?



Instant colour snaps from your screen with Polaroid's Video Printer

Electronic Mail (Part 56)

Sometimes fate plays strange tricks.

Here we have Prestel, steadily collapsing under the weight of its own bureaucracy, desperate, you would have thought, for new markets, yet resolutely ignoring the one that could have saved it. That's you lot by the way.

It must be the best part of a year since we attempted to point this out to the Buzby lot. The silence, as you will know if you read my open letter to them last month, was deafening. (They even managed to deliver the letter to the wrong person!).

At last, however, there is news that the penny has dropped. On second thoughts, make that £500,000 because that's the amount earmarked for a new scheme called *Micronet 800* dreamed up by several old micro hands in conjunction with British Telecom.

The essence of it is a massive new database, comprising some 30,000 Prestel pages of games, business and educational programs which can be down loaded onto personal computers.

To do that you will need a telephone and a Prestel adaptor, costing somewhere between £50 and £100 depending on your computer. The subscription will be about £1 a week, although there will be telephone charges to pay on top of this.

Tantalizingly, both electronic mail and telex facilities are promised. Ditto armchair shopping and access to various news and information services.

It all sounds great, and my only reservation is about the name *Micronet*, already used by the second largest Stateside micro computer network; but that's a small quibble.

Much, of course, will depend on the quality of the software offered and the ability of the *Micronet* people to persuade the likes of you and me to subscribe. This sort of scheme needs lots of subscribers and software authors to contribute, in order to succeed.

Practical Computing's experience in this area proved less than happy, but lower access costs may just do the trick. Let's hope so, because we *need* electronic mail, and Prestel's a sure gonner if *Micronet* fails.

We will be taking a closer look at *Micronet 800* when it gets off the ground in January. In the meantime you can get more information from them at 57a Hatton Garden, London EC1N 8JD (tel 01-242 6552).

If you can't wait until January, another alternative is the *Torch* Business Computer, which has its own built-in modem to plug it directly into the phone network. One day all computers will have built in modems.

The *Torch* can automatically dial other numbers, re-dialling it if it gets the engaged signal or the speaking clock. (This is just as well, I get the speaking clock everytime I telephone my stockbroker). Prestel connection is a cinch. Details from 20 Orange Street, London WC2H 7ED or ring 01-930 1612. If, by chance, you get through to my stockbroker, tell him to ring me.

STOP PRESS: No reply as yet to my open letter to British Telecom.

Son of VisiCalc

Having single handedly created the Spreadsheet program market with *VisiCalc*, it's always puzzled me that VisiCorp should have so easily given up their lead.

It was ages before a PET *VisiCalc* surfaced - and back in 1979 half the personal computers in Britain were PETs – and a CP/M version never did. Madness!

And when more powerful competitive products like *SuperCalc* made their inevitable appearance, VisiCorp seemed to ignore both of them, and users demanding that various niggling deficiencies be put right.

VisiCorp have now put these right, and added some useful new features in the *VisiCalc Advanced Version*.

The thinking behind it seems to have been to enable the problem solving power of the electronic work sheet to be spread throughout an organization.

This is done by creating pre-formatted 'templates' for estimates, budgets, forecasts and so on. These templates can then be circulated throughout the organization for others to fill in the blanks.

Once the figures are filled in, the program performs all the calculations you have built into the worksheet, and displays the results.

Various anti-dumbkopf measures have been incorporated, including (at last!) protected cells to prevent accidental loss of information.

Hidden cells can now be created, to allow information not intended for the shop floor to be incorporated without becoming public property.

Initially *VisiCalc Advanced Version* will only be available for Apple IIIs with 128K of RAM and at least one disk drive and printer.

I hope for their own sake that VisiCorp can move a bit quicker with versions for other machines this time round.

More for Less

Suppose you were asked to specify a design for a low cost personal computer, what would you ask for?

Colour, for sure. With reasonable high resolution graphics. Probably a 24 lines by 40 character display, although 24x80 would be nice for word processing.

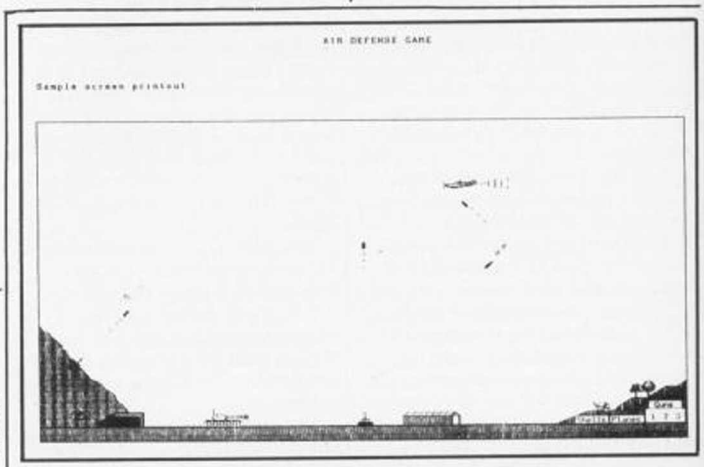
Lots of memory would be essential; 48K bytes of RAM at least, in order to leave a good 16K to play about with in hi-res colour mode. You would also want to be able to expand internally to 192K or so.

CP/M compatability goes without saying these days,, so we are talking about a Z80A microprocessor for the CPU. While we are at it, we will need an RS232 port for connecting printers and the like.

So what does all that add up to?

A *Lynx* believe it or not. And it will be on sale next month at £225, inc. VAT., from Camputers (I kid you not) Ltd., 33a Bridge Street, Cambridge. (tel 0223-315063.

Clever people Camputers. They must have read our minds.



The ACT Sirius is a business computer, right? For business men. Serious chaps in horn-rimmed spectacles and pin stripes. Who wouldn't dream of using those 800x400 pixel high rsolution graphics for playing games.

Especially not games that involve shooting down bombers attacking tanks and anti-aircraft emplacements.

So clearly no-one is going to send off £17.25 to J.R. Ward Computers at 35 Potters Lane, Milton Keynes for a copy of Air Defence.

They are not, are they? Go on, tell me I am not wrong, someone....

by Julian Allason

A word with the Guvnor

Interview with Bill Gates of Microsoft

"Microsoft BASIC" are the magic words that greet over a million personal computer users when they switch their systems on.

Microsoft, the company that made BASIC famous, have gone on to offer the widest range of systems software and languages available for micros, making its young founders Bill Gates and Paul Allen very rich in the process.

Rumour has it that much of the credit for the extraordinary success of the IBM Personal Computer is due to Gates. Julian Allason and Richard Pawson talked exclusively to him on a fleeting visit to London.

Bill Gates, legendary founding father of the microcomputer software industry, is 27, megarich, and wearing a suit two sizes too large for him.

The airport hotel suite into which he leads us is clearly intended for the megarich, and is also two sizes too large for him.

Microsoft, as part of their grand UK opening, have been conducting a seminar for European manufactuers and O.E.M.s. Bill has just come from addressing this crowd, and bears the look of a man who would rather be back at his keyboard.

Microsoft were literally the first company set up specifically to write software for microcomputers.

Back in 1975, Bill, then only 20, had astonished the creators of the first personal computer, the MITS Altair by writing a BASIC Interpreter for it. "In fact when we first brought Microsoft BASIC up and running the people at MITS were extremely surprised at what their machine could do," he grins.

Allen and Gates went on to put together a family of high level languages for 8-bit microcomputers: COBOL for business programming; FORTRAN, primarily for scientific applications; Pascal for both systems and educational work; and a BASIC compiler that mirrors the famous BASIC Interpreter.

Latterly Microsoft has moved into two new areas, operating systems, and what Bill calls Multi-Tools, of which the first, a sort of super *VisiCalc* spreadsheet program called *Multi-Plan* has just been released.

MicroComputer Printout:

"Does this mean that Microsoft will become a software publisher selling applications programs written by outside individuals?"

Gates:

"No sir. Microsoft's job is to provide the tools which hardware manufacturers and applications software houses need."

"Sure, we will be placing great emphasis on the multitools, but these are generic applications – things like Word Processing, Spreadsheet and Database – which aren't specific to a single application."

"We have *MultiPlan* out now – that's our spreadsheet. I don't want to say too much about the others, although they will be here soon. I will just mention Charting and Filing as being two of the generic applications we will be covering."

"How do you see the market moving in during the next year?"

"Very fast. We'll be emphasizing 16-bit because that's the way it has to go. The extra cost of using a 16-bit microprocessor is extremely low. Fortunately with the right tools, software can be developed just as quickly as the new chips and additional users needs arise."

"Microsoft can already offer software solutions for *all* the 16-bit microprocessors: 8086, Z8000 and MC68000. At the time we are also continuing to update and provide support for our 8-bit products."

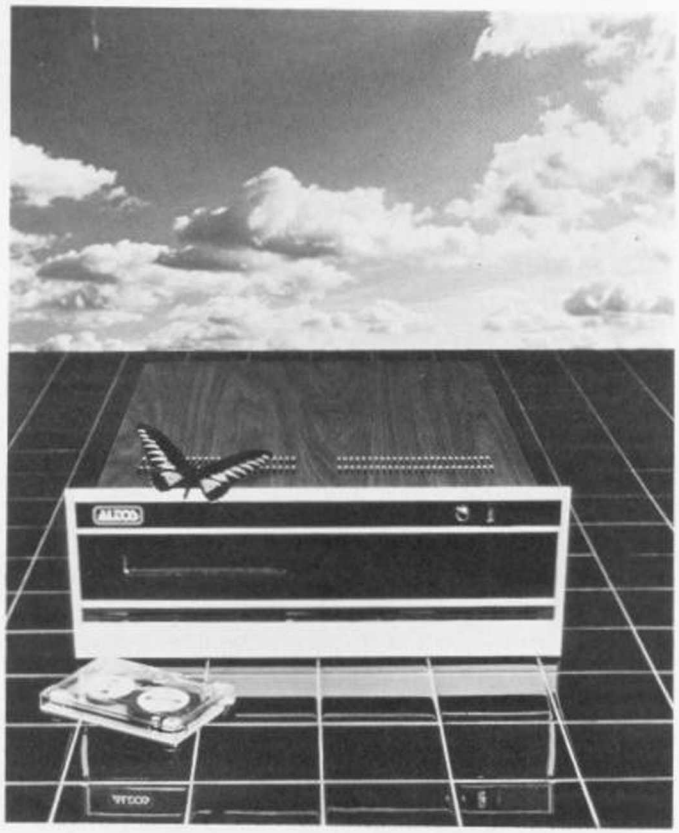
"Who else do you rate in Software?"

"Well, there is Digital Research of course, and Peachtree who worked pretty closely with us during the IBM P.C. project."

"The only other applications people I think are really serious are VisiCorp. Mind you, their Visi-File, Visi-Plot range is awful. It doesn't demonstrate the integrated family approach we believe in: in fact it hasn't even got a unified command structure."

"VisiCorp's Data Interchange Format has been hailed as breakthrough..."

"It's a joke – extremely low level.



Rolls Royce for Multi-Users

The question computer journalists dread is the one asked most often: which computer should I buy? Often advice on home computers and even small business computers is no longer such a problem. It is in the multi-user area that the going gets difficult.

In part this is due to the relatively limited choice available; in part also to the fact that most of the established systems are now showing their age a bit.

Altos have always been respected as a well engineered family of 8-bit computers intended for serious business use. The arrival of a new 16-bit generation of *Altos* systems must put them pretty near the top of anyone's shortlist, if it's a powerful multi-user micro they need.

Up to eight users cans share the processing power of the new ACS 8600 systems, which are based on the Intel 8086 microprocesser.

Microtex, (119-120 High Street, Eton, Berks), are offering two basic *Altos* systems with 512KB of main memory, upgradable to 1 Megabyte with either 20MB or 40MB of hard disk storage plus floppy disk back-up. The 20MB system costs £10,625; the 40MB system £12,325. Both configurations can be doubled in capacity!

The family sport no less than four operating systems including *Xenix*, Microsoft's version of *Unix 7*. The others are *CP/M86, MP/M86* and *Oasis-16*.

Teach yourself CP/M

I have distinctly mixed feelings about MicroCal's new interactive training package *'Hands-on CP/M Operating'*.

It is nothing to do with the package, you understand. Indeed if it is half as good as their *Hands-on CIS COBOL Programming* course, it will be excellent.

I just can't help feeling that it shouldn't be necessary in the first place.

According to MicroCal's blurb "this course is designed for the inexperienced CP/M business machine *user*, and is ideally suited for anyone requiring microcomputer experience, from a *clerk* using an accounting package, to the *executive* using a financial planning package, or the *secretary* using a word processing system..." [The italics are mine].

No mention of programmer, you note, who might reasonably be expected to have to get involved with the operating system.

But it beats me why clerks and secretaries, or – perish the thought – executives should have to grapple with CP/M. As Bill Gates remarked (see *"A word with the Guv'nor"*), operating systems ought to be invisible.

Since at this juncture CP/M is all too visible, perhaps I had better tell you a bit more about the course, which also covers such topics as 'An Introduction to Computer Hardware,' and 'Information Processing Concepts.'.

The part of the course that deals directly with CP/M splits the screen into two halves, a CP/M simulation taking place in the top half with the tutorial running underneath. The student is asked to enter a CP/M statement to perform a specific function on the top half. When this duly causes a CP/M error condition, the tutor software tells you where you went wrong, and the top half demonstrates the CP/M response.

Versions of the program are available for most machines running CP/M or CP/M86, price £70 + VAT from Microcal at 36 Elm Road, Windsor, Berks (tel: 07535-68009).

Roll on the day when you don't *need* a course to operate a computer, say I.

Max's Micro

Your correspondent passed a mainly alcoholic August lunchout attempting to prise Max Hughes' big secret out of him.

I am sorry to have to report that the closest I got to success was in prising out of the laid-back laird of Icarus the promise that his new machine "would have all the features the *SuperBrain* should have had by now".

Since Icarus are one of the principal *SuperBrain* distributors here, this was a surprising observation.

Max's micro when it was duly unveiled in September, proved to be as close a copy of the as yet still (officially) unreleased IBM Personal Computer as we are likely to see. The keyboard is even made in the same factory.

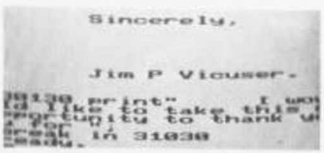
The only difference I could detect was a colour CRT controller card and the presence of eight expansion slots instead of the five in the IBM PC. Max aims to sell lots of special expansion cards, which he won't be able to do if there isn't room.

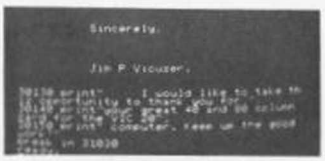
Of course, the main purpose of carbon copying IBM is to take advantage of all that software that everyone is writing for the 8088 + MSDOS or CPM/86 combination. And one thing Max's Micro is, is compatible.

After all that big build-up I had better tell you that it's called the *Columbia P.C.*, costs £2800 + VAT for the standard dual mini floppy, 128K RAM model, and a competitive £4550 for one with ten megabyte Winchesters built-in.

Max and his micro live at Icarus Computer Systems, 27 Greenwood Place, London NW5 1NN. (Tel: 01-485 5574).

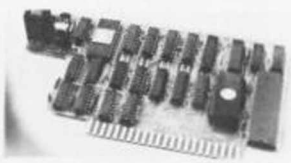
80 Columns for VIC





The Commodore took one of his all-too-frequent hammerings when the VIC-20 first came out. The 22 character screen width was no good to man or beast, said the critics (this column amongst them). The Commodore merely nodded sagely and counted the cash coming in.

I still think 22 columns isn't enough, and I am not even sure that 40 is either. Most word processors assume 64 or 80 characters to the line.



Were it not so expensive, I would probably send the folks at Computer World (Hilvertsweg 99, 1214 J B Hilversum, Holland) a cheque for $249 (U.S.) for their 40/80 character expansion board. As it is, £150 sounds like rather a lot, so I will probably sit tight and see what the Commodore decides to charge for upgrading VIC-20s to VIC-40s. [*Note for thick readers:* that is a hint. The Commodore is actively considering just such a scheme... but don't tell him I told you.]

by Julian Allason

Libel Corner

Advice for readers by our legal correspondent, Martin 'Legless' Banks.

Have we libelled you recently? We have? Pray allow me to offer you some sound advice.

Magazines hate publishing apologies; most would rather run the risk of a libel suit.

With that in mind, the best way to obtain redress is to write an *interesting, entertaining*, and preferably *humourous*, letter of rebuttal for publication. The Editor might even be man enough to admit he made a mistake, or some other idiot did.

Don't complain to the Press Council, which is totally toothless, and whose existence the Editor, doesn't acknowledge anyway, but may well serve to annoy him, none-the-less.

Do *not* send a solicitor's letter, unless you are whiter than white. It is the magazine's policy to harrass complainants, and the first thing that the Editor will do is unleash some serious professional investigative reporters to dig up the real dirt on you.

Do *not* sue. We have yet to lose a libel suit, and our insurers can stand the costs better than you can.

Remember this is an irresponsible publication run by unprincipled yobbos. Anyway, if we libelled you in the first place, you probably deserved it.

If you are still mad enough to want to sue us, writs should be addressed to our legal advisors, Messrs. Garcia, Galtieria and Gomez, C/o Banco Reliabilo, Plaza del Gringos, Buenos Aires.

Fujitsu have been making very large computers for years. The experience shows in the detailing on their first contender for the personal computer market, the Micro 8.*It has no less than three microprocessors; twin 6809s (sort of souped up 6502s) to handle the 640x200 resolution 8-colour graphics and a Z80A CPU to run CP/M software. Loaded from disk, Microsoft BASIC takes up 32K of the 128K supplied. I was interested to see that provision has been made for bubble memory as well. Details from Minichip Ltd., Enterprise House, Terrace Road, Walton, Surrey. (tel: 09322-42777).*

Forces pin-up

How did British forces in the Falklands keep track of Argentine prisoners? Using their *DMS* program on a Commodore 8032 PET, according to Heather Kearsley of Compsoft.

If I were the lovely Heather (she of the admired legs), I am not sure that I would be publicizing this particular application, seeing as how much confusion over the actual numbers of prisoners there was at the time.

DMS is a useful system none the less, and one which has gone from strength to strength since distinguished former editor, Terry Hope, good naturedly took its documentation apart. Terry has now incidentally found his true vocation running the dodgems at Messrs. Balls Bros. Circus.

But back to *DMS*, which has just surfaced as the first piece of fully compiled British Software for the IBM Personal Computer. Price? £400 + VAT.

What does it actually do? Er, just about everything really. Its main function being the keeping of records of every conceivable sort.

Since I first saw the package, a letter-writer program has been added. This enables any number of letters, up to a maximum of 88 lines in length, to be typed onto the screen, saved and recalled at will. In short, it is ideal if you want to mailshot standard letters to the unfortunates whose addresses you hold on file.

The lovely Heather's telephone number is 0483-898545.

DMS, plus IBM PC, but not, alas, the lovely Heather

Alas poor Oric

[Editor's note: In the absence of Julian Allason on a fact finding mission to the Algarve, the following report has been compiled by his butler, Rodwell, who is of Irish descent.]

Hallo, there. Is this thing switched on? Testing. Testing. 1... 2... 3... 4... This is Rodwell at your service. Now, in the asbence of the master, I have here a piece of paper entitled 'New Micro to Challenge Sinclair', whoever he may be.

It pertains to one of these new computer microchip things that be putting everyone out of work. This one rejoices in the name of the *Oric 1*, to be sure. No doubt in memory of Hamlet's own faithful butler, the discovery of whose skull provides such a dramatic counterpoint to the intimations of mortality suffered by his master in Act II.

This Oric is designed by Dr. P. T. Johnson, an Irish name if ever I heard one, who, according to his boss, is "without doubt the best mircocomputer designer in the UK, probably in Europe and possibly the world". And the Universe too, I shouldn't wonder.

Sales of 50,000+ are anticipated at £99 each, inclusive of the pernicious value added tax. For this sum you will be pleased to receive 16K of RAM, no less than 16-colour graphics, and somthing called Microsoft of BASIC, which I am sure will be a pleasure to you. The screen display is to be 24 rows of 40 characters, which sounds like a Connemara Jury, and it will be teletex/viewdata compatible.

There be a dedicated sound chip, and 57 moving keys as you can see in the picture.

[The picture unfortunately suffered an accident during the decanting of some whisky – Ed.]

Also a 48K RAM version will be available for £169 plus V.A.T.

How was that, son? And when do I get paid?

Spectrum Software

With 50,000 odd *Spectra* (oh, alright, *Spectrums)* sold since the launch in April, Uncle Clive would have to be insane to ignore the software market.

Uncle Clive being demonstrably sane, Sinclair Research has just released twenty one office, educational and games programs for the *Spectrum*.

In amongst the usual crop of *Space Raiders* and *Planetoids*, (both £4.95), are some serious business programs in the shape of Psion's Vu-File and Vu-Calc - both at a most reasonable £8.95.

ICL authored five educational programs on *English Literature, Inventions, Music, History,* and *Geography*, plus the distinctly uneducational *Biorhythms*. (The latter is a complete con by the way; biorhythms enjoy about as great a standing in the scientific community as strip poker). The ICL cassettes cost £6.95. All from Sinclair Research, Stanhope Road, Camberley, Surrey.

CLOUDBURST
meteor run
Renaissance
SPIDERS OF MARS
satellites and meteorites

5 More great VIC Cartridge games from Audiogenic

Available from all VIC dealers or direct from Audiogenic Ltd. PO Box 88, Reading, Berks. (0734 586334) Credit cards accepted. Meteor Run, Renaissance, Spiders of Mars, Satellites and Meteorites £24.99, Cloudburst: £19.99 (inclusive of VAT and p&p). All titles copyright UMI INC represented in Europe by Audiogenic. Send for full catalogue.

"I don't expect end users to walk around saying 'I love Xenix'. They won't even be aware of it."

You will never get a standard for exchanging information just by going to the lowest common denominator.

"How did Microsoft's involvement with the IBM Personal Computer come about?"

"About three years ago IBM took a hard look at the microcomputer market. What they saw was a great number of companies and a great number of microcomputers, and the only common element that they could isolate amongst all these machines was that every single one of them was running Microsoft BASIC.

"This made them realize that software *did* play a key role in microcomputers and would play a key role in the system they wanted to put together."

"Being IBM, they had several teams working on different P.C. projects, which, I guess, is how there came to be such conflicting rumours of what the P.C. would be like."

"At any rate one day I got a call from IBM. Could they fly up from Boca Raton, and see us?"

"They were in a real hurry. They brought 14 people with them, so they could carry on simultaneous meetings about hardware, software, marketing and legal matters."

"IBM usually take four years to complete a project. But they realized that the market was moving so fast they would have to complete this one in a year. And it was exactly a year from the day we first met until they unveiled the Personal Computer to the press. In that time we delivered them over 14 major systems programs."

"What happened after that first meeting?"

"We actually sent them to see Digital Research, who do CP/M. Digital Research's founder, Gary Kildall, is a friend of mine, and we didn't really have the right operating system ready to go then. So I sent the IBM people down to talk to Digital Research."

"For some reason Gary chose to go off flying that day, and his wife decided she wouldn't sign their non-disclosure agreement. So the IBM guys sat there all day, in their white shirts, waiting for Gary to turn up. About three o'clock they got fed up and came back to see us, and said would we do it."

"So Digital Research threw up the chance of an exclusive with IBM?"

"That's right. Digital Research later pressured IBM to make CP/M86 available for the P.C; they agreed for political reasons, but they don't support it. Only our MSDOS is officially supported!"

"What sort of state was the Personal Computer in when IBM came to see you?"

"Actually it was an 8-bit machine then; just another me-too Z-80 based system."

"I thought that was kinda boring and anyway we wanted to do something awesomely different – all bit mapped."

"Anyways, we persuaded them to consider the 8088, and ended up doing MSDOS for them."

"What about the 'Bug that ate Boca Raton'?

"Oh yeah, the famous double precision multiplication bug. That's Bob O'Rear's bug. Actually, it only ever comes up once in 2 to the power of 24. We fixed that pretty darn quick. I was on a plane to IBM's Boca Raton facility within three hours of that surfacing. It was kinda embarrassing, but inevitable really. You can't totally test software in that area, although we sure try."

"People's imagination about how to use computer is very limited at present.... It's exactly like when TV first came out, everyone behaved as if they were still on the radio."

"Did IBM get anything wrong with the P.C. in your view?"

"That's hard for me to say as the design has a lot of things we suggested in it. But it has only got 2 slots, so the amount of RAM is limited. The 8088 can address up to a Megabyte – that's 16 times as much as an 8-bit CPU and the single most important reason for going 16-bit."

"We reserved 0 to 512K bytes for user RAM, but we will probably now increase that to three quarters of a Megabyte."

"Which computer would you choose if you had to go out and buy one?"

"Well, I see pretty nearly all the new ones while they are still under development, and there are some pretty good ones coming that are real small, but with decent sized Liquid Crystal Displays."

"But of what's available now – excluding the IBM P.C. – I like the Sirius very much. It's got things in it like the Codec voice synthesizer which no-one has even begun to use yet. Incidentally, all Sirius systems software and languages are going to run under MSDOS in future."

"We also have a *Fortune* for 68000 work; its an important machine because it actually has a degree of performance and memory space capability even beyond that of the IBM P.C. and Sirius."

"We also have one of the *Xerox Star* systems to let the development personnel play around with some of the advanced user interface ideas we think are going to be very important in the future."

"We put State-of-the-Art systems into our daily operation. Anyone who visits Microsoft for instance, will immediately notice that we don't keep paper phone messages. We're actually using an electronic mail system built on top of *Xenix*, our *Unix*-based operating system. In fact, there are multiple *Xenix* machines at Microsoft. Those are the machines we use for development, but most of the people sitting at the terminal are not development employees, but actually managers and support personnel who are exchanging messages across this electronic mail system."

"What new surprises have you got up your sleeve for us?"

"I have got to be careful what I say here, but I will give you a clue; non-keyboard input devices."

"I am very interested in improving man-machine bandwidth."

"Don't laugh. I am serious!"

"Can you be more specific then?"

"Well, I will admit that we have been experimenting with touch screen and joystick devices, and we are doing something in speech recognition as well."

"Digital Research later pressured IBM to make CP/M86 available for the P.C.; they agreed for political reasons, but they don't support it."

"People's imagination about how to use computers is very limited at present. You have got people doing word processing, spreadsheet, playing games. But that's about all that people are doing. Just little pockets of good things."

"It's exactly like when TV first came out. Everyone behaved as if they were still on the radio. It took about fifteen years to discover what you could actually do with the technology. It takes a long time to realize quite what you have got."

"Chuck Peddle realizes this. That's why he put the Codec in the Sirius."

"We are at the point now where devices like this, and the things we are working on will make the machine much easier to use."

"The major missing element at the moment is software. If you take graphics, in which I am extremely interested, you see this. On most computers, the characters are a fixed size, and mono-speed. The only machine with the ability to totally change this is the *Xerox Star*."

"Are you saying that the computer should become almost invisible?"

"Yeah. Take our *Xenix* operating system. Its structures are such that the user can network properly without getting involved in all the internal stuff. MSDOS 2 shows very heavily the influence of Xenix, incidentally."

"It's actually a beautiful system, but I don't expect end users to walk around saying 'I love *Xenix*'. They won't even be aware of it."

WHEN YOU HAVE 637 PROSPECTS TO REMEMBER YOU NEED OUR ELECTRONIC CARD-INDEXING AND RETRIEVAL SYSTEM

Many people know Henry VIII had six wives. But few are aware of his 637 girlfriends. Poor Henry! Is it any wonder he laid about them with an axe. Just imagine trying to remember all those first names, addresses, birthdays, pigeon hole numbers and personal details.

With CARDBOX, Caxton's new electronic card indexing system, keeping and retrieving information is simplicity itself. Not only could Henry have found his ladies but he could have kept tabs on all those barons, bishops and bowmen. (Rent demands would have gone on time, confiscations would have been orderly and executioners would have been selected to suit every occasion.)

And he wouldn't have had to understand a thing about computers. CARDBOX looks like your favourite card index on the screen. You draw the card yourself. You decide where you want lines. You make up your own headings. And you fill in the details.

At this point CARDBOX stops behaving like a flat inflexible card. It becomes multi-dimensional electronic paper. You can change any information you want. You can retrieve portions of information. You can print out all or selected information from your cards.

You talk to CARDBOX in plain English. You search your records on key words or on selected criteria. CARDBOX acts like a sieve, sifting through the records reducing the number until it finds only those that meet your needs. You display records on your screen or print them out in a format of your own design. Label production for mailing is simple. You can also use CARDBOX with some of your favourite wordprocessing packages, eg Wordstar.

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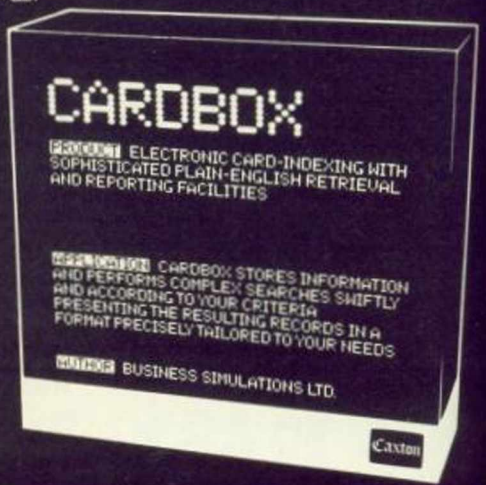

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database

Even the most casual glance through any of the micro-computer magazines will reveal a vast number of advertisements for "Database" systems. The newcomer to computing may be puzzled by these packages – what are they, what can they do? The experienced computer user who is now using micros rather than larger computers may think he knows the answer, but will probably be surprised by what he finds behind the glossy image of these "do it all" products.

There is little doubt that databases are currently in vogue. New database packages are constantly appearing in the marketplace, each launched with a fanfare of publicity and wild promises that this is the one you've been waiting for. Databases, so we are led to believe, are going to revolutionise your computing activities and solve all your problems in one fell swoop. Sadly, this is unlikely to be the case. Indeed, there are some applications where a database will only make matters worse!

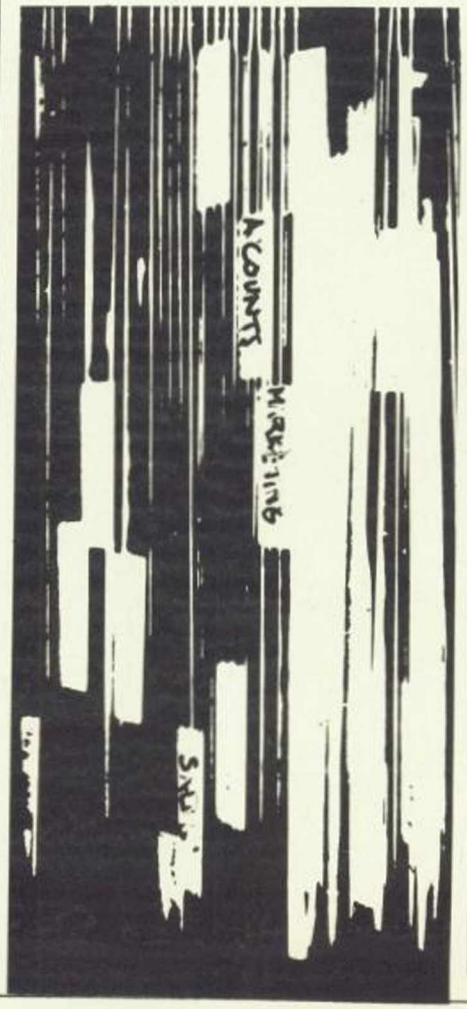
So just what is a database anyway? Unfortunately, trying to define this simple word is rather like trying to push water up hill. The word "Database", especially in the field of micro-computers, is increasingly being used as synonym for "a file containing information" which is unfortunate because it rather misses the point. A slightly better definition of a database is "a collection of information stored in some organised fashion". It is important to recognise that this definition implies that the data stored can be of many different types and may be kept in a number of different computer files (or even over a number of different computers spread over the country).

The classical definition of a database, taken from the days when the Commodore PET was just a gleam in Chuck Peddle's eye, goes something like this – "A generalised, integrated collection of data which is structured on natural data relationships so that it provides all necessary access paths to each individual item of data in order to fulfil the differing needs of all users".

Varying requirements

Whilst this definition is somewhat opaque in it's prose it does introduce several important ideas which we should add to our previous rather simplistic definition. Firstly, there is the implication that the datbase exists to support the varying information requirements of several users. These 'users' need not be different people, merely the same individual doing different things. The second concept is that the user can access the same information in many different ways, depending upon his requirements at the time. Each 'user' of the database should be able to look at the same information in a manner that is appropriate to his own specific requirements. This ability to support different "user views" of the overall volume of data is one of the features that that sets the true database system apart from the many pretenders.

In mainframe computing circles, the term 'Database' is very tightly defined. In the field of micro-computers, however, database can mean any thing more sophisticated than a file of information. Steve Prentice looks at a number of pckages which are sold as Databases, and explains which type would be most suitable for your business.



In reality, there are very, very few packages available to run on micro-computers that can really be considered as database systems in the accepted sense of the words. However, to say that is to attempt to duck the issue. If all these packages are not database systems, what are they? The simple answer is "File Management Systems" and "Data Management Systems". File Management Systems are the simpler of these. They usually allow the user to perform simple data entry and retrieval operations on a single file of information containing just one type of information (corresponding to a single record type). A typical use for this type of system is a list of names and addresses – the ubiquitous mailing list.

Slightly further up the ladder comes the "Data Management System", offering a rather greater range of facilities. These systems provide the user with a means of collecting data from the screen, and often from other sources (perhaps word-processor files) as well. Often the user will be able to set up quite complex screen formats to make data entry much more accurate, perhaps including the options of validating the entries as they are made. Having entered the information the user will be able to create formatted reports to the the screen or printer, using all, or just part, of the data, as selected by a variety of criteria.

Data management

The Data Management System will usually allow the user to store different types of information by allowing several different files to be accessed, although there may be a limit on how many may be available at any one time. However, the user will almost certainly have to know the structure of each of these files in some detail in order to extract the information he requires. This category covers the vast majority of so called database systems available for use on micro-computers. Typical examples include dBase II (from Ashton-Tate) which has almost become the de facto standard "database system", FMS 80 (from DJR Associates), DMS (from Compsoft) and Condor (distributed in the UK by MOM systems). All of these systems fall into this category at various levels. In fairness it must be said that these are all very good packages, but they're not 'Database Systems' in the true sense of the words, because they impose too many restrictions upon the way the user perceives the data items.

The true Database system should offer the user true data independence. This means that the user should never need to know how the computer stores the various data items and thus his own 'user view' of the data should never be dictated or constrained by the system itself.

Whilst Database Systems are undoubtedly very powerful and flexible systems for storing and manipulating data they are certainly not simple. A full database system comprises a series of files to contain the actual information

itself, together with additional files to store information about the information (I told you they weren't simple!) and a series of programs called the Database Management System (or DBMS for short). The original idea was that the DBMS would be used by programmers to create application programs for the less gifted mortals who had to use the thing! Consequently, the usual DBMS contains a series of "building blocks" and utility programs from which the programmer can rapidly create a program to fulfil the specific requirements of the task in hand. Programs created in this fashion were built more quickly (and cheaply) and were usually more reliable than a program written entirely 'by hand'. When the requirements changed, they were relatively easy to modify to meet the new requirements. These programs were written in the standard computer languages (e.g. COBOL, FORTRAN etc.) which meant that the DBMS had to interface itself to these languages.

Non-programmers

Then along came micro-computers and suddenly everybody decided that a database wouldn't be a bad thing at all. The only problem was, they didn't want to learn languages like COBOL, so DBMS's started to include "Query languages". These allowed the non-programmer to access the data without actually going to all the all the trouble of writing a program. However, they placed quite a strain

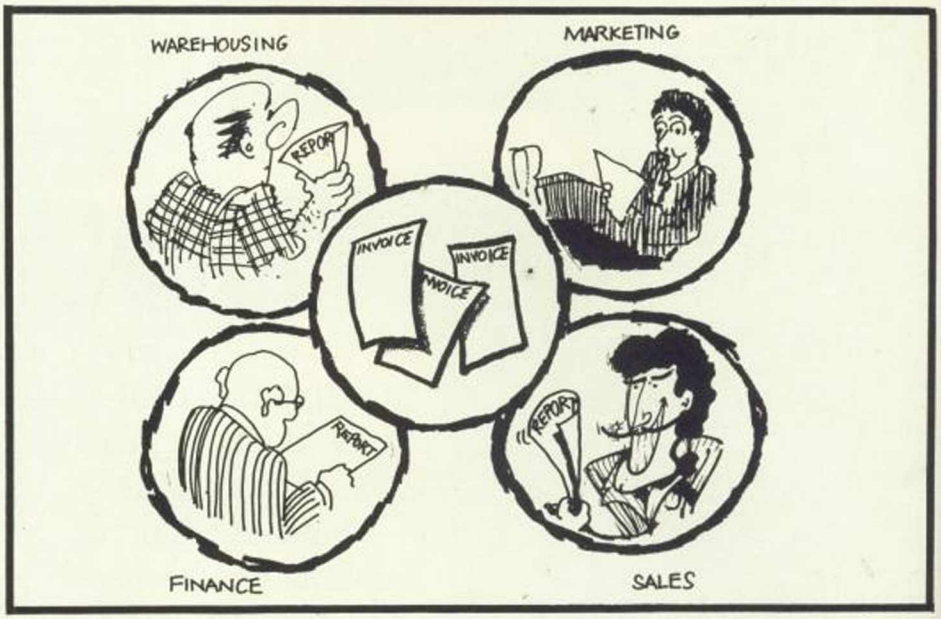


Figure 1: One of the most important concepts of a Database system, is that it can support different "user-views" of the same information. Take, for example, a file of invoices, which contains information on customers, goods sold, date and values. By extracting information in different ways, it is possible to produce specific reports for the Marketing, Sales, Finance and Warehousing departments.

Warehouseing **requires the total number of each item sold over a specific period for stock control.**

Sales **are concerned with the monthly sales value accumulated by each customer.**

Marketing **is concerned with breakdowns of sales by area, or type of goods.**

Finance **uses information about date and values for credit control and management reporting.**

FMS-80

FMS-80 is an American package although it has been available in the UK for a considerable time and hence is well supported by a number of major dealers and distributors.

It claims to be a comprehensive system covering the spectrum of operations from Database Management to applications program development. This is achieved primarily through EFM (Extended File Maintenance), which is a powerful if somewhat complex data manipulation management language.

The system is basically menu-driven although many of the facilities can also be accessed as stand-alone programs. A useful HELP facility is available that allows the user access to any text file so 'on-line' help facilities can be tailored by the user to suit his/her own requirements. The manual is large and comprehensive, if a little heavy going at times.

Without the use of EFM the user is restricted to accessing one file at a time, although each file may contain up to 255 fields and 65,535 records. The usual range of field types are supported although there is no 'date' type field available within the data file itself. The system stores a date for use with reports etc. and this can be specified in several formats, a distinct improvement on the usual American-only style.

Defining the database initially is straightforward if a little clumsy at times (the editor system uses 'D' for DOWN etc. rather than the standard WORDSTAR control keys. The user must also define at this stage which field is the primary key and which other fields will also be indexed. Data entry is carried out by an interactive process to create an update file and then actual insertion of the records into the main data file is carried out in batch mode. Once records are entered they may be amended by using the interactive QUERY system, but this does not allow new records to be created.

Retrieval of data is also carried out via QUERY. Retrieval is relatively simple and searches can be carried out even on unkeyed fields, although there are problems associated with the use of inequality conditions on numeric fields. There is a separate report writer system which offers adequate facilities for all normal use.

The real flexibility of FMS only becomes available through the use of EFM which is certainly very powerful although I am somewhat sceptical about it's suitability for the absolute beginner as the suppliers claim in the advertising! With EFM the user may access up to 19 files at once and write simple (!) programs to perform all conceivable operations on the data. One big disadvantage of EFM is that, within programs, fields are referred to by number rather than name. This means that if the database is reorganised and the field order changed, all programs will have to be edited. There is also a facility called SHELL-80 which allows conventional CP/M commands or programs to be integrated into the EFM command stream although the use of the standard CP/M facilities of SUBMIT and XSUB would also allow most of these facilities as well.

The most peculiar thing about FMS is the way in which default sizes for things such as line width in reports are set up in LOCATE.SYS by using dummy 'file' extensions. The same system is also used to specify which disc drives various files will reside on. I found this system distinctly confusing, it could be a disaster area for the raw beginner!

FMS-80 is undoubtedly a powerful package if full use is made of EFM. It takes up some 240 Kbytes of disc space if all the facilities are available on-line. A simpler version (FMS-81) is also available without EFM and a simpler report writer. This can then be upgraded at a later stage once the user finds this necessary.

dBase II

dBase II from Ashton-Tate has virtually become the de facto standard for micro-computer data management systems. It is a stand alone system (i.e. no links into other languages), although the system will both read and write standard CP/M files for use by other systems.

The user is restricted to working with two files at once, each with a maximum of 32 fields, 1000 characters per record and 65,535 records per file. The user can index the file on any field, or group of fields (including parts of fields) although numeric fields must first be converted to character strings before indexing. When you bring a file into use you can specify up to seven index files associated with the main data file and these will then all be kept up to date when records are added, deleted or amended.

Defining the database structure in the first place is very straightforward although, like most packages, changes are not quite so simple once you've actually loaded some data into the file.

Data entry (and editing) can be done interactively or from files. In the interactive mode entry is via a simple form on the screen, with full cursor control (the WORDSTAR standard controls) implemented. Deleting records is also possible this way, with the added advantage that they are not actually lost forever until you issue a PACK command.

Retrieval of records is similarly simple, with the ability to search on any field. Retrievals via an index are faster, but it's very useful to not have to depend on the existence of one. The Report writer facilities are certainly adequate, although not exceptional.

More complex input, editing and report generation can be performed by using command files. These contain longer sequences of the dBase command language, with the addition of logical structuring (IF – THEN – ELSE type commands). The command language is sufficiently powerful to allow most operations (although it needs a certain amount of effort to learn properly). The most annoying aspect of using these command files is the need to go outside the dBase system to create them (with any editor) and then re-enter

on the somewhat meagre computing power of smaller computers so that restrictions were placed on the format of data (thus resulting in the Data Management Systems discussed previously). As the system developers got better at writing these query languages they included more and more facilities until the Query languages themselves became more complicated than the conventional programming languages they were intended to replace!

If this situation were not confusing enough in itself, we then have the new generation of Data Handling program generators to consider. Program Generators such as "The Last One" and "Personal Pearl" (if one ignores the more outlandish claims for them) offer of many of the facilities of the Data Managfement Systems. Indeed, it is very difficult to differentiate between these two types of package. The tight data structures and powerful query languages of systems such as FMS80 and dBase II make them better as application program generators than as true database systems! Suffice it to say that these program generators can do most of the things that a Data Management system can, they just go about it in a rather different way. For some users they may represent a far better investment – however, that is a subject that we'll go into in much greater depth in a later feature. All this is fine you may now be saying, but which of these systems is the one for me? How do I actually go about choosing the right package from the increasing range available?

One thing is for certain, going into your local dealer with an open wallet and a closed mind is definitely the wrong way. All you'll get will be a lighter wallet and, perhaps, a lot of hot air! The first thing to do is to close your mind to all the copy writer's advertising hype about each product. There is a lot of snobbery attached to database systems (and I use the word generically here to cover the whole range from File Management Systems to a full-blown DBMS). Many attempts are made to make each system appear very sophisticated and impressive (but very easy to use!).

Report Writer

First of all we have the basic specifications of each package. Here the suppliers compete with each other with claims about features that the average end-user is neither interested in or doesn't understand. Most of them appear to have completely missed the point that the average end-user is not at all interested in files, sets, fields, records and so on. He is only interested in one thing – information.

Then we come to the bit about the highly sophisticated way in which this package stores your previous data. While enmeshed in the advertising campaign for a database system it is very easy to overlook the fact that the only reason ordinary users ever put information into a computer in the first place is to get it back out again! It is therefore the creation utility, the data entry system and the report writers that are the most important aspects of any package you are contemplating. Whilst the way the system manages the data in the middle of these utilities is undoubtedly important, it is merely a means towards an end. Provided it fulfils basic requirements (in terms of supplying the correct data records at an adequate speed) then the exact way in which it performs this task need not concern the average user.

However such a simplistic approach is not always tenable given the rather limited computing power of the average micro-computer. There is no doubt that some types of database system are more suited to some applications than others. At the same time, some applications do not really justifiy the sledgehammer approach of the full blown DBMS when the simpler File Management System would more than suffice.

After you have cut through the advertising copy you may have a slightly clearer idea of what the package claims to be able to do. Before going any further you have to try and quantify your own requirements for the package. What do you want to be able to do? What computing expertise do you have available? There are literally a thousand and one questions you must ask yourself, and attempt to answer truthfully. Never underestimate the importance of this period of analysis in your haste to get a system up and running. You will have to live for a long time with any mistakes you make now so the fewer you make, the easier your life will be!

dBase to run them. If errors are found it can take quite some time to completely debug a 'program'. The manual is split into two parts, a reference section and a more explanatory section. Both have been considerably improved since I first saw this package, but further improvement can still be made. One big plus with dBase II is the availability of useful 'development tools' to use with it (one of the advantages of being perceived as the leader). Fox and Geller have the useful "Quickscreen" to allow screen formats to be generated very simply and "Quickcode" allows command files to be generated with similar speed. Ashton Tate have also brought out "Zip", a screen generator package. The existence of such development tools (at reasonable price) considerably enhances the value of dBase II as a package.

All in all it isn't hard to see why dBase II is so popular, it does virtually everything required to the average database application on a micro-computer. With very large files the performance drops off noticeably and you are restricted to just two files at once, but this still leaves a lot of applications for which it is

DMS

DMS from COMPSOFT is another all-British Data Management System. Although originally developed for the Commodore PET, versions are also available for CP/M systems. DMS allows the user one file only, with just over 26,000 records (or 8 Mbytes), each containing up to 60 fields or 1024 characters. The full range of data types are supported including dates, together with validation options on data entry. Storage of numbers is unusual, taking 1 byte for each digit, rather than the conventional 2 bytes for integers etc.

Setting up a database is reasonably straightforward, although DMS requires that you specify the maximum number of records to be stored at this stage since it uses hashing to place records rather than the conventional sequential file. The user can specify a useful range of security options to control access to the data at entry time, but these are not difficult to break. Selection of records on retrieval can be selective or the user may simply browse through the file. The allowable conditions for retrieval seem a little less flexible than some other packages although they are perfectly adequate for normal use. The report writer also offers a reasonable range of facilities and the system supports good mathematical capabilities. One possible drawback is that sorts must always be in ascending order, an annoying restriction on some occasions. Setting up of search criteria and sorts is easy enough although the conditions specified are not easy to change later.

The system is very helpful to the absolute beginner, but once you have become more familiar with the commands it is annoying to still have to go through the rather tedious processes. The documentation is adequate but would be much improved by the inclusion of more real examples. Like many packages DMS does not explain particularly well (at least to the raw beginner, at whom the package is aimed) how to design the data file structure in the first place. Reference style manuals are very important for the user, but in the early days you need a much more generalised approach.

With it's restriction to a single file DMS seems fairly limited when compared to some of the more complex and sophisticated packages available today. With the limited range of serious business software for the PET DMS is clearly very valuable in that area, but it fares less well in the slightly more competitive CP/M environment. Being all British, there is plenty of support, including training courses available from COMPSOFT so the absolute beginner should always be able to get an answer to his questions.

MDBS III

MDBS III is a full CODASYL style extended network database system and is a most impressive achievement on an 8 bit micro-computer. Whether it was worth the effort is another question! The full system includes virtually every facility ever likely to be required, a full interactive query system (QRS), language interfaces to virtually any language (including the ability to process the embedded commands interactively for debugging systems), a database definition utility (DDL), full transaction logging facilities and data security options.

The problem is the cost of all this, over £2,000 for an entry level system included the query language, rising to a mind blowing £3145 for all the options! Multi-user systems are available, at about twice the cost for 4 users.

The system offers a good range of data types including dates (US style only) and can manage databases of impressive size (probably much larger than the average user would ever want). The problem with the system is it's complexity. In order to get information out of the database the user must know and understand how the database is structured in order to traverse the various sets and relationships to find the required data item. The suppliers make a great point of the fact that there is no duplication of data within the system (although they forget to mention the overhead of all those pointers!). The documentation is impressive and very comprehensive although not the easiest to understand. Given that the subject matter is complex this is not surprising.

MDBS is unashamedly for programmers and this must influence the way one thinks of the system. Even so, I doubt the user would get the best out of the system without attending one of the 3 day courses run by ISE-Pactel on MDBS III. If one includes the cost of this in the system cost the price goes up to more than £2,500 for an entry system and more than £3,500 for all the bells and whistles.

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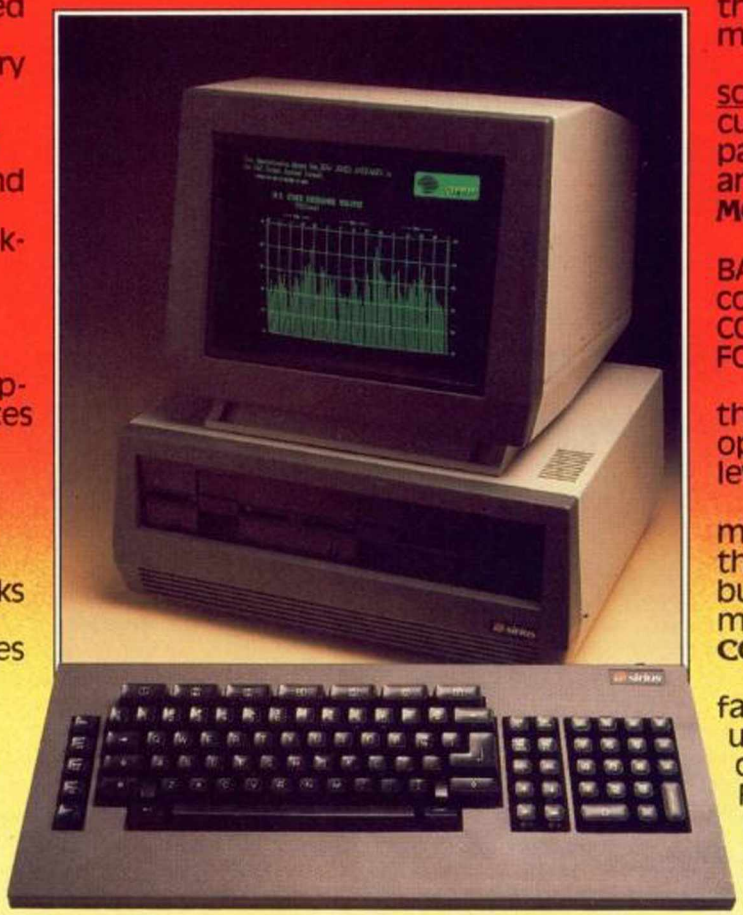

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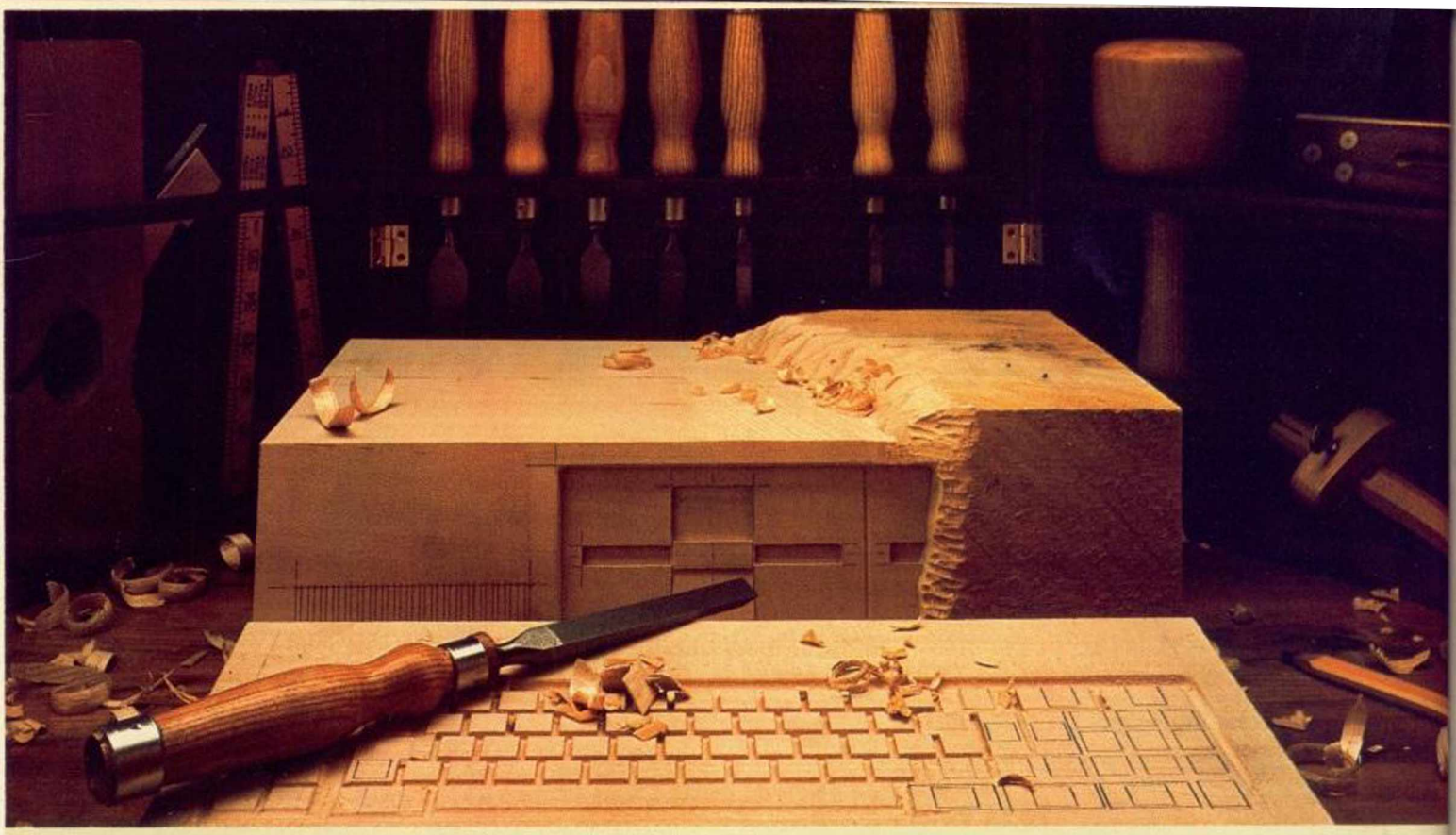

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Checklist

If you use the checklist included in this feature,you should end up with a pretty sound idea of which packages are worth further investigation. Don't be afraid to add further questions if they seem relevant, after all there are as many checklists as there are problems, so we cannot hope to provide a complete set of questions. At the same time, don't be disappointed if none of the packages seem to fit. Whatever happens you will probably have to compromise on some features, or pay a lot more for a system than is really necessary.

Now is the time to get hold of the manuals, together with a demonstration pack if possible. As a last resort, get your dealer to give you a comprehensive demonstration of the package, on realistic volumes of data. Most packages perform well with only 20 or 30 records in, but what will happen when you enter your 25,000 records? Never buy a package without either a demonstration or a copy of the manual, or you could be in for a nasty surprise inside all that shrink-wrap! If the supplier will not provide this sort of help before you buy, what will they do after they have your money?

So where does this exercise get you? By now you should have been able to knock out some packages because they are not suitable for your application. However, there are probably still half a dozen left, any of which might be suitable. How do you make that final all important decision? In the end it is likely to be a personal decision, based largely upon how informative you found the manuals, (the sooner the suppliers realise just how important the manual is the sooner we may see some really good ones in the market!).

One decision that you are almost certainly going to have to make is between one of the many Data Management Systems and one of the very few real Database Management Systems. This can be a tough one indeed. Unless you have some programming background, or are prepared to work at it at to learn, you'll probably find a Data Management System easier to get to understand. DBMS are really intended as programmers tools rather than system for the raw beginner. It is worth pointing out though that the effort will be well worthwhile in the long run, since you'll end up with a system with far more potential. In any case, some of the Data Management Systems I've looked at are as complicated, if not more so, than the true DBMS!

Logical Views

If the system is going to handle several different types of data, (e.g. personnel records, stock control information and accounting data) then it will be vital to ensure that the chosen system supports several logical 'user views' of the data. This will tend to dictate a DBMS approach although if your needs are not to complex, a Data Management System will probably be able to cope. Supporting different 'user views' usually means that you have considerable freedom over how the information is stored by the computer. This freedom is usually only available via the true DBMS, most of the Data Management (and File Management) systems tend to take the view that the organisation of information in the files should be determined by your basic retrieval requirements, rather than by the natural relationships between the various data items.

One final point, is your application going to be done with the built in Query Languages/ Report Writer of the system (a 'stand-alone' application) or will you want to write programs in a conventional language? If the latter is the case then you'll almost certainly need a true DBMS. Very few of the Data Management Systems will link directly into a host language, although most will create files that can later be read and processed by other programs.

Never underestimate the amount of effort that is going to be required to learn one of these 'powerful, English like data manipulation languages'. They are just as complicated as any other computer language, and you may find it a lot easier to work in a language with which you are already familiar.

To summarise therefore, a successful implementation of a database system on a microcomputer depends on two things. Firstly, you

CARDBOX

It is all too easy to disregard CARDBOX as a trivial data handling package because of it's rather gaudy packaging and heavy use of index card images to store and display the information. I made the same mistake.

The documentation for this package is superb, both in content and presentation. Apart from a good tutorial manual there is a separate reference guide. This contains a wealth of useful information, particularly on the exact format of the files, making it very easy to access the files from other programs. With both a contents list and a very good index it's particularly easy to find what you're looking for. Defining one initial data format iis straightforward, relying heavily on a few simple menus and commands. A single data file is used, with up to 26 fields, 1404 characters per record and 65,500 records per file. Indexing is the real forte of CARDBOX. Each individual word in the field may be indexed with some clever handling of hyphenated words so that they are indexed both as individual words and as a single collapsed word (without a hyphen).

Retrieval is interesting in that searches are done one by one and, if indexed, the system rapidly responds with the number of records that fit the conditions. The user can either cancel that condition or go on to refine the search criteria even more tightly. This is very useful to ensure that you end up with the right number of records for examination rather than hundreds (if the criteria are wide) or none at all! Retrievals can also be carried out on non indexed words, but these take longer. Basic report facilities are available, together with the ability to dump the current screen to the printer.

Most impressive of all is the acceptance of the fact that, sooner or later, you data file may become corrupted. CARDBOX includes utilities, and very clear instructions about how to determine what damage has occurred, and how best to retrieve the situation. Sod's law dictates that you data file will always crash just before you take a fresh backup copy, so this facility is very reassuring. At least the originators are realistic enough to accept the reality of life on floppy disc systems! To get the best out of the package you probably need a terminal with highlighting facilities since these are used quite widely. If your data falls inside the restrictions of a single file with 26 fields CARDBOX is well worth looking at in greater detail. It's ability to search for occurrences of words (or groups of characters with 'wild cards') makes it particularly usetul tor textual information retrieval systems.

SILICON OFFICE

This package is interesting because it combines a data management facility with a word processing capability. It's not cheap but there aren't that many systems available for the PET computers (all the other packages looked at run under CP/M). Setting up a new database seems slower than on some systems, and it can be very time consuming to change the structure once data has been entered (although this is a process that appears to be universally difficult on all these systems!). Each record may contain up to 252 characters with 78 characters maximum in one field. One field must be designated as the primary key and this must be character, not numeric, and at least 10 characters long although only the first 10 characters are used.

Index files can be created (via a short command program) to index on other fields but these index files are not automatically updated, a great disadvantage. Searching can only be performed on a complete key and if no exact match is found then the system will at least repond with the record that most closely matches the specified criteria. There is no date data type, although facilities are provided to handle date information with reasonable ease. The program resides completely in memory, thus freeing both disc drives for use. However the user can only have 6 data files (3 on each disc) which seems an unusual restriction. The Report writer seems reasonable, although you have to be able to use the word processing side of the package to get the best out of it. This is probably not a problem if you purchase SILICON OFFICE as a complete package for business use, and thus use the word processing side just as much!

The documentation is again good, with both training a reference material provided. SILICON OFFICE is an interesting departure from the normal style of data management systems. The integration of word processing is fairly rare, although it is probably indicative of the way systems are going in the next few years. Whether it is worth paying for the privilege, rather than buying two separate packages which may be less compatible, is a matter for the individual user.

CONDOR

CONDOR (distributed in the UK by MOM Systems) is a relative newcomer in the UK market, although I understand it has been available in the USA for some

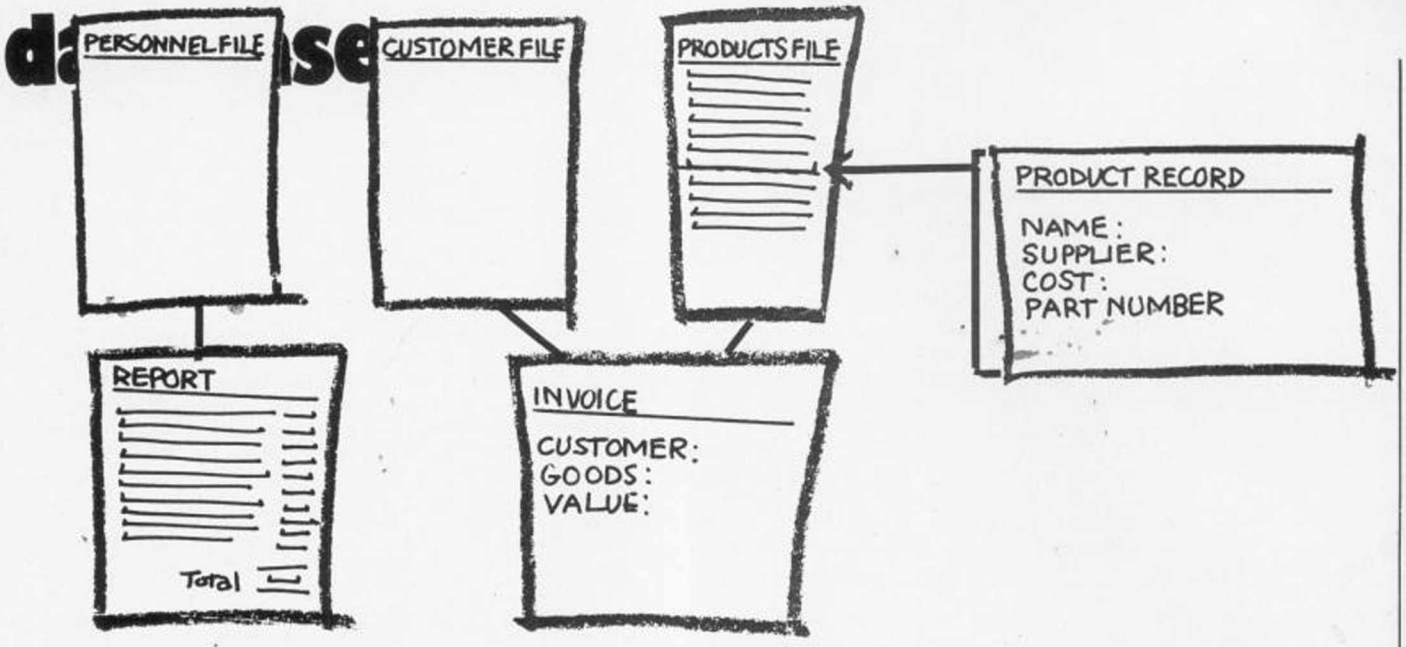


Figure 2: All databases work with *files*. A file is a collection of records – all of the same type. Examples of files shown here are: Personnel (one record for each employee), Customers, and the Catalogue or Product Range (one record per product).

Databases permit you to retrieve any record from within a file, or produce reports from the whole file. These reports may simply be totals accumulated over the whole file (e.g. the total credit value of our customers), or selective – how many employees live in London, for example.

Sophisticated databases allow information from more than one file to be merged. An invoice file, for example, may contain links to both the Customer file and the Product file. This permits far more useful reports to be generated, and in fact mimics many of the kind of processes around which businesses revolve.

must be able to analyse the problem sufficiently accurately to be able to decide exactly what hardware and software is needed to provide the solution. Secondly, you must choose a suitable software package and the correct hardware to run it one. Don't be misled by all the claims for this system or that. In the end it is the solution that matters and nothing else. How you get there becomes irrelevant provided the chosen path meets the basic performance criteria.

years. It is a relational data management system and uses the conventional relational terminology throughout the manual (i.e. Joins, Project etc.). Each database file can contain up to 32,767 records, each of up to 1023 characters in total, covering up to 127 fields. A full range of data types are available including date (US format only). Storage of numeric data is interesting since only integers are used, with a fixed 2 decimal places to make them look like real numbers. This means that arithmetic is always accurate to the last decimal place, even for numbers up to 21 million plus. Defining the database is performed in a fairly typical manner with great emphasis placed on the screen based format file.

Entering data is easy, either from the screen or from other database files. When entering from the screen a full range of data validation options can be used to ensure that only valid records are generated. At the same time the system will allow a transaction log to be created to keep a record of all database updates. A range of different screen formats can be stored in the Data dictionary and used at different times.

Retrieving records is done using conventional relational commands such as SELECT although (as is the case with dBase II but not MicroRAPPORT) the relational JOIN operation results in a new database being created. If you wish to JOIN data from more than two files then you have to do a further JOIN with the new database. This can result in a proliferation of temporary database files cluttering up your discs.

The report writer is fairly comprehensive and allows a full range of formatted reports to be created, including totals and subtotals etc.

As well as operating in an interactive mode, CONDOR can utilise batch command procedures to enable more complex sequences of commands to be executed, including calls to programs written in other languages.

Three versions of CONDOR are available, offering a simple single file system (level 1), multi file capabilities including JOIN operations (level 2) and full indexing capabilities for large files (level 3). CONDOR has many similarities with dBase II and thus enters a very competitive section of the marketplace. Without the multi-indexing facilities offered by the latter package it must be progressively slower on large databases. However, it does offer some interesting facilities not available with dBase II and must therefore be seriously considered for many applications.

MicroRAPPORT-2

MicroRAPPORT-2 from the UK software house Logica, is somewhat different to typical micro-computer database systems. As a derivative of a mainframe relational database package it is technically closer to the theorists DBMS than most other packages. The new release is considerably faster than the older version and copes with much larger databases.

Defining your database is relatively simple, although it may appear difficult the first time. A database may contain up to 16 'files' and up to 150 separate data fields. With up to 32,000 records in each file a database can stretch to more than 30 Mbytes total size. All of these files are accessible simultaneously if required, there is no need to switch between them.

Data entry is only via a batch loader utility at present, although a screen based data entry package is soon to be launched. Retrieval is either by means of the IQL system (Interactive Query Language) or through a FORTRAN program (Microsoft FORTRAN 80). The latter is much faster in operation, but a lot less convenient for typical ad hoc enquiries. The IQL system only allows restricted mathematical operations and the report generation facilities are slightly limited. It does include quite a powerful macro facility, allowing complex sequences of commands to be executed with a single word.

The searching facilities are reasonably comprehensive and this system comes closer to the true relational database management system than most.

The real forte of MicroRAPPORT is it's ability to handle very large databases comprising several separate data files without the loss of performance that accompanies most other packages. At it's best on large hard disc systems it can retrieve individual records with only one disc access when retrieving on the primary key fields. Up to 32 indices may be created using combinations of fields to maintain very high performance even when searching on other fields. All of these index files are maintained automatically once defined, a definite plus point compared with some systems.

Once defined the database may be restructured in many ways. Being closer to a true DBMS MicroRAPPORT maintains a high degree of data independence and thus many changes have little effect upon the database. Restructuring is a complicated area however, and not easy for the beginner, although for the expert it offers great potential for tuning the system for optimum performance.

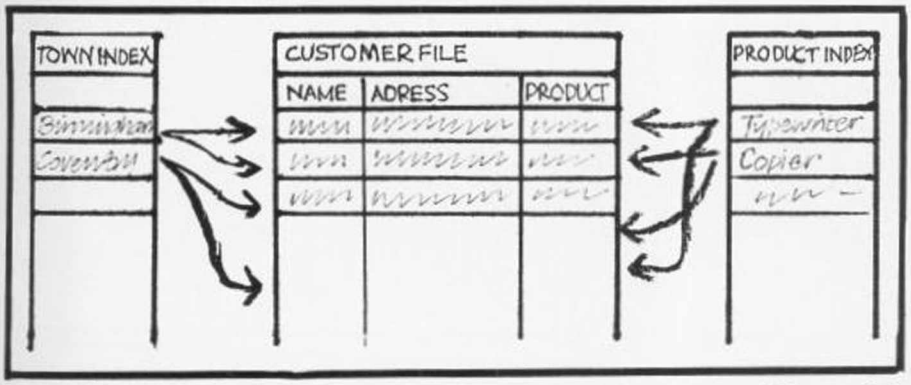
Types of Database.

Experts will undoubtedly argue about it but, in general terms, Databases come in three basic flavours. Not surprisingly, although each may offer the same basic facilities, there are certain applications for which each is best suited.

Multi Indexed

This is the "Plain Vanilla" of the database world, and the one most commonly found on micro-computers. This is hardly surprising since it is fairly easy to implement and works reasonably well on the smaller sized databases typically found on micros (especially those with only floppy disk systems).

The multi indexed database stores the information as fixed length records in a large random access file. The order in which records are stored is determined by the value of the primary key, although this may be unimportant. The user then creates indices based on the values of other fields (including, in some packages on parts of fields and combinations of fields). This allows all records containing a certain value for that field to be selected very simply. For example, in a mailing list the company name could be the primary key. An index could be created on the 'Town' field, allowing all those companies in Bristol to be selected without having to examine every record in turn.



In a Multi-Index database, a number of indeces can be created to point to records in the main file. For example, to find the name of all customers in Birmingham, the Town Index would be consulted which would point to a number of records. This is much faster than searching through the whole file.

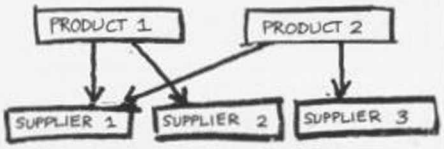
Points to watch with this type of database are the number and size of records that can be stored and the number and specification of indices that can be created. It is very important to ensure that all the indices are updated automatically by the system itself when records are deleted or amended.

The multi-indexd type of database is well suited to the single file type of problem. Typical applications are Mailing Lists, Personnel Records and so on. These applications are usually fairly straight-forward to define initially and rarely require complex report generation. Whilst some of the database packages allow access to multiple files you should be careful that sufficient power is availabe from the package to cope with the complexities of several files, particularly the automatic maintenance of the various index files.

Hierarchical and Network

These are the classical database structures, developed over many years on mainframe computers. Hierarchical databases are rarely found these days due to problems encountered in their operation. These databases look like family trees with the most important records at the top and successive layers of subordinate records below. While you only ask certain questions these databases work well. For example, it is relatively simple to find out which parts are used to make each product. The problems arise when we turn the question round and want to know which products con tain a certain art. Suddenly we have to examine every branch down to the lowest level.

It was to get round such problems as these that the 1971 report of the Conference of Data Systems Languages came up with the CODASYL standards. These represented a major advance on previous systems by allowing the relationships between different data items to be defined more exactly. This was achieved without duplicating the information (which would have been very wasteful of storage space) by including many pointers to related items of data. Unfortunately, all these pointers take up a lot of space themselves, but without them we are not much better off (in terms of being able to get at individual data items) than before. What is more, to be able to use the database efficiently the user must both know and understand the various relationships that have been defiined between the data items.



A Hierarchical, or Network database depends on setting up a hierarchy or family tree of information – such as a list of products and possible suppliers shown here. The computer maintains all the links between different items. These links are invisible to the user, but take up a considerable amount of memory.

Network style databases are well capable of handling impressive volumes of data. However, they are not by any means easy to use and it can be very difficult for the novice to understand the rather complex structures and relationships. Without such knowledge it can

Hardware—Is the microcomputer you have in mind anything like big enough to run a 'database' at all?

Throughout the text we have mentioned the restrictions placed upon database systems on microcomputers by their limited computing power. Database systems, particularly the more complex ones are real memory killers and will push your micro to it's limits. Whilst all those discussed in this article will run on most standard CP/M micros with 64 Kbytes of RAM, not all will run under MP/M. Even a very simple system like Cardbox occupies almost 48 Kbytes of memory. Some will take up a prodigious amount of disc space just for the programs (e.g. FMS 80 occupies 237 Kbytes of disc space for the progams alone!).

Ashton-Tate's dBase II is particularly good here, occupying less than 60 Kbytes all in.

The total storage requirement on disc is something to be very wary about. Despite what the salesman says, you are soon going to get tired of having to change discs to perform each separate operation.

Before getting too involved, check to see if your planned database will fit onto your system. For each file of your database multiply the total size of each record (allow 1 for each character of text, 2 for an integer and 4 for a numerical or date field) by the number of records in the file. Then add the total size of all the programs. If this comes to more than about 2/3rds of your total available disc space you could be heading for problems. Remember that you have to have space to accommodate any indices and you'll want copies of standard CP/M programs such as PIP and STAT available.

Whilst this approach is very rough and ready it will give you an idea of just how hungry for space database systems can be. If your application is considerably more than 2-3,000 records you ought to seriously consider using a hard disc based system. Apart from the advantages of the extra disc space you'll benefit immensely from the added speed of disc access, which will show up particularly when searching through the file to retrieve specific records.

Hard discs bring their own problems though. Now that you've committed all your customer records to this fantastic database system, what happens if your machine breaks down, or there is a fire? Do make sure that the system incorporates an adequate backup facility. If you have ever attempted to backup a 10 Mbyte database onto floppy discs you'll know that this is not an adequate system! A tape streamer is vital at this level, and for your own peace of mind (and the future of your business), make sure you use it at frequent intervals. Having made your backup copies, don't just leave them next to the machine, a fire won't leave your precious backups alone. Either store them in a separate building (not just the next room) or invest in a fireproof data safe—your business is worth it!

prove very difficult to use the databse system to it's full benefit. If you are sufficiently experienced and the application is relatively static (i.e the requirements, particularly for retrievals is unlikely to change over a period of time) then these systems will serve you well. However, the structure of the database and the relationships between data items, once defined, can be difficult to alter.

Relational databases

logical relationship exists, without having to specify that relationship in advance. This means it is the data manipulation language rather than the storage structure that determines whether a database is truly relational. The full relational database (or at least the best of those available) offers you the most flexible means of storing and controlling your data. It should be possible to extract virtually any meaningful subset of the information in a relatively simple manner. This makes it particularly suited for databases used for "what if" type enquiries – such as sales and marketing information and those where the type of enquiries are hard to predict in advance. This ultimate flexibility is often only achieved at a price, that of program size, storage efficiency and performance. It is up to you to determine if that price is worth paying.

'PERSONS' FILE

NAME	SALARY	DIVISION
Smith	9000	Research
Jones	5500	Sales

'DIVISION' FILE

DIVISION	MANAGER	LOCATION
Research	Smith	London
Sales	Spencer	Durham

A relational data base permits links between files, but those links are 'implicit' not 'explicit' as in a Network type.

In this example, hidden pointers between the Persons file and the Divisons file do not need to be created because the name of the division provides a link for each record.

Perhaps in response to the shortcomings of the CODASYL style of database came the Relational systems. Developed in the 1970's by Edgar Codd (of IBM) these are the trendy, radical databases. Codd formalised a process that has been used for centuries, that of tabularising data to make it more understandable.

The true relational database is a highly theoretical construct and involved creation of a whole new school of mathematics to describe it! Although the basic idea is very simple and very easy to understand, the concept has proven virtually impossible to implement in practice, even on mainframe computers. There are many micro data systems advertised as relational but very few even approach the theorists ideal. However, some do come close enough for the average micro-computer user.

The relational database usually stores the information as a series of two dimensional tables with rows (equivalent to records) and columns (fields). If you thought that advertising hype was a problem before, when it comes to relational databases the copy writers run riot! Many old products, and new ones that are not even close to relational, have been dressed up with buzz words and relational terminology to become full blown relational databases overnight, so read their prose with a pinch of salt!

Without attempting to get too deep into the theory, the relational database provides a number of data manipulation commands that work on the tabular data. These commands relate data stored in different tables by the values stored in the various data fields themselves rather than by a plethora of externally defined points. Consequently it should be possible to relate any data items between which a

"English Like" and "User Friendly"—Two advertising phrases that frequently don't mean a thing.

Of all the innocent phrases in advertising copy that should put you on your guard, these two take some beating! Whoever dreamed them up in the first place was probably very anti-social, and didn't speak English! You'll find them scattered liberally throughout the brochure, extolling the power and ease of use of the System, the Query language or Report writer. Beware!

A Command such as:
DISPLAY REFNO,
COMPANY,ADDRESS
WHERE BALANCE <0
may seem delightfully English like to the programmer but is not necessarily so to the computing novice. As soon as you get on to more complex sequences, for example to produce reports with sub-totals and so on, life gets much tougher indeed. The syntax is frequently obscure enough to fail an 'O'-level in English Language! The more "powerful" the language becomes, the less "English like" it usually turns out to be. With the predominance of trendy "structured" programming approaches found in most of these languages you could find them a lot more difficult to originators seem to imply. The average BASIC programmer will certainly have a hard time, although the PASCAL or COMAL user should be in his element! All of the advertising copy is only there to hide the fact that this is another programming language to learn and become familiar with if you are to get the full benefit out of the system.

To give you an idea of what that innocent phrase "English like" should mean, try these.
ARE THERE ANY PEOPLE WORKING AS SECRETARIES AND EARNING £10,000 OR MORE?
PRINT ME A SORTED LIST OF THE NAMES OF ALL CUSTOMERS IN BRISTOL AND LEEDS.
Both of these sentences would be accepted as a valid command by at least one mainframe system (INTELLECT—Arteficial Intelligence Corporation Inc.)

Moving on to the subject of "User friendliness" it is worth pointing out that this phrase should be ignored wherever it appears! At some points, some systems (without naming any names) are about as user friendly as a grizzly bear with a hangover! or our *editor*!

Whilst none of the systems will actually lose your data, it can sometimes take all afternoon to undo what you managed to achieve over your coffee break! Beware also the dreaded "Menu driven" system. These are great for the first few days whilst they lead you gently through the various options. However, after you have become more familiar with the system, the delays caused by having to pass through several layers of menu to do whatever you want will drive you mad with frustration. The better systems should allow you to bypass at least some of the menus after you have gained experience (much the same way that you can turn off the various reminder messages in WORDSTAR if you wish).

Whilst the current hysteria about 16 bit micro-computers is largely just that, they do offer a great potential for database systems. With their additional memory and (usually) large disc capacity systems like the ACT Sirius 1 and the IBM Personal Computer are ideal machines on which to run a database. Before getting too excited however, check that any 16 bit database software is truly that. Much of the currently advertised software for 16 bit machines does not take advantage of the new hardware. All of the 'heavyweight' systems described either have versions available for 16 bit systems, or these are soon to be released. If your reqirement is not urgent they may well be worth waiting for!

In conclusion therefore, make sure before you start implementation that your hardware is adequate. Database systems use lots of disc space and lots of memory. One thing is certain you won't be able to run any of these systems on your ZX81, even with a 16K RAM pack!

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Here is the specification, a comparison with the Apple II, and a coupon.

The rest is up to you.

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1. A total memory capacity of 64K; 38K directly available to BASIC. When not using BASIC a full 54K is available for machine code programs.

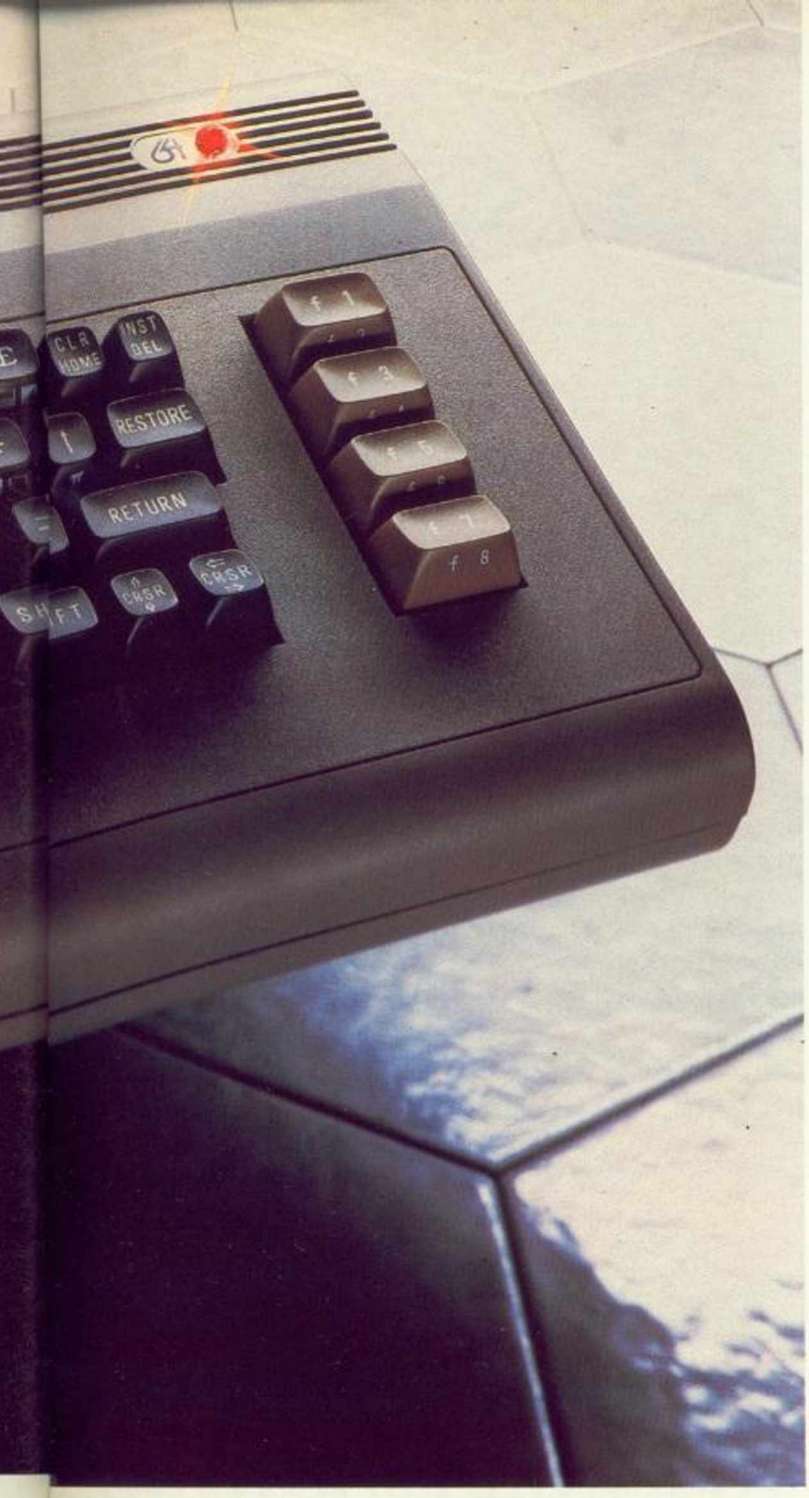
2. Interface adaptors will allow the use of a complete range of hardware peripherals including disk units, plotter, dot matrix and daisy wheel printers, Prestel communications, networking and much, much more.

3. A complete range of business software including word processing, information handling, financial modelling, accounting and many more specific application packages will be available.

4. Other computer languages such as LOGO, UCSD PASCAL, COMAL and ASSEMBLER are being developed. Existing VIC and 40 column PET BASIC programs can be easily converted.

5. The powerful sound chip gives 3 totally independent voices each with a range of 9 octaves. User control over music envelope, pitch and pulse shapes provides the ability to make your Commodore 64 sound like a variety of musical instruments, solo or in harmony.

6. 62 predefined graphic characters plus



full alpha numerics with upper and lower case letters, all available directly from the keyboard and displayable in normal or reverse video in any of 16 colours.

7. 40 column by 25 lines colour display. In high resolution graphics mode, a bit mapped screen gives 320 x 200 individually addressable pixels.

8. The dedicated video chip allows the use of high resolution multi-coloured "Sprites" (moveable object blocks). Sprites can be moved pixel by pixel, independently of anything else on the screen.

9. Sprites can also be set up in 8 "layers" giving full 3 dimensional effects with, if required, automatic collision detection between sprites and any other screen object.

10. Machine bus port will accept ROM cartridges for many applications, including business, educational, home and leisure software.

11. A second processor option using the Z80 gives the Commodore 64 the ability to support CP/M®.

HOW COMMODORE PIPS APPLE.

FEATURES	COMMODORE	APPLE II+
Base Price	£299*	£499*
ADVANCED FEATURES		
Built-in user memory	64K	48K
Programmable	YES	YES
Real typewriter keyboard	YES (66 keys)	YES (52 keys)
Graphics characters (from keyboard)	YES	NO
Upper & lower case letters	YES	NO**
Function keys	YES	NO
Maximum 5¼" floppy disk capacity per drive	170 K.B. to 1 M.B.	143 K.B.
AUDIO FEATURES		
Sound Generator	YES	YES
Music Synthesizer	YES	NO
Hi-Fi Output	YES	NO
VIDEO OUTPUT		
Monitor Output	YES	YES
T.V. Output	YES	EXTRA
INPUT/OUTPUT FEATURES		
Cassette Port	YES	YES
Intelligent Peripherals	YES	YES
Serial Peripheral Bus	YES	NO
ADDITIONAL SOFTWARE FEATURES		
CP/M® Option (over 1000 packages)	YES	YES
External ROM cartridge slot	YES	NO

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Microprocessor	TMS 9900 16 BIT
Graphics	16 colour, high resolution
Languages	TI-BASIC (built-in), extended BASIC, UCSD-PASCAL, TI-LOGO, Assembler
Memory	16K RAM standard–expandable to max ROM/RAM of 110K
Keyboard	Full size, standard typewriter style
Software	1000 programs to choose from worldwide
Solid State Speech Capability	Yes

TEXAS INSTRUMENTS

database

Checklist for Database System Selection.

It is virtually impossible to specify a list of points which will allow you to determine exactly which database system most closely matches your needs. Instead this list aims only to remind you of the various points which you should investigate when evaluating any package.

Basic parameters of the system

How many files can you access at one time, or from one program?

How many individual records can each file contain?

Must all records be the same size?

How many fields can each record contain?

Is the maximum size of one field sufficient for your largest data item?

What types of field are supported (e.g. Character, integer, real (floating point number), date (in a suitable format!) etc.)?

Does the system support mathematical operations on field values (i.e. can you define one field to be the sum of two others, or can you add 10% to the value stored in the price field?

Is the total file size sufficient (i.e. size of each record*number of records+any additional space required)? Remember that CP/M can only support files of less than 8Mbytes.

If the total file size exceeds the storage capacity of your discs, can the file(s) be spread over several discs?

What will performance be like with the volumes of data you intend to store? Remember to allow for the inevitable growth.

Data Entry

How easy is it to define the database structure in the first place?

Does the system allow screen formats to be created?

Are full cursor controls supported?

Is the data validated (i.e. characters in numeric fields etc.)?

Can the input be taken from a pre-existing file?

Is the format of such a file compatible with your existing programs, word-processor etc.?

Can you add records to a file, or must the total number of records be specified at database creation time?

Flexibility

How easy is it to add or delete a field from a file once the file has been defined and data entered?

Will the Query Language/Report Writer satisfy all your requirements or will you have to write application programs in a conventional programming language to support certain tasks?

Does the system support an adequately powerful interface to a suitable language?

Will the system support all your future (predicted) needs!

Can the system be accessed by multi-user systems (e.g. MP/M or CP/NET)? Does this affect security? Can two users attempt to update the same record simultaneously?

Support

Is the supplier represented in the UK?

Do they provide training courses, or a telephone support service?

Do they provide software upgrades and bug-fixes?

Are new versions being developed? Will your existing data files be compatible?

Can you buy the manuals, or a demo package before committing to the full thing?

Costs

How much does the package cost?

Does that include Query language, Report writer, any other 'optional' faciliities?

Remember that if you have to write programs in a conventional programming language you will probably have to purchase the compiler/interpreter as well. Will the package run on your present micro-computer? Is the amount of disc space available adequate for current purposes, and for future expansion?

Data Retrieval

What restrictions are there on selecting subsets of the information for retrieval?

How many conditions can be defined to select records on one pass?

Does the system examine every record or are indices used to select subsets?

How easy is it to create an index?

How many fields can be indexed? Can an index contain more than one field, or parts of a field?

Are indices automatically updated by the system?

Can the system support duplicate values in an index or must they all be unique?

What "housekeeping" activities are related with the use of several indices?

What options are available to display the data?

Can reports be sent to the terminal, printer and to a disc file? Are disc files compatible with your word-processor or mailing liist package?

Can sub-totals, totals and counts be provided in reports?

Are reports paginated, with headings etc?

Can records be sorted prior to output? On how many fields, ascending and descending order?

Ease of use

Do you understand the system?

Does the system allow you to do everything you want to or is it restrictive? Are you going to use all those extra facilities or not?

Is the documentation useful, or a mess?

Are on-line Help facilities available?

Are program generators or screen building utilities available for the system, either from the suppliers or from other software houses?

Security

How easy is it to erase information by mistake?

How difficult is it to recover if you do?

Does the system allow "logging" of input to another file or to the printer?

Does the system allow files and fields to be password protected, or encrypted?

How difficult is it to make a copy of all the database for security purposes?

Glossary.

As soon as you start looking at database systems you will come up against a large number of specialist terms. While you don't have to use them yourself, it will help if you at least know what they mean!

CODASYL—A style of database defined by the standards laid down by the Conference of Data Systems Languages (1971 report)

Data Dictionary—A store of information (used by the computer) which describes the format of your information (e.g. field names, types, validation information, headings etc.)

Data Entry—The process of getting your information from that heap on the floor onto that floppy disc!

Field—One item of data in a record (e.g. Company name, address, etc.)

File—A collection of records of the same type

Index—A collection of pointers to the main data records that provide the computer with a 'short cut' to records containing the specified value for a given field (or fields)

Join—A trendy term associated with relational database meaning to combine information from two files to make a third. This third file may not exist in reality, simply being created record by record, but many micro-computer database systems actually create the third file on disc

Key—A field that may be used to select records from the overall database. The more keyed fields in your files, the more ways you will have to select subsets of the information

Network—A style of database in which the various relations between data items are maintained by pointers between the individual records

Primary Key—The key which uniquely defines the record and which determines the way records are stored on the disc. The primary key of a record must be unique, whereas a simple key need not be

Project—Another relational term, meaning to take a subset of the fields from a database file

Query Language—An interactive system which allows the user to interrogate (and sometimes update) the data without having to write a conventional computer program. With many Data Management Systems, this is the only way to interrogate the database

Record—A collection of fields which all relate to a single item (e.g. one person, one company etc.)

Relational—Most recent style of database in which the data manipulation commands relate records in different parts of the database on the basis of the data values themselves rather than by explicit pointers

Report Writer—A vital item in any database system. It allows the user to extract records from the database and present them in tabular reports, perhaps with headings, totals, sub-totals etc.

Select—Another relational term, meaning to extract a subset of the total records in a file

Set—A CODASYL style database term. A set of records is essentially a subset of records in a file that all refer to the same type of data. A set usually has an owner record and a number of members

Transaction logging—A process whereby updates to the records in a file are copied to another computer file or the printer (as well as to the database file), thereby creating an audit trail

User view—One individual users perception of the structure of the database, which may be very different to the actual structure

Validation—Associated with data entry, a means of ensuring that you cannot enter 'ABC' into a numeric field! Validation may go further to restrict the values stored in some fields to lie within a certain range (e.g. 1-99) or be on a specified list of values (e.g. Male/Female) and so on

REW MICRO COMPUTERS

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			Nett	V.A.T.	Total
A400	16K RAM Computer (without manuals)		173.90	26.09	199.99
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AM800	16K RAM Computer (with manuals)		433.91	65.09	499.00
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810	Disk Drive		260.00	39.00	299.00
CX853	16K RAM Expansion		56.52	8.48	65.00
Calisto	32K RAM Expansion		77.39	11.61	89.00
Application Software					
Atari CX 404 Word Processor		(Disk)	86.94	13.05	99.99
Atari Visicalc		(Disk)	103.47	15.53	129.00
Draw Pic		(Disk & Cass)	23.04	3.46	26.50
Mail List		(Disk)	30.43	4.57	35.00
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Star Warrior		(Cass & Disk)	24.00	3.60	27.60
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Wizard & the Princess		(Disk)	19.78	2.97	22.75
Jaw Breaker		(Cass & Disk)	17.82	2.68	20.50
Eastern Front		(Cass & Disk)	19.56	2.94	22.50

B.B.C. MICROCOMPUTER

BBC Model A	16K RAM	Price on Application
BBC Model B	32K RAM	Price on Application
BBC Disk Drive		Price on Application
BBC Printer		Price on Application

Software			
BBC Space Warp	10.00	1.50	11.50
BBC Golf	6.09	0.91	7.00
BBC Backgammon	6.96	1.04	8.00
BBC Multifile	21.74	3.26	25.00
BBC Chess	10.00	1.50	11.50

ACORN ATOM

Acorn 8K + 2K RAM Assembly		150.00	24.50	174.50
Acorn 12K + 12K RAM Assembly		250.00	39.50	289.50
Family Packs		173.00	27.00	200.00
Seikosa G.P. 80A Printer		199.00	33.00	232.00
Atom Disk Pack		299.00	44.85	343.85
Atom Colour Card		39.25	6.00	45.25
Software				
Games Packs I to II	(each)	10.00	1.50	11.50
Maths Packs I & 2	(each)	10.00	1.50	11.50
Soft VDU Pack		10.00	1.50	11.50
Database Inc Manual		10.00	1.50	11.50
Peeko Pack		10.00	1.50	11.50
Adventures		10.00	1.50	11.50
2K Programs I, 2 & 3	(each)	3.91	0.59	4.50
Galaxian		6.96	1.04	8.00
"747"		6.96	1.04	8.00
Chess		7.83	1.17	9.00
Disassembler Program		3.48	0.52	4.00
Statistics		17.39	2.61	20.00

COMMODORE VIC20

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VIC — 20 Computer 5K RAM		155.65	23.35	179.00
VIC C2N Cassette Unit		39.09	5.86	44.95
VIC Printer		200.00	30.00	230.00
VIC Single Disk Drive		344.45	51.55	396.00
VIC 3K RAM Cartridge		26.04	3.91	29.95
VIC 8K RAM Cartridge		39.09	5.86	44.95
VIC 16K RAM Cartridge		65.17	9.78	74.95
VIC Programmers Aid Cartridge		30.39	4.56	34.95
VIC Super Expander High Res		30.39	4.56	34.95
Application Software				
Simpli-Calc	(Disk)	21.70	3.25	24.95
Simpli-Calc	(Cass)	17.35	2.60	19.95
VIC Stock Control	(Cass)	17.35	2.60	19.95
VIC File	(Disk)	21.70	3.25	24.95
VIC Writer	(Disk)	21.70	3.25	24.95
	(Cass)	17.35	2.60	19.95
Entertainment Software				
Rat Race	(ROM)	17.35	2.60	19.95
Gorf	(Cass)	21.70	3.25	24.95
Jelly Monsters	(ROM)	17.35	2.60	19.95
Sargon 2 Chess	(ROM)	21.70	3.25	24.95
Rabbit Chase				
Skier				
Asteroids	(Cass)	6.08	0.92	7.00
VIC Panic	(Cass)	6.08	0.92	7.00
Cosmiads	(Cass)	6.08	0.92	7.00
VIC Men	(Cass)	6.08	0.92	7.00
Arfon Expansion Boards		85.21	12.79	98.00

TEXAS TI99/4A

TI99/4A — 16K RAM		173.04	25.96	199.00
Speech Synthesiser		82.60	12.40	95.00
80 Column Matrix Printer		347.82	52.18	400.00
Peripheral Expansion System		144.34	21.66	166.00
Disk Controller Card		122.03	22.31	140.34
32K RAM Expansion Card		176.47	26.48	202.95
Cassette Cable		8.65	1.30	9.95
Application Software				
Speech Editor		15.60	2.35	17.95
Personal Record Keeping	(ROM)	38.21	5.74	43.95
Personal Report Generator	(ROM)	38.21	5.74	43.95
Personal Financial Aids	(Cass)	7.78	1.17	8.95
Inventory	(Disk)	46.04	6.91	52.95
Invoicing	(Disk)	46.04	6.91	52.95
Mailing List	(Disk)	46.04	6.91	52.95
Text Formatter	(ROM & Disk)	46.04	6.91	52.95
Entertainment Software				
TI Invaders	(ROM)	16.47	2.48	18.95
Munchman	(ROM)	23.43	3.52	26.95
Chess	(ROM)	30.43	4.57	35.00
Soccer	(ROM)	19.08	2.87	21.95
Adventure Land & Pirate	(Cass/ROM)	30.43	4.57	35.00
Adventures 1 to 9 & 12	(Cass)	19.08	2.87	21.95
Adventure 10 & 11 (Joint)	(Cass)	23.43	3.52	26.95
A-Maze-Ing	(ROM)	19.08	2.87	21.95
Tombstone City	(ROM)	19.08	2.87	21.95
Zero Zap	(ROM)	19.08	2.87	21.95
Blasto	(ROM)	19.08	2.87	21.95
Blac/Jack Poker	(ROM)	19.08	2.87	21.95
Attack	(ROM)	19.08	2.87	21.95

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BROCHURES

CUTTING THROUGH THE SALES-TALK!

Ugh! Manufacturers sales brochures – don't they make you cringe? It's no wonder agencies win prizes for their copywriting, though one can't help wondering if they should be nominated for the Fiction category in some cases! Trouble is – without sales brochures, comparing different computers would be considerably harder, particularly when most computer shops or high street department stores don't stock all the brands you wish to examine. The trick, as with most things in life, is learning to turn the situation to your advantage – and that means learning to cut through the sales-talk and ascertain a system's strengths and weaknesses.

Start collecting brochures, however, and you'll soon discover a very odd thing: the only page which contains 'hard' information, as distinct from sales blurb, is the worst written page of all. I am referring, (you've guessed it!), to the Specification Sheet – the point at which the advertising agency gives up and asks the computer company's boffin-in-chief to come up with a page of impressive looking jargon. And impressive it is, too. Invariably too long, liberally sprinkled with technological 'waffle', frequently plagued with errors because the typesetters can't read the boffins' handwriting – the whole thing is absolutely impenetrable to the newcomer. To incorporate such a rubric in a brochure for a computer that's purportedly 'designed for use by novices' is either extreme carelessness or sheer hypocracy.

Alright, alright – enough of this cynicism; I was telling you how to turn the situation around. First, one important caveat: you *cannot* and *must not* make a meaningful comparison between two computers merely by comparing spec. sheets. Software available, after-sales support and hands-on 'feel' are all as important, (*more* important in the case of a business system). A working knowledge of computer specifications, however, *will* help you to assess the relative value of a system, and make you less susceptable to fast-talking salesmen. Next time he tells you that "having a four megahertz Gargleblaster is essential for a business system", you can retaliate with confience.

The following pages contain excerpts from a wide selection of brochures we've accumulated over the months. No names (except where unavoidable) to protect the innocent.... and the guilty! Notice that we've mixed together specifications for both home and business systems, because the principles are identical even if the values differ greatly. Needless to say, though, most business machines don't have colour and sound, and most home computers lack disks.

Along side the excerpts come our comments and explanations. The emphasis is on *understanding* – what those parameters mean in practical terms – not just straight interpretations of the jargon words.

One of the problems with comparing spec. sheets is that different manufacturers use different jargon to mean the same thing. We've divided up the sheet into ten distinct areas, which you should be able to identify on most brochures.

If you read last month's episode of this exciting series,*(Ed: That's enough.... wait a minute, this* is *the Editor),* you should be familiar with what each part in a computer system does. If not – go back one issue, and if you're not sure what a computer is – go back two!

So that's it – read the following pages, practise the buzzwords in front of a mirror, and repair with equinimity to your local computer store.

Processor	6502
User Memory	Minimum: 48K bytes Maximum: 64K bytes

Processor Unit Intel 8088, 16-bit Microprocessor.
128 Kbytes, RAM-memory standard optimal expansion to 512 Kbytes.
Codec audio controller.

6502 Microprocessor: 0.56 microsecond cycle. 1.8 MHz.

Processor: 8 bit 64 K RAM memory with 4 K ROM : Z 80* processor using CP/M** operating system.

Internal electronics. Z80A CPU, 64K bytes RAM memory (60K available to the programmer, 4K used to run the screen). System software is held in ROM in a separate address space.

CPU / memory
Z80A microprocessor running at 3.5 MHz.
16K-byte ROM containing BASIC interpreter and operating system.
16K-byte RAM (plus optional 32K-byte RAM on internal expansion board) or 48K-byte RAM.

Memory: Total combined memory capacity: 72K bytes.
Internal ROM memory supplied: 26K bytes.
External ROM memory: (Solid State Software™ Command Modules) up to 30K bytes each.
RAM memory supplied: 16K bytes (Expandable to 48K).

– RAM 16 to 256k bytes
– 2K Bootstrap PROM

Display: 12" green phosphor P-39 with anti-glare optical filter.

Display Screen: 24 lines 80 characters per line. Displayed white on black background with brightness control.

Various cursor options:
– Reverse video.
– High/low intensity.
– Non-display.
Split screen

Display: Highest graphics resolution 320 x 192.
24 lines of 40 characters.

– Upper and lower case with true descenders
– 8 x 12 Matrix

PROCESSOR & MEMORY

The identity of the central processing unit (CPU) is useful information to someone who programs in machine code, but irrelevant to anyone else since no difference shows up in an applications program.

The Z-80, 6502 and 8088 (16-bit) are now the three most popular CPU's, though there are other equally good ones.

Having a 16-bit processor will eventually be a major advantage in a business system, since it can cope with more memory and work much faster than an 8-bit one. For the moment, however, there is little software which takes full advantage of 16-bits.

The speed of a CPU is measured in MegaHertz. In theory a 4 MHz, Z-80 can process instructions at four times the rate of a 1 MHz Z-80. In practice, the throughput of a program is determined far more by the efficiency of its programming, and by the access speed of the disk drives (rarely quoted). A comparison between the MHz speeds of *different* processors is meaningless.

RAM is the part of the computer's memory you can use. The more KiloBytes (KB) you've got, the bigger the program you can run, or on a business system, the less often the program needs to refer to the (slow) disk drives.

There is no point in having loads of RAM unless the software you have can make use of it – check with the software supplier before buying.

The computer often requires a substanital part of RAM for internal use, so not all of it is available to the user. Make sure that your chosen programs will still fit in memory even allowing for these 'system overheads'.

Many computers allow you to expand the memory at a later date. But don't forget to find out how much this costs, whether it goes inside or outside the main casing, and whether you can fit it yourself.

ROM us the part of the memory you can't alter. If a computer has a lot of ROM, it should be able to cope with some sophisticated programs.

However, many microcomputers now have all the operating system in RAM (whence the overheads) and so have very little ROM. This is more flexible on business systems, where a disk is available to 'load up' the operating system when you first switch on.

Quoting a combined figure of ROM and RAM is completely meaningless.

ROM, too, can be expanded on some systems with plug-in packs. This is what games cartridges are.

PROM is another form of ROM.

DISPLAY

The size of a display is measured diagonally across the screen in inches. A small screen means the characters displayed will be smaller.

Physically adjustable screens, special colours (phosphors), anti-glare filters and brightness controls are useful because they reduce operator fatigue on business systems. Most of this doesn't apply to home computers which make use of a T.V screen. Some, however, can be connected to a special purpose monitor, which gives much better clarity.

The number of columns determines the amount of useful, information you can display on a screen at once. The number of lines is fairly standard at between 20 and 25. 80 columns lets you display the full width of a typed letter – a must for Word Processing. Occasionally you get more than this, which is useful when dealing with columns of financial figures.

Reverse (or inverse) Video, variable intensity and flashing fields are different ways of highlighting information out of a screenful of characters. A boon *if* your program makes use of them.

High resolution graphics permits graphs, pie charts and curves to be drawn – or more spectacular games effects on a home computer. The higher the resolution (number of pixels x number of pixels), the smoother the curves, but the more RAM they will use up when displayed.

The matrix size determines how readable each character on the screen is, because the more dots available – the more realistic each

character is. 8x8 is normal – anything above that is better. Larger matrixes allow 'true descenders', that is: the tails of g's and y's drop below below the base line – a far more readable result.

Some displays without high resolution graphics offer a wide range of graphic symbols and characters, in addition to the normal ASCII range. This means that simple block graphs and diagrams can be built up, but curves are impossible. ASCII includes A to Z, 0 to 9, punctuation and a few computer symbols.

KEYBOARD

Detachable keyboard means that you can choose the distance between you and the screen – work with the keyboard across your knees if you are lazy enough.

Similarly, the more expensive keyboards will be carefully sculptured and shaped to suit a typist – an advantage for word processing.

A numerical keypad is faster than a row of digit keys when entering a lot of numerical data or figures. Many have both.

Software Definable or Programmable Function keys are keys which can be used by a program to perform any function from 'fire at the space ship' to 'cancel this invoice'. They make a system much easier to use *if* the software makes use of them.

Very impressive, except that no two manufacturers or countries can agree on what the international standard layout is!

The more keys on a keyboard, the more functions of the computer can be controlled with just one key press, and the less you have to resort to obsure 'ESCape Codes' and 'ConTRoL' characters!

Some home computers have solid-state keyboards or 'real moving keys' which are not typewriter-like. Great for games, useless for typing!

DISK

Almost all business microcomputers now use 5 1/4" diameter disks, though some still cope with 8" drives. The latter are, in theory, more reliable and have larger capacity. In practice, 5 1/4" disks have come on a long way since 8" was popular.

The capacity of a disk is measured in Kbytes (represents approximately 1000 characters of a typed page), or MBytes (a million). The more you have, the better your chances of winning (well, something like that!).

Whether the disks are single or double sided, single, double or quadruple density will determine the capacity of your disks, and the type of floppy disks you will need to buy.

Quoting the 'unformatted' capacity is totally misleading – like quoting the top speed of a car with no people or petrol in it! Where you see this word, deduct around 10% to get the true capacity.

Some brochures try to express the capacity in understandable terms (usually typed pages) – but note the discrepancy in values! The *only* real capacity is that expressed by software suppliers, e.g., "Our program can deal with 500 account entries when used with 360K disk drives".

COLOUR

The number of foreground colours is equivalent to the number of different coloured inks in which you can write and draw on the screen.

The background refers to the equivalent of the colour of the paper on which you are drawing. Sometimes there is also a border colour – a margin around the edge of the screen in which you can't write or draw anything, put there for reasons best known to the manufacturer.

Variable intensity is rare, but permits very fine shading of colours on the screen.

Extended colour BASIC, means that special easy-to-use commands have been built into the machine which allow you to control the colours and create graphic objects very easily.

Many sophisticated home computers offer a variety of different formats,elected from the keyboard. This chart shows how the resolution, range of colours available, and memory used up, varies with the formats.

SOUND

Some home computers have a built-in loudspeaker, others make use of the one in the T.V., others use both. There is little difference either way.

SCREEN

2000 character display, organised into twenty-five 80-column lines
128 ASCII, 128 graphic characters

Keyboard — Detachable
— Standard QWERTY keyboard including Shift, Shift-lock etc.
8 Programmable function keys.
Optional Numeric keypad, Cursor control keypad, Word processing key set.

Keyboard: Software definable key codes.
Alphanumeric layout to international standards.
Sloped and sculptured keytops with full travel

KEYBOARD

73 key typewriter-style keyboard with graphic capabilities
Repeat key functional with all keys

Keyboard
40-moving-key keyboard with full upper and lower case with capitals lock feature.

Disk Storage Capacity:
5¼" Floppy (dual):
92 K unformatted (40 pages approx.) per drive.
8" Floppy (dual):
300 K unformatted (130 page approx.) per drive.

280K bytes (unformatted) per drive — double sided, double density.
560K bytes per drive — double sided, double density and double track.

Dual floppy disk drives. Two 5¼" floppy disk drives provide 100,000 characters each of data storage, or about 60 pages of typed, doublespaced text.

Colours: 16 foreground and background colours.

Colour: 16 colours, each with 16 intensities.

Extended Colour BASIC

640×256 2 colour graphics and 80×30 text	(20K)
320×256 4 colour graphics and 40×32 text	(20K)
160×256 16 colour graphics and 20×32 text	(20K)
80×25 2 colour text	(16K)
320×256 2 colour graphics and 40×32 text	(10K)
160×256 4 colour graphics and 20×32 text	(10K)
40×25 2 colour text	(8K)
40×25 teletext compatible	(1K)

Sound: 5 octaves, 3 simultaneous tones plus noise generator. Each tone controllable in 1Hz steps from 110Hz to beyond 40,000Hz.
Built-in loudspeaker and volume control.

Sound: Four independent sound synthesizers for musical tones or game sounds. Four octaves. Variable volume and tone. Internal speaker (in addition to audio through television set).

3 Independent Voices, 9 Octaves each. Programmable ADSR (Attack, Decay, Sustain, Release). Envelope Generator. Programmable Filter. Master Resonance & Master Volume Control.

Loudspeaker: Driven from 8255 via buffer

Interfaces
The standard version includes a serial interface (RS232)
Optional interfaces can be fitted, including
– IEEE 488 – Additional RS232's
– Parallel – S-100 Bus.

Input/output:
Audio cassette at CUTS 300 baud or high speed 1200 baud via 5 pin DIN with relay switched motor control.

Interfaces: 1. Serial: two RS-232 (V-24) ports, asynchronous or synchronous.

Operating Systems	Languages
CP/M®	Basic
MP/M®	Cobol
BOS®	Fortran
UCSD® p-System V.4	Pascal

Standard Software:
- CP/M Operating System.
- WORDSTAR word processing with MAILMERGE®.
- SUPERCALC electronic spreadsheet.
- CBASIC.
- MBASIC.

FIRMWARE

18K of ROM contains:

Electronic Requirements
System Voltage: 198-254 VAC
Single phase (two wires and earth) fitted 13 amp plug
Frequency: 49.5-50.5 Hz
Power:
System with 5¼" disc drive 200W.
System with 8" disc drive 400W.

Internal supply voltages
–12V, +5V, 2 x +12V.
The power supply is suitable for maximum configuration, Low noise fan.

Size and Weight
Display Unit:
Height 12.87" (32.7cm.)
Width 15" (38.1cm.)
Depth 13.5" (34.3cm.)
Weight 30lbs. (13.6kg.)

Volume control through a program as well as with a volume knob is more flexible.

The number of octaves gives the range of notes that can be produced. The number of voices: how many notes can be played at once, (i.e. in harmony).

'White Noise Generator' is used for special effects, from 'whistling wind' to 'headache-inducing throbs and explosions'.

Envelope control and programmable filters turn the computer into a mini-synthesiser. You can imitate different musical instruments.

The number of the sound producing chip is irrelevant!

INTERFACES

IEEE-488 is really an Engineer's interface – useful for connecting the computer to laboratory equipment.

RS232 (or V24) is the standard interface for connecting to most printers, or to a modem for transmitting information over the telephone line.

S-100 is rapidly losing popularity, but was once the standard for connecting extra memory and disk drives.

Parallel (or centronics) is used for some types of printer – notably Centronics (surprise, surprise!), and is useful for home experimenters who wish to interface their own circuits and devices.

Cassette interfaces tend to be individual to each make of computer: one machine can't usually read another's cassettes.

Synchronous is faster than asynchronous, but you will need to buy compatable equipment. Most equipment is asynchronous.

The higher the baud rate, the faster the information is transferred between devices.

STANDARD SOFTWARE

The operating system is the program which runs the whole computer, and supports the applications programs. CP/M has been the most standard one. MP/M is a version of CP/M which allows for several computers to be linked to one disk unit. CP/M86 is a version for 16-bit processors.

Sometimes more than one programming language is supplied with the computer, on disk. Frequently, however, this list refers to languages which can be purchased to run on the computer. Again – check before buying.

A very welcome move by some new entrants to the computer field is to supply a range of the most commonly used applications packages, included in the price.

When the Operating System and Program Language interpreter are 'encapsulated' in ROM, this is sometimes referred to as 'Firmware' – software built-into the hardware!

ELECTRICAL

Manufacturers frequently go into unnecessary detail about electrical and environmental requirements. Do you know what the frequency variation on your local mains is? Don't worry! All microcomputers are designed for normal home and office environments, but use common sense – avoid extremes of temperature of humidity.

Internal voltages are of no interest to the user.

The power requirements will give an idea of the heat given off by the system – cooling fans aren't always quiet, so its worth asking to inspect a system that's been running for several hours.

On some systems, adding additional memory would require you to upgrade the power supply unit also. Check first!

PHYSICAL SIZE

Physical size can be important, particularly if you have a computer, disk unit and printer on the same disk.

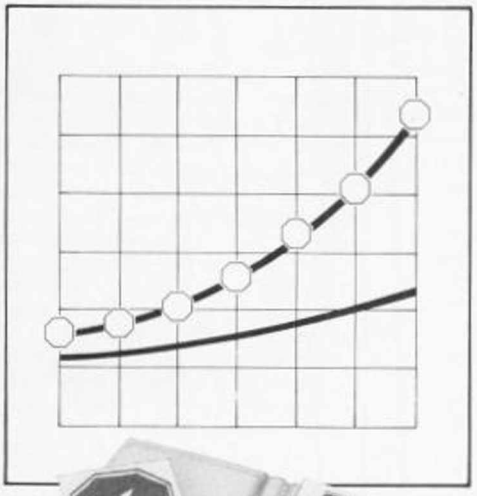
Weight only matters if you will be moving the computer around a lot. Most micro's are fairly rugged, but excessive bumping or vibration can loosen internal connections. Again – use common sense.

By Richard Pawson

PROGRAM GENERATORS

DYNATECH MICROSOFTWARE

DYNATECH MICROSOFTWARE



Ask yourself -

"As a cost conscious user of a microcomputer, how can I obtain application software easily, economically and efficiently to increase my productivity and create greater profits?"

the answer -

Your choice is to buy either;

(a) Customised programs - *costly, take many expensive consultants days to write.*

(b) Off-the-shelf general purpose programs - *generally inflexible, changes difficult.*

(c) Dynatech's 'do-it-yourself' program generators - *the key to efficiency and ease of use, productivity, cost saving and thus the ability to create greater profits. Even without experience you can write programs in minutes! It's the only way to have customised and off-the-shelf programs in one package.*

Applications already in use include;

- ◯ DATA ENTRY STORAGE and RETRIEVAL
- ◯ STOCK CONTROL SYSTEMS
- ◯ GRAPHICS PROGRAMS and GAMES DEVELOPMENT
- ◯ TECHNICAL and SCIENTIFIC PROGRAMS
- ◯ LABORATORY and MEDICAL APPLICATIONS
- ◯ WRITING PROGRAMS FOR OTHER USERS
- ◯ PROJECT RECORDS and CONTROL
- ◯ MAILING and LABELLING SYSTEMS

... and this is just the tip of the iceberg!

The following program generators are now available from Dynatech Microsoftware for the micro-computer systems indicated:-

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Please forward details on the program generator(s) as indicated.

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MCP11

Computer people..

By Humphrey Walwyn

COMPUTUS TYCOONUS

Description:
Any elitist member of an elite computer firm can be a 'Computus Tycoonus'. They are variously described as software specialists, hardware designers, marketing strategists or—more simply—computer executives. Whatever they are, they are most certainly NOT salesmen. They see themselves as creative wizards and dedicated scientists—visionary explorers of new horizons. Other people—mere mortals by comparison—further enforce their status by interviewing them at great length in computer magazines or by inviting them to give important lectures on "Ergo-symbiosis and DATA retrieval". Nobody understands them but everyone applauds. We only use the equipment. Heavens above, they actually have a hand in MAKING it!

Classification:
In the beginning, they were clean-cut all American wonder-men.
Lately, the breed has devolved to include Germans, Swiss, Britons and—of course—Japanese. The British breed are mostly, though not entirely, based in

Cambridge. Silicion valley is a small ridge running out of Newmarket. There seems to be one common factor to all nationalities...the face that launched a thousand chips wears horn-rimmed glasses. Some of them have cheated and now wear contact lenses. Of course, it's further proof that gazing into VDUs is bad for your eyesight.

Habits:
Like all guardians of the inner sanctum, they are mostly aloof and removed from society. With one or two British exceptions, they are not very interested in what happens to their creative product once it has passed to the manufacturing stage. This is why they are not involved in selling. Commercial sales are involved with today's world. They are busy creating the world of tomorrow. Unlike traditional inventors, they are not all eccentrics and don't often have egg stains on their ties. This is because Gods don't have messy habits and—being immortal—food is not an important input.

Advice:
If you are fortunate enough to meet one of these, don't grovel or bow down. This will only serve to heighten their innate superiority. A better tactic is to quizzically twist your eyebrows and remark: "Sorry but WHO did you say you were? I'm so awful with names." They will then depart in a huff. Beware of lightning bolts on the way home.

COMPUTUS SMALL-BUSINUS

Description:
A small businessman doesn't have to be diminutive. Most of them are now self-assured and free of any worries. The dreaded invasion of the computer to their shop or factory *didn't* prove to be a wrong decision on their behalf. Instead, they now have more spare time on their hands to enjoy life or expand their business. The relief at finishing stock-taking chores within a few hours rather than a few weeks is apparent on their faces.

Classification:
In some ways, COMPUTUS SMALL-BUSINUS is closely related to COMPUTUS EDUCATIONALENSIS (viz). The same missionary zeal of the computer convert shines through their daily life. However, educational fervour and commercial competition do not swim hand in hand. If they sing the praises of their new 'software invoice package' too highly then neighbouring shops may catch on to the same trick. If the entire high-street is silicon based, their momentary advantage over their competitors will be eroded.

Habits:
The new found ease of commercial operations in the small business has bred a parallel fear of security. Since all the firms' accounts are now handled by Simon (who knows more about these computer things than I do...) or Julie (whose typing has improved remarkably since we got that word processor thing...) there is a growing fear that the company's innermost secrets are locked away in areas that computer illiterates cannot properly decipher. Furthermore, if the new mailing list program can do the same job that old Atkins in accounts did in one quarter the amount of time, what about MY job? It is an old and worn argument that computers will remove people. Most computer people try and reassure everyone that this will not be the case. The fear remains however, and no one has effectively solved the dilemma. Some COMPUTI SMALL-BUSINI therefore have developed nervous twitches and spend a lot of time glancing over their shoulders at the 'beast' in the corner.

Advice:
Get to know the beast a bit better. If you get hooked on it all, then you will find that you know as much about your business as Simon, Julie or anyone else. You can also have fun playing 'ADVENTURE' after everyone has gone home.
So *that's* what Simon and Julie have been doing every evening 'working late'!

COMPUTUS HOME-SOFTWARUS

Description:
Small and red-lined eyes staring from a washed out face. This is caused by hours of V.D.U. eyestrain at three o'clock in the morning. The species is mostly—but not entirely—male and often unshaven. This is because there are far more important things in life than normal behaviour. Eating, sleeping, shaving and feeding the goldfish are no longer meaningful when your mental energies are solely concerned with solving the 'bug' in the variable loop at line 2100.

Classification:
This breed is the most numerous of all computer related humanoids. Everyone is doing it. Producing one's own software is *the* cottage industry of the 1980's. I have been doing it for years. So—now it transpires—have my neighbours, half the people in my office and my bus conductor. There used to be a time when the glazed expressions of COMPUTUS HOME-SOFTWARUS isolated them from the rest of the community. Nowadays, however, there are so many people hooked on silicon that it is the so called 'normal' person who stands out in a crowd. Look around you as you travel to work tomorrow and you will see rows of faces lost in vacant thought as they ponder 'array sort subroutines'. Newspaper sales continue to plummet downwards as comuters are far too tired to read anything in the mornings. If you see someone smiling, relaxed and apparently free from any worries, this means he/she has not yet discovered the delights of home programming. This is abnormal behaviour. To be a member of today's society, you almost need to have a permanently comatose expression. Nothing moves on your face as your brain whirls in endless FOR...NEXT loops. The only thing that blinks is a cursor.

Habits:
Designing your own programs is one thing... trying to sell them is another. In order to be a successful COMPUTUS HOME-SOFTWARUS, you need to be a good copy-writer and a reliable letter writer. You also need to design original programs that people might want. Since home-programming is such an introspective occupation, it is sometimes hard to accept that other people exist at all. You may enjoy writing the most brilliant spacial fantasy progam with more moving gargle-blasters and flashy colours than ever before but if everyone else is doing the same thing then it ain't good commercial practice. The sales pitch is vital, particularly as your small-ad in the nearest computer magazine will occupy three small lines and be easily lost amidst a sea of competitors. Perhaps teamwork is the best answer. You can leave the mail-order and sales business to a reliable friend while you lose yet more sleep over your next creation. And if no one buys your wondrous programs then console yourself with the fact that Creativity is Art.

Advice:
If you are a COMPUTUS HOME-SOFTWARUS then take heart from so many others around you in the same predicament. Making programs is hard work but fun. Making money from them is just hard work. If you aren't yet into computers at all, then remember you may feel increasingly ostracised by the silicon society. Since you're reading this magazine you must be *nearly* hooked!

COMPUTUS VENDOR

Description:
This breed falls into two sub-divisions. The first type has an impressive appearance and a mouth that mega-bytes. The second is more of a background person and has a quiet voice that seems to 'under-sell' the products in the shop. The first is untrustworthy while the second type is a more reliable salesman. It is quite astonishing how many COMPUTI VENDORI (both types) have beards. On second thoughts, the reason that so many of our computer shop salesmen have beards is simple. They are just advanced cases of COMPUTI HOME-SOFTWARI (viz) who have stopped shaving altogether, since computing takes up so much of their time.

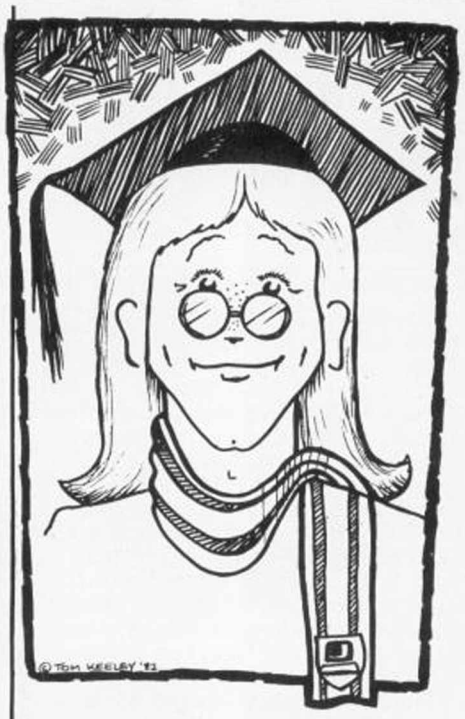
Classification:
The first type of COMPUTUS VENDOR is an aggressive sales-person. Any new product in the shop *must* be good to sell because it is new. This is not the same as saying it is better than older computers but it helps. In order to be a good and successful member of this breed it is not necessary to know a lot about computers. On the contrary, it is perhaps easier to sell computers if the potential buyer doesn't ask too many awkward questions. The second breed-type is not really a salesman at all. He only got labelled as a COMPUTUS VENDOR because he wanted a change from his *other* computing job. He is genuinely helpful and takes a more sensible approach to computer sales by assuming—rightly—that the majority of customers to his shop are totally unaware of the intense and habit-forming obsession they will suffer when they buy their first computer. The approach over the counter is therefore tinged with a hint of sympathy for the customer's forthcoming sleepless nights as they grapple with BASIC.

Habits:
Both types of COMPUTUS VENDOR have one marvellous advantage over other computer addicts. Any problems over lack of bonuses, anti-social working hours or hot and sweaty computer shop working conditions are completely negated by this same advantage. Namely, this is the ability to play with all the machines in the shop after closing hours.
This fact explains the self-satisfied smile to be found on the faces of all COMPUTI VENDORI. You have to BUY the machine to play with it. They can dabble for free.

Advice:
It is obviously essential to be able to tell the two types of COMPUTI VENDORI apart. If you purchase your machine from the wrong shop or wrong salesman, then you may well regret your decision later. It is easy to find out who is who.

Just ask one simple question:
"What about *after* sales service if it goes wrong?"
Make sure you watch his eyes when he answers...the slightest screen shift and you've got the wrong breed.

COMPUTUS EDUCATIONALENSIS



Description:

Normally inhabits college canteens and staff common rooms. Can be easily recognised by the earnest expression and wide-eyed excitement that normally is a hall-mark of the religious convert. Mostly—though by no means exclusively—female, young and extremely enthusiastic. Other teacher colleagues tend to enter a comatose state when she/he sits down at their table. They have heard it all before. Many times. Here it comes again... move over....

'Computus (or probably Computa) Educationalensis' talks in capital letters: "Hey, this morning it was AMAZING. The fourth form are HOOKED on that GREAT new historical simulation program. I've NEVER known—NEVER—kids actually QUEUEING to be taught like THAT. We need HUNDREDS of micros. EVERY school—No, every CHILD—needs their OWN computer."

Classification:

A new and refreshing breed. They used to be rare specimens constantly under threat from sneering senior staff. Their enthusiasm has made them a prevalent species however and nowadays you can hear their strident cries ("More cash for Educational technology!") echoing throughout local Education establishments and Government offices as well as classrooms. They may be keen on the academic benefits of New Technology but are not always computer-literate themselves. Indeed the students they teach are often better programmers than they are. This fact is an incentive since the professional pride of teachers is under constant threat.

Habits:

The more members of staff on their side, the higher the chance that the school will consider buying yet more micros. They have developed great powers of endurance and persuasion and have had to acquire internal political skills to pursue their objectives. If two such individuals meet in a corridor, they'll talk for hours exchanging DATA statements. They often 'work late'. This enables them to have a go on the school micro themselves and keep one step ahead of their own students.

Advice:

If you meet her/him, don't giggle or make disparaging remarks. Such rabid enthusiasm may hopefully infect any remaining sceptics. An erratic viable input to the system. We need more of them.

COMPUTUS CLUB-ORGANISUS

Description:

Energetic to the point of distraction and brimming with enthusiastic Zeal. This individual is a leader among men... a paragon of organisational skills and a masochist. There is nothing very extra-ordinary about him/her when you realise who they are but many of them have fidgetty fingers and are heavy smokers. These traits are due to a surplus of adrenalin in trying to find guest speakers to the monthly computer club bash.

Classification:

The species is a sub-classification of COMPUTUS HOME-SOFTWARUS and owes its very existence to the sheer disorganisation of the computer addict. (See COMPUTUS HOME-SOFTWARUS). British society breeds clubs of all sorts to satisfy the insatiable enthusiasms of all specialist fanatics. In this country we have clubs for bee-keepers, stamp enthusiasts, weekend gardeners and steam engine followers. The local computer club is therefore not so much an anachronism but rather an inevitable progression of a changing world. As already stated, the majority of COMPUTI HOME-SOFTWARI are pretty incapable of looking after themselves since they are too involved in creative programming. Hence the arrival of the computer club and the club organiser to make sure that someone is looking after them.

Habits:

They tend to be methodical and capable individuals who don't panic easily. It is also essential to have a fair degree of social expertise to weedle subscriptions out of unwilling contributors and a brave front to convince the visiting COMPUTUS TYCOONUS (viz) that he/she could really benefit from a guest appearance at Ongar town hall.

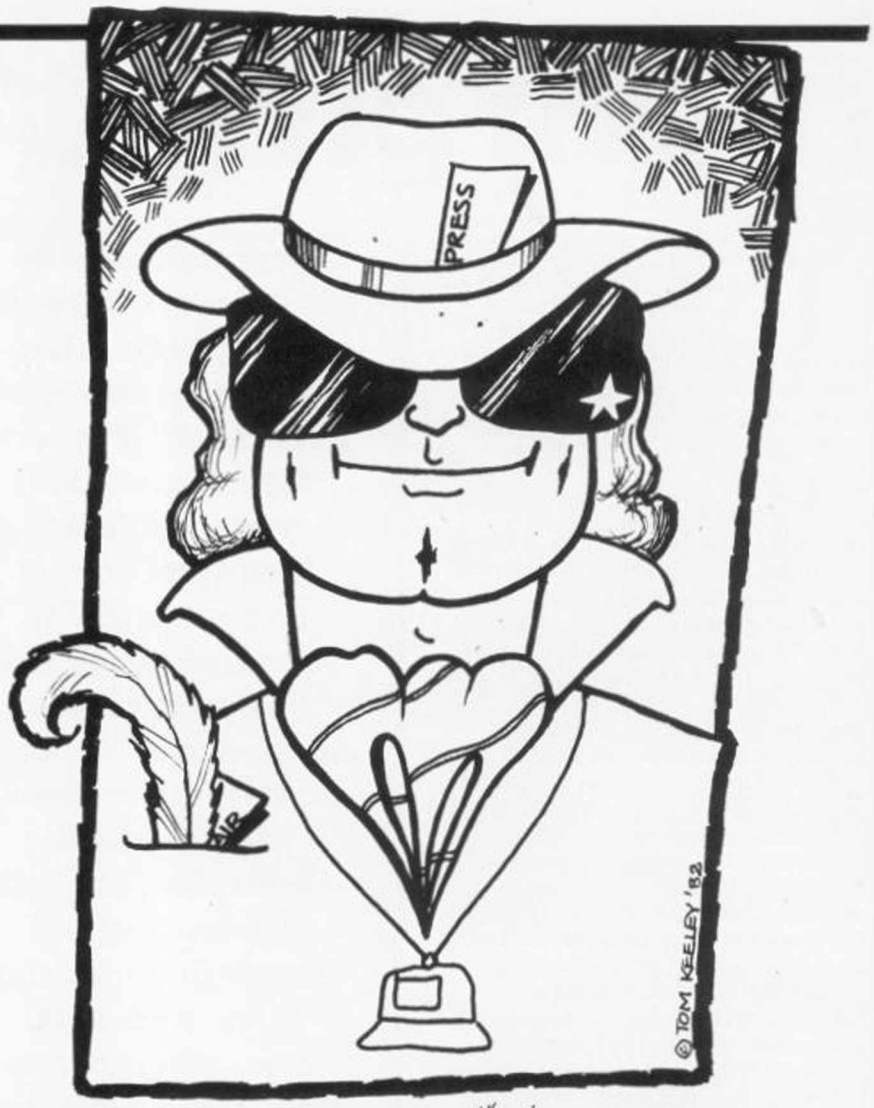
Frankly, this breed is often on a hiding to nothing since computery people are more interested in machinery than social discussion. Wherever possible, COMPUTUS CLUB-ORGANISUS should have a meaningful contact within the silicon trade. 'Meaningful' in this context means 'having the right sort of friends who can lend the club the new 128K super-micro for one evening.'

Advice:

If you are one of this brave breed, don't forget the social aspects of the club. Learned lectures on Fortran are better digested over a bottle of wine.

If you meet one, express sympathy at the amount of work he/she puts in. If you get too closely involved however, you will be asked to deliver leaflets or type three hundred envelopes on a Friday evening. If this seems a nice idea, then 'good for you'. But you have been warned.

COMPUTERUS JOURNALISTICUS



Description:
Gosh, they're famous! You buy their books, read their magazines, recognise their names but—surprise surprise—they don't look very different from normal people. In fact, meeting your favourite writer is quite often a let down. You often expect them to be taller.

Classification:
Computerus Journalisticus is a relatively new cross-breed. As the micro-religion gains ground, the more we require temple acolytes and aurus.
Unfortunately, pure journalists write about people and computerologists write for machines so there aren't too many silicon prophets who are readable.
Creative artists may set pages on fire but are unmoved by the literary boredom of restrictive one-liners. 'IF X=YTHEN200' won't win the author a Booker prize. Similarly, creative computer programmers spend so many hours staring at VDUs they sometimes forget their mother tongue. BASIC English isn't basically English at all. No one has yet written a best selling book solely based on IF...GOTO statements.

Habits:
In Britain, most of the successful prophets seem to come from America, Canada or Australia. It is quite an achievement to actually meet one since they aren't often here. They're either "... just back from the Chicago computer fair" or "... just off to Sydney for a micro seminar".

Advice:
Don't be put off by all this bravado. You can play the game too. Smile broadly and put on an impressive display of imagination and bullshit.
"Didn't I see you at TEKNEX 82 in Hong-Kong last month?"
Computerus Journalisticus will be alarmed because he's never heard of TEKNEX 82. Why wasn't he invited? He must be slipping...
One up to you.

THE JAPANESE

Over-enthusiastic advertisers frequently refer to their micro-computers as a 'new generation'. The term 'Fifth Generation', however, refers to a long-term project instigated by the Japanese which will revolutionise computing as we know it. The implications, *as Rex Malik* discovered, are both fascinating and frightening – among them: a personal computer that can *think* like a human.....

The Vth Generation is probably the most ambitious, far reaching, and change seeking programme ever devised in computing technology. It is indeed probably as ambitious as was the space programme of the sixties, that programme which President John Kennedy announced was to put a man on the moon in a decade. Which it did. But you can forget anything you may have read in the trade papers about British or American Vth Generation, because the only concentrated programme worthy of the name is going on in Japan, and indeed it was the Japanese who carried the phrase in the first place. Similarly the Vth Generation programme seeks to overturn thirty years of computer development, to begin the technology anew, and to do that within a decade. It sets out to take a fresh and fundamental look at computing, not to continue its development by a process of accretion, taking what advance one can get from individual developments, and adding it to the arsenal of the practicable. Instead it does something I find of incredible fascination: In effect what the many hundreds of closely packed pages of the documents outlining the scope of the Japanese R & D programme say, is this. About the only two things we have got right with computing so far have been: one, to make it electronic, two to make it digital. Everything else needs re-inventing. Naturally one has to begin with what we know, even if only to say that it is unsatisfactory.

Economic Advantage

But why should the Japanese want to re-invent computing? The reasons are many and complex, some are technical, others primarily concerned with an evolving Japanese view of the future and what they expect to happen to Japanese society. Certainly the Vth Generation's realisation will have immense spill-over effects on other countries, and that must be to Japan's economic advantage. But the real reasons have to do with the evolving Japanese situation.

The Japanese begin with a proposition: The future of the industrialised countries is one in which they become increasingly involved and immersed in the information economy. There is no future for hordes of people manning factories and offices. And the reason that there is no future down this route is that computers and machines can do most of the tasks that people now do more economically and efficiently.

So how is a living to be earned? It will come from adding the highest amount of value possible to the smallest amount of raw material possible. This is vitally necessary tor Japan which has almost no raw materials of any kind and little natural sources of energy. Over 97% of Japan's energy requirements, it is worth noting, are imported.

And where is high value added to a minimal raw material base to be found? It is found in bio technology and electronics. These have a bonus. They are fields, which require the sorts of skills that Japan is good at producing – trained engineers.

So why not continue as the rest of us are doing now, the building up of their computer industry on known lines. They are doing that anyway, but they also take the view that the existing industry outside Japan, particularly IBM and the IBM compatibles, have a firm grip on conventional computing, so firm that it is doubtful if Japan can supplant them.

That would take years if not generations. Even so, they will continue to try. But that is not where the main effort is going. That is to be mounted on a market which does not as yet really seriously exist. Indeed in the Japanese view the present market is really a subset of a larger one, one awaiting creation.

Non-Numerical Data

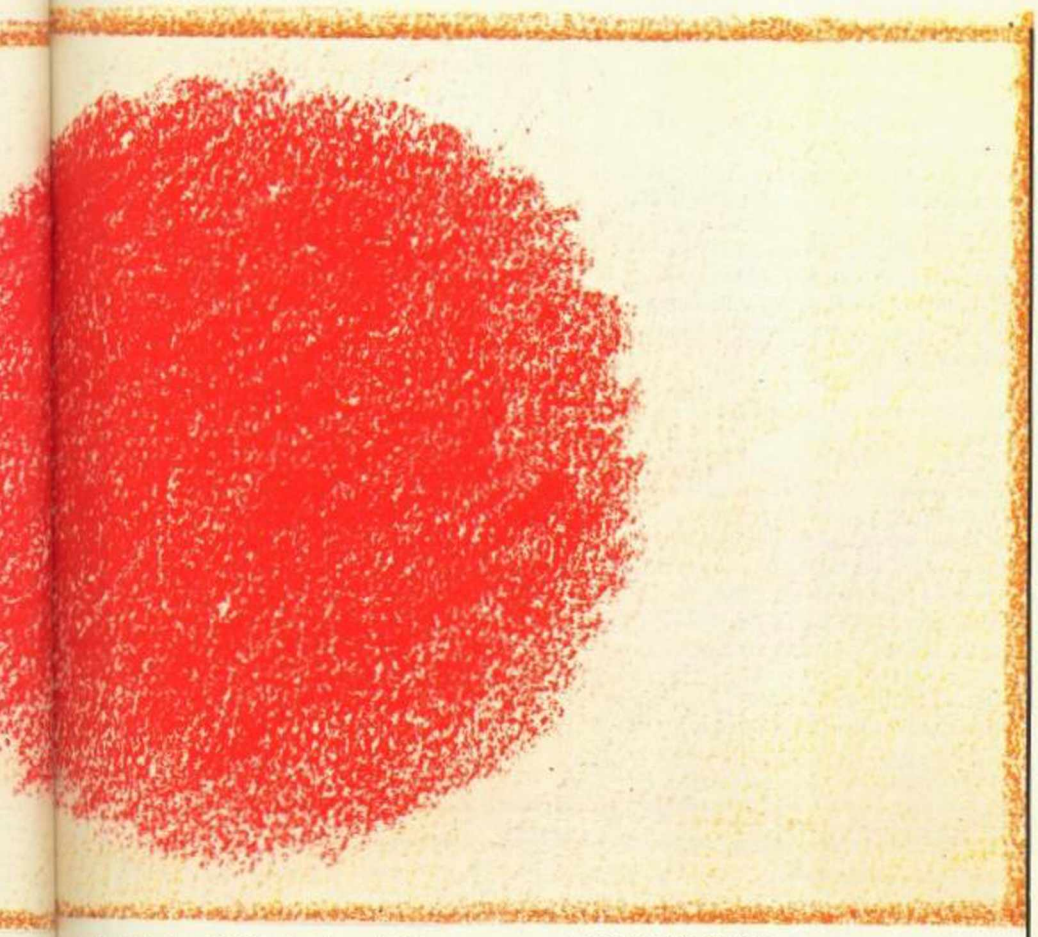
To get at that larger market demands substantial change within the technology. What is that larger market? Well the Japanese would say that everybody knows what current computers are good at: they are good at tasks which require computation. However, they are extremely weak in basic functions for processing speech, text, graphics, picture images and other non numerical data. And they are even weaker for artificial intelligence type operations: they are very bad at processing such things as inference, association, and learning – all things that people do well.

Conventional computing requirements to even begin to handle such things at any level of complexity, are huge. Now why are they huge? Because the organisation of most computer systems is a linear organisation in which everything marches in serial order one after the other. This means that handling the sort of complexity that people handle makes considerable requirements on processing power. If one is to break into the people-replacement or the people-aiding market in any serious way, the system must change.

Why should the Japanese want to break into those markets? There are other reasons besides the ones given at the start. One of the most important is that Japan faces a rapidly ageing population, and that ever rising standard of living is going to need to be supported by a smaller and smaller work force.

And how does one go about breaking

/and a thinking micro



into them? One has to re-think computing. So how does one re-think computing? One begins by understanding what the previous four generations have been about: they have primarily been about hardware change. First valves, then transistors, then integrated circuits, and currently large scale integrated circuits. But the philosophy behind computing has hardly changed in thirty years. And neither have the objectives.

Hardware Tailoring

Can computing then be up-ended? Well, yes it can. We have tailored our languages and programs so far to suit hardware, why should we not reverse the process and tailor the hardware to suit the logic of our programs?

We do this in a very small way at present, by designing microprocessors to perform a desired set of instructions. But this is really at the fringes of our effort, software remains something added to hardware. Its own logic does not dictate the layout of the hardware.

Well it should. You can see that this is in many ways revolutionary thinking. The Japanese are not alone in thinking like this, there has been considerable research in the last ten years. But that research has been peripheral to the main thrust of computing R & D. What the Japanese propose is to move it to the centre of the stage.

And a change, claim the Japanese, is becoming necessary anyway. Device speeds they say are approaching the limit imposed by the speed of light. The performance improvements we can then get out of the existing serial architectures are becoming more and more limited.

The design philosophy behind conventional computer architecture (named after its inventor – Von Neumann) has been based on configuring systems of maximum simplicity with minimal hardware, this in large part because hardware has been expensive. That constraint is disappearing. The emergence of VLSI's substantially reduces hardware costs and an environment permitting the use of as much hardware as is required will be feasible shortly.

But to take advantage of the effect of VLSI mass production, the Japanese claim it will be necessary to pursue parallel processing. Now the Japanese are good at VLSI, so naturally one would expect them to plead this in support. But it is more complex than this. It is because they are good at VLSI that they have been able to go to the next stage, to think how it might be used.

We now need to step back a little, back to the logic structures that underpin computing and consider what changes need to be made there. Those changes, it turns out, are considerable.

PROLOG

Let me now wheel on stage PROLOG. It is a language which was developed by A.Colmerauer of the Artificial Intelligence Group at the University of Marseilles in France, but whose chief proponent and most extensive developer has been the American Robert Kowalski. Strangely the development has been largely limited to Europe (and Japan) for Kowalski works out of Imperial College in London.

PROLOG (which stands for PROgramming by LOGic) is best thought of as the first language based on a non deterministic logic: its roots lie in the predicate calculus, for those who like buzz-phrases.

The language is based on the observation that declarative sentences of the form

A if B and C

can be used as procedures which, given problems of the form

A

can reduce them to subproblems of the form

B and C.

And this of course turns out to be much more akin to the logic that people use, even if we the people do not know that we are using logic anyway. It differs substantially to the logic base used in conventional computing.

PROLOG is an execution of the logic of people, if not necessarily the ultimate execution of it. It is the starting language for the Japanese development. As that simple construct above shows, however, a language based on this logic should be well suited to parallel execution. In other words, having reduced a problem (A) into two problems (B and C), both can be worked out at the same time.

But how can we meaningfully talk any more in such a system about Instructions Per Second? Of course we cannot. Well then what is the measure to be? It is a human measure, though we never in fact use it. It is LIPS or Logical Inferences Per Second.

Expert Systems

What is human about it? One LIPS is one syllogistic inference a second. And how is it derived? Well though few know it, we already have a base from which to derive it. That base is found in the artificial intelligence field of expert systems. Those systems have all run on conventional hardware.

When you study what their programs do and measure in terms of the syllogistic inference operations per second, you find that each will require between one

THE JAPANESE / and a thinking micro

hundred and one thousand instruction "steps". So it follows that 1 LIPS would correspond to between 100 and 1000 IPS.

Now we are beginning to get a handle on it. Japanese studies indicate that many of the operations people do are rated in hundreds of thousands of LIPS. Some indeed are rated in many millions of LIPS.

The Japanese are talking in terms of targets of 100 Mega LIPS to 1 Giga LIPS to be achieved from 1990 onwards. This is to postulate not special purpose systems, but machines which have a much more general purpose problem solving capability.

It is a distant target, one which we can now leave. For nobody as yet, let alone the Japanese, know if it can be achieved and if it can, how it will be achieved. They are setting out however with considerable confidence to try to find out.

This is the necessary background to consider what they are actually doing, and what they hope to get out of it directly. It is part of the Japanese tradition and culture to make their advances in small incremental steps. And the Vth Generation Project is unlikely to be an exception.

I have spent part of the summer of 1982 in Japan, talking to senior Japanese computing and electronics R & D specialists, and to the leaders of the team charged with the development of the Vth Generation.

The project was being discussed for three years before funds were allocated, and that happened this spring. So that on June 1st, ICOT, the Institute for New Generation Computer Technology ,– formally came into being.

It is based on two floors of a modern bank building in Tokyo, and initially houses forty researchers. The Japanese system is one of consensus, and this has been applied here. The researchers are drawn from the eight major Japanese electronics companies and Japan's major R & D laboratories, including those of the NTT, the Japanese equivalent of British Telecom.

Government Funds

ICOT is funded by Japanese government funds, and will do basic R & D. When it becomes a question of development towards product, then the R & D will be moved to the companies. And eventually in the distant future when they have product on the market, they will pay the government back accordingly.

The project will last around ten years. They have around a million pounds for the first year, 'thinking' money because they are initially going to be doing very little else. And ICOT expects that it will have between twenty and twenty five million pounds for its second year.

After that, the real money starts. Whatever money they get, what are they going to do with it? ICOT's head, Kazuhiro Fuchi, tells you that their first task is to develop a personal computer. It is to be an intelligent personal computer based on PROLOG. It may be that it will

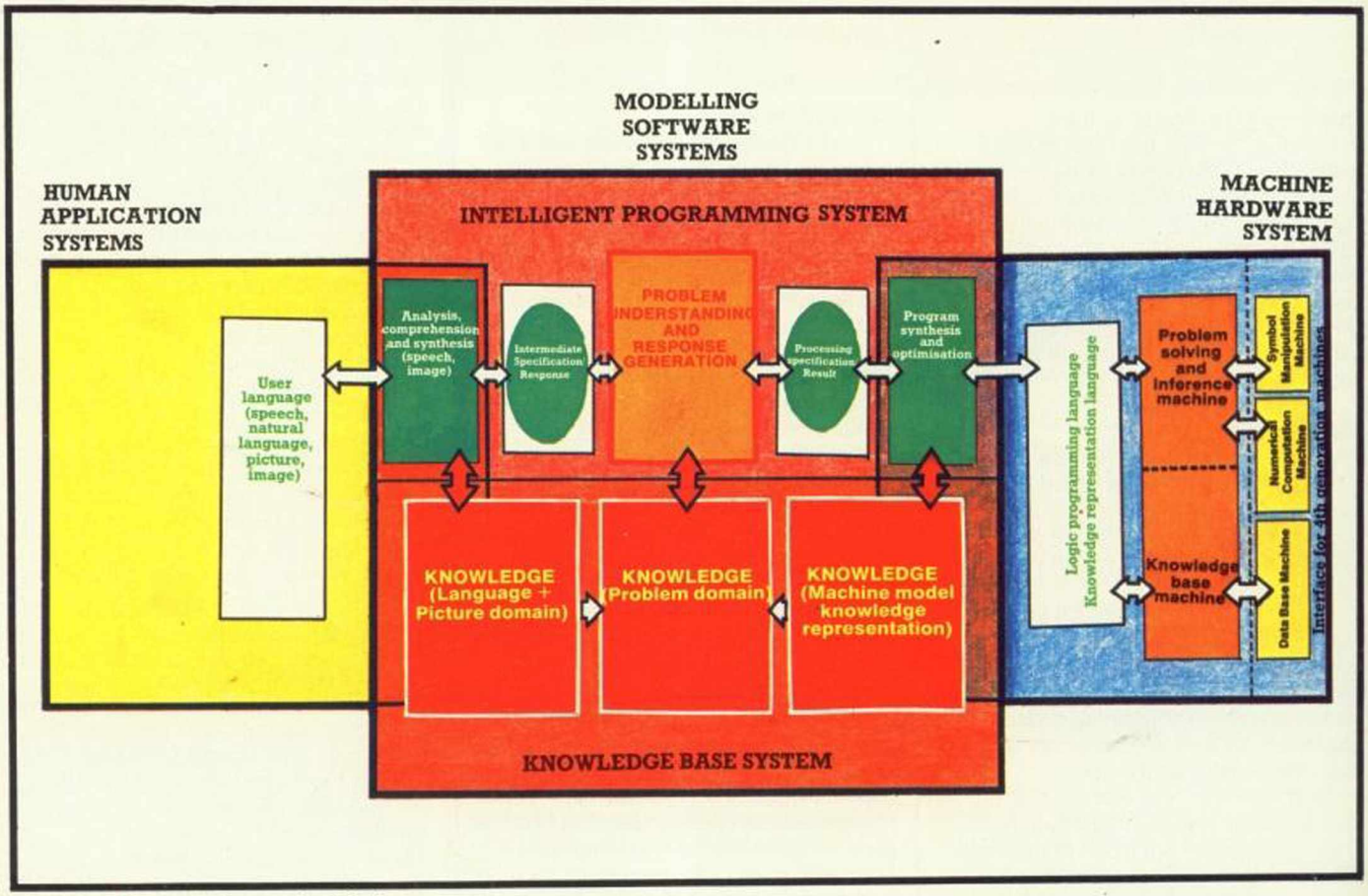


Figure 1: This extremely complicated diagram shows the concept of 5th Generation as seen by the programmer. Notice in particular that contemporary computing (4th Generation) is relegated to a small subset of the whole scheme.

come to market, but that is not the aim.

The aim is to test the reality of their thinking, and to try to develop a development tool.

For it becomes quite apparent that to develop with Vth Generation, they are going to have to 'automate' software generation to a level not previously considered. Mr Fuchi tells you quite clearly that eighteen months onwards in the development they are going to be turning to the industry for development tools.

For programming is to change. Now we have all heard that before. Nevertheless Mr Fuchi can say something which all programming purists have been saying for the last quarter of a century, but Mr Fuchi means it.

"We should be able to write programs as if there were no speed or resource contraints. The programmer should not have to worry about resource allocation, he should just be able to write his statement and not have to pay attention to the machine."

It will be of course a different sort of machine. It may be that the inference process is at the heart of it, but in terms of actual organisation a lot of other functions have to be carried on. Some idea of the complexity of the different approach they are following can be obtained from the conceptual diagram of a Vth Generation system as seen by the programmer. (Figure 1)

Intelligent Database

It takes very little looking to see that there is no operating system as it is normally conceived. Indeed how could there be. It takes also very little looking to see that inbuilt into the Vth Generation are functions I have not even mentioned, such as, for instance, its intelligent database management.

And I am not going to mention them. Because that would set me down a very complex road. I can describe to you how complex it is by stating that the research headings in the most recent short version of the Vth Generation report, which is in English, devotes thirteen closely printed pages just to listing major research topics on which work will have to be done.

All jolly good stuff you might well say, but at the end of it, what do we get, and why should we worry anyway? Let me deal with the second part first. Unprecedentely the Japanese have asked for international co-operation: they have approached Britain, France and the USA to see if they would collaborate over the development of the Vth Generation. So far no one has replied, though the omens are that any reply will probably be in the negative. We will try to do what we can on our own. Some sceptics indeed take the view that we shall probably be able to reverse engineer what the Japanese do.

I have doubts.

Machine translation system

- Translations among multiple languages
- Vocabulary size: 100,000 words
- Machine to guarantee a 90% accuracy, with the remaining 10% to be processed through intervention by man.
- System to be an integrated system where computers participate in the individual stages ranging from text edition to printing and of translations.
- Total costs involved to remain at 30% or lower than those of translation by man.

Consultation systems

- Specimen applications
  - Medical diagnosis
  - Natural language comprehension
  - Mechnical equipment CAD (computer aided design)
  - Computer user consultation
  - Computer systems diagnosis
- Number of objects 5000 or more
- Inference rules: 10,000 or more
- Semi-automated knowledge acquisition
- Interfaces with system: Natural languages and speech
- Vocabulary size: 5000 words or more

Figure 2: This table shows the initial targets for development of commercially available systems as part of the Japanese 5th Generation project. Note that many of the objectives would be totally unrealisable using conventional computer architecture.

What do we get? Figure 2 comes from that latest Vth Generation report. It is the initial targets for commercial development after they have survived budget battles. They will not be the only systems, it doesn't work that way. Japanese processes are iterative so that the short term targets are likely to alter as the R & D process continues. For the ease or difficulty of all the R & D cannot now be foreseen.

Ten Year Agenda

Will they be able to pull it off? Are they likely to obsolete computing as we have understood it ten to fifteen years out? I think they will, and this strangely – whether or not they succeed. This may seem a most peculiar thing to write: it is not. What has happened is this. In setting out their plans they have alerted everybody. So that everybody else is now going down this route if for no other reasons than to protect themselves. So what has effectively happened is that the Japanese have set the agenda of computing for the next ten years.

And that alone is bound to change computing. One last thought, and it comes from Dr. Uchida, ICOT's chief hardware designer. "What we are setting out to create", he says "are what could be classed as special purpose machines. If you go that route, you are free from compatibility problems".

The note of relief is very evident in his voice. For he knows very well, as well as anybody else, that if you can forget about compatibility, a large part of the designer's problem disapears. He knows too that they will have enough problems without those.

And he knows something else. And it is something that the analysis and the documents give a hint of. In fact if you forget about compatibility, if you design a system which does not set out to be compatible, in many ways you are making it easier to be compatible. That's the paradox.

For compatibility now becomes a straight problem of interfacing to an external system. And that anyone who has pored over the conceptual diagram which accompanies this article will see is precisely the route they are taking.

So they can be said to end up compatible after all. But in this way. Computing as we understand it becomes a sub set of the larger scheme of things. So the wheel turns circle: and whichever way it goes they probably end up winning anyway.

I wish I could have thought of that for a strategy. □

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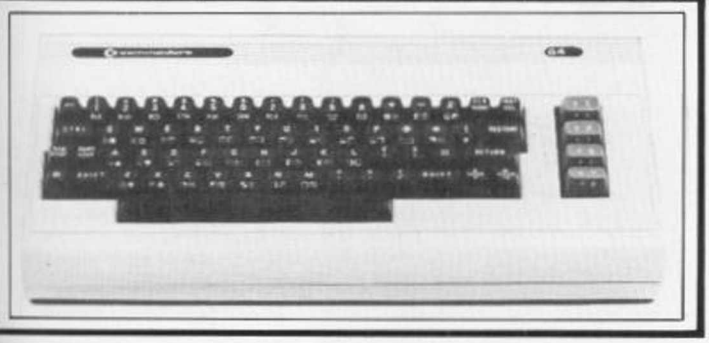

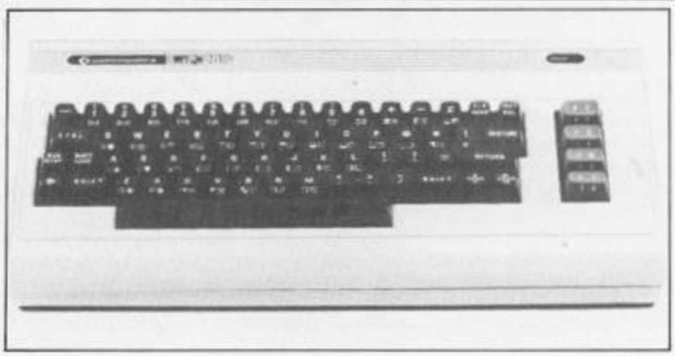

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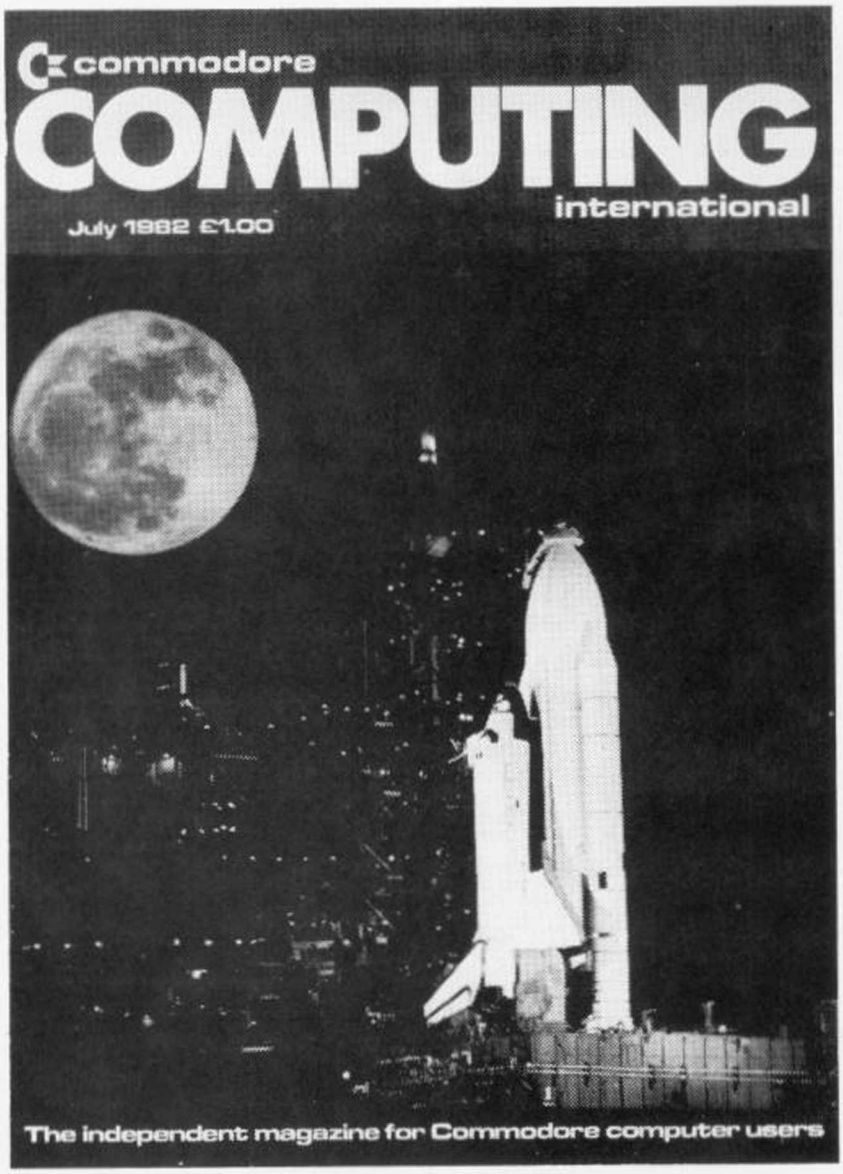

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PLAYER MISSILE GRAPHICS

Terry Hope concludes his three-part series on Atari with another look at player-missile graphics and an overview on screen scrolling.

Hello again! Let me launch into an apology first by saying "sorry" about our non-appearance last month. The brickbats descended heavily on the head of our hapless editor but it wasn't his fault, folks! A vicious virus launched itself at the Hope household and we were all down with it. It was as much as I could do to get downstairs, let alone write an article.

It's gone now though – and not before time – so I can carry on where we left off in the last instalment. Then we'll finish by looking at various methods you can use for screen scrolling. Everything is part and parcel of your Atari, and not using what you've got is akin to Saville Row suiting wasted in the wardrobe!

If you remember, the previous article concluded with a very simple BASIC program to produce an on-screen "player" you could move around with a joystick. The cursor stayed in view throughout and, wonder of wonders for those brought up on simpler computers, the "player" could move over the cursor without disturbing it or erasing it in any way.

The movement was slow and cumbersome because the program was written in BASIC – a machine-code version would have been fast and smooth, which may be an encouragement to have a go at learning machine-code!

Digressing for a moment, if you'd like another and more material motive for mastering machine code, here's an interesting fact about an Atari game called "Choplifter!" which is in most Atari dealer's shops at the moment.

Compulsive....

Notwithstanding my good friend Julian Allason's sideswipe at it a couple of issues ago (I suspect he hasn't seen it or played it, but fell victim to an unhappily worded press release!), "Choplifter!" is an utterly compulsive pastime. So compulsive in fact that it's headed the list of American best-selling software for the last three months, dislodging "VisiCalc", the world's best-selling program for aeons, in the process!

Now "Choplifter!" uses every trick in Atari's very considerable repertoire – reconfigured characters, display list interrupts, fine horizontal scrolling, player-missile graphics, manipulated sound registers, and Heaven knows what else!

I won't even attempt to describe what goes on because that's not the point of the story. The moral is that "Choplifter!" is, of course, written in machine-code, and it was authored by a chap called Dan Gorlin who sold it to Broderbund Software on a royalty basis.

And would you like to know how much Dan is likely to make from this one single game in terms of royalties? I'll tell you (and I have it on good authority from none less than charming Doug Carlston, president of Broderbund Software).

....And Cashworthy!

The royalties are likely to be around the $100,000 mark! Remember, that's for one single game but remember also that it's for a game written in machine-code, since the extraordinary things which happen on-screen couldn't be made to occur in any other way.

Now I'm not suggesting for a moment that you're likely to write a world-beater like that. But it's a thought, isn't it?

Enough of this digression though. Let's try picking up the threads where we left off in the last article. You'll remember that we concluded with a program listing which put a "player" on the screen. You could move it with the joystick, including to and through the cursor (which remained on screen) without disturbing or erasing the cursor in any way!

As we said at the time, it wasn't a game, merely a demonstration of just what could be achieved by scratching the surface of player-missle graphics. And now we're about to dig rather more deeply.

We must start with that program in the previous article though, because it contained quite a few important memory locations which we PEEKed and POKEd rather unmercifully.

Manipulating Memory

You'll know, of course, that your Atari has a considerable memory consisting of many hundreds of locations, each of which is helpfully numbered. You can look into each one to see what's there with the PEEK command, and you can use the POKE command with a lot of them to make sure your choice of content is in position.

There *are* some you can't POKE but Atari has an answer to most of those, in that there are "shadow" locations you *can* poke. Whatever you put in those locations will be transferred to the 'unpokeable' locations fifty times a second so there's no real problem.

Now the locations we used in that demonstration program are locations you'll use quite often during your experiments with player-missile graphics. That's why we need to start by describing them and what you can expect them to do for you.

Here then are the important details:

Location 54279: this is known as the player-missile base pointer and ANTIC uses it to find out where player-missile information can be found in memory. That's how we used it in Line 15 of the program.

Location 559: this one's known as the direct memory access enable which is a complicated name for a point at which we can actually turn ANTIC on or off. Better, it's also the shadow register for location 54272, the point at which it can be decided what size our player is going to be: in our program we settled on 2-line resolution.

Location 53277: this one's used to actually allow (or "enable", to use the professional term!) the use of player-missile graphics. It turns the players "on" in other words. According to the value we POKE into it, we can get a number of possibilities. It's enough for now to know that a 3 allows a "players" display.

Location 53248: this one tells us (or more important, tells our program) the horizontal position of Player 0. There are other locations (53249,53250 and 53251) for the other "players".

PLAYER MISSILE GRAPHICS

Location 704: this another of the shadow locations – we use it because whatever number's there is written 50 times a second to the location which controls the colour of Player 0 (guess what: locations 705,706 and 707 look after the colours of the other three "players").

There you are then – that's a listing of the major locations used in the program at the end of the last article. Armed with those, and a desire to experiment, you should be able to have some fun with the program by changing the values originally given.

Be Sure To Experiment!

The key thing to do is, in fact, experiment. Nothing in terms of PEEKing and POKEing will harm your Atari, but the different results you'll obtain will be an invaluable if gradual education.

Mind you, let's be clear about one thing: there's no way that three articles can possibly teach you all there is to know about Atari's possibilities. They're manifold and books have been written about them.

One sensible suggestion might be to get yourself a comprehensive list of Atari's memory locations. One publication I'd recommend is Educational Software's 'Master Memory Map'. Copies are in most Atari dealers' shops, and it lists just about every location you're likely to need and then some!

Another publication regular readers will know I've recommended before is Atari's master-work "De Re Atari". When I first mentioned it many months ago, you were lucky if you could get hold of a copy of a copy of a copy. Now the original is freely available and again you should check your nearest friendly Atari dealer. You may well find parts a little heavy at first, but you'll inevitably come to value it more and more.

More Manipulation

But let's get back to graphics manipulation.

I'd like here to give credit to "De Re Atari" for inspiring some of the ideas I'm presenting. you'll find no less than 56 short programs for you to enter and try. Each of them explores one aspect of graphics manipulation, and most of them use the PEEK/POKE locations I've listed.

Figure 1 provides a program that takes the concept of player-missile graphics a stage further than we've explored so far.

For Heaven's sake don't expect a game – in fact, don't look forward to anything which even moves, for you'll be disappointed if you do. What you *should* expect is a display which may make you think rather carefully about what's happening!

So what does the program in Figure 1 set out to do? It explores the possibilites offered by the player-missile concept in *addition* to animation.

```
10 GRAPHICS 7
11 SETCOLOR 4,12,4
12 SETCOLOR 2,0,0
13 COLOR 3
14 FOR Y=0 TO 79
15 PLOT 0,Y
16 DRAWTO 159,Y
17 NEXT Y
18 A=PEEK(106)-20
19 POKE 54279,A
20 X=256*A
21 POKE 559,46
22 POKE 53277,2
23 POKE 53248,100
24 FOR I=X+512 TO X+640
25 POKE I,255
26 NEXT I
27 POKE 704,88
28 POKE 53256,0
29 POKE 623,4
30 COLOR 4
31 FOR Y=30 TO 50
32 PLOT 45,Y
33 DRAWTO 65,Y
34 NEXT Y
35 GOTO 35
```

Fig 1: Increasing the resolution of a stationary player by putting it behind a playfield cut-out

```
10 GRAPHICS 0
11 A=PEEK(106)-16
12 POKE 54279,A
13 X=256*A
14 POKE 559,62
15 POKE 53277,3
16 POKE 53248,102
17 FOR I=X+1024 TO X+1280
18 POKE I,0
19 NEXT I
20 POKE 704,140
21 FOR I=0 TO 15
22 READ A
23 POKE X+1100+I,A
24 NEXT I
25 DATA 14,29,24,24,24,24
26 DATA 24,24,24,24,24,24
27 DATA 24,24,184,112
28 PRINT CHR$(125)
29 POSITION 15,6
30 PRINT "=ABC"
```

Fig 2: A simple program to use a 'player' as a special character.

We've already seen that "players" provide four extra colour registers which we can control. The memory locations for them are in the earlier list and manipulating them lets us have four more colours on each line of our display.

Increasing Resolution

There's a snag, of course (isn't there always?) – the best we can normally get with a "player" is 8-bit resolution, which is just the tiniest bit limiting. Except that there is a way round it, and that's what you'll find used in the Figure 1 program.

First we create a "player" (and a very simple shape our "player" is too, but feel free to make your own more adventurous). After we've put the shape on show, we change our display priorities – remember our discussion of this in the last article? – so that the player has a lower priority than the playfield it's on.

Then we play with the background colour and the playfield colour, reversing each to make the screen's apparent background colour actually a playfield colour. The nett result of all this jiggery-pokery is that the player vanishes behind the new but entirely false background.

```
10 GRAPHICS 0
11 A=PEEK(560)+256*PEEK(561)
12 B=A+4
13 C=A+5
14 D=0
15 E=0
16 D=D+40
17 IF D<256 THEN 21
18 D=D-256
19 E=E+1
20 IF E=256 THEN END
21 POKE B,D
22 POKE C,E
23 GOTO 16
24 FOR J=1 TO 12
25 POKE 1536+3*J+1,I
26 NEXT J
27 NEXT I
28 GOTO 23.
```

Fig 4: This program produces a coarse vertical screen scroll of the contents of memory.

Great, you say – an invisible player. Just what you've always wanted! Is there really a point?

Certainly there is. We cut what to all intents and purposes is a hole in the false background by drawing the real background on it. If we've drawn it where the player is, the player then seems to appear in *front* of the real background, but only where it's been drawn.

In this way we can have a player with considerably more than 8-bit horizontal resolution.

```
10 POKE 1536,112
11 POKE 1537,112
12 POKE 1538,112
13 FOR I=1 TO 12
14 POKE 1536+3*I,71
15 POKE 1536+3*I+1,0
16 POKE 1536+3*I+2,I
17 NEXT I
18 POKE 1575,65
19 POKE 1576,0
20 POKE 1577,6
21 POKE 560,0
22 POKE 561,6
23 FOR I=0 TO 235
24 FOR J=1 TO 12
25 POKE 1536+3*J+1,I
26 NEXT J
27 NEXT I
28 GOTO 23
```

Fig 3: A Basic program to scroll data from right to left on the screen.

PLAYER MISSILE GRAPHICS

Relax And Try It!

Now you may be reeling a bit at this stage, but don't worry! Just relax and enter the program in Figure 1. When you've done that and run it, read this explanation again. It should start to make rather more sense!

We've introduced two new memory locations in the Figure 1 program, so let's set out their details right away.

First, there's Location 53256. This one controls the size of Player 0 (53257,53258 and 53259 control the sizes of players 1,2 and 3). A 0 in 53256 produces a normal size player; a 1 gives you a double size player; a 3 gives you a quadruple size player, which is really fat!

The figures to get double and quadruple size players for the other three locations are different. Check an Atari memory map for details.

The other new location is Location 623, another of the useful shadows, this time of 53275, a location to which you can't write directly. Location 623 (or 53275 – they're effectively the same) determines which of the things on the screen gets priority – a "player", the "playfield" or the background.

Again, if you've been following this series you'll remember some of our preamble to the subject, when we explained the way in which Atari could magically have anything on screen passing behind or in front of anything else, all at the choice of the programmer. The key, of course, is memory location 623 which "shadows" 53275.

For the rest, the Figure 1 program should be more or less self-explanatory if you've begun to use Atari's BASIC for simple programming. The only 'magic' in Figure 1 lies in the use of some of the more esoteric memory locations, and you've now got some grounding in those.

Other P-M Uses?

The program in Figure 2 takes us on to another of the uses for player-missile graphics, albeit a fairly unusal and little used application: the construction of specially sized and shaped characters, if they're needed to supplement Atari's normal set.

I really am in debt to "De Re Atari" here, and Atari's master magican, Chris Crawford. It's the extraordinary degree of lateral thinking that Chris generates which leads to really far-out applications of the kind shown in the Figure 2 listing.

There are no memory locations used other than those we've already discussed so go ahead and enter the program to see the effect.

Oops, Nearly Forgot!

So there we are. But wait a second – I nearly forgot! What about Figures 3,4 and 5?

Well, to paraphrase the publicity line for a famous film "Just when you thought it was safe to stop reading...." – and the finish must be "along came screen scrolling"!

```
10 GRAPHICS 0
11 LIST
12 A=PEEK(560)+256*PEEK(561)
13 POKE A+10,50
14 POKE A+11,50
15 FOR X=0 TO 7
16 POKE 54277,X
17 FOR D=1 TO 200
18 NEXT D
19 NEXT X
20 FOR Y=0 TO 3
21 POKE 54276,Y
22 FOR D=1 TO 200
23 NEXT D
24 NEXT Y
25 GOTO 14
```

Fig 5: Finally, a combined fine horizontal and vertical scroll. It's unrealistic as a demonstration – assembly routines must be used for perfection.

Be warned: I'm saying nothing by way of explanation for the listings in Figures 3,4 and 5. You can see for yourself they're very short: two programs of 18 lines and one of 15 lines.

Try entering them. It won't take you long. Don't expect anything too spectacular – the captions will give you an idea of what to expect. Simply run them. Then think about what you're watching. Then look at the listings again. Then make up your mind to master your Atari and turn those effects to use in *your* programs.

You can, you know. And your programs will be small masterpieces of which you can be justly proud!

Thank you for staying with me through these three articles. I know it's been heavy going at times but I hope you feel it's been worth it in terms of showing you what *you* can do.

Coming Next Month!

Next month I'm moving back to an easier vein – some of the really remarkable software that's now available which make Atari a force to be reckoned with in the efficient running of a home or small business. Or, come to think of it, a small business at home, which is always something to think about in these uncertain times.

And while I'm at it, I plan to clear up that haunting question "What shall I do for a printer with the mysterious disappearance of the 80-column Atari printer machine?

Join me then. I'll look forward to it! □

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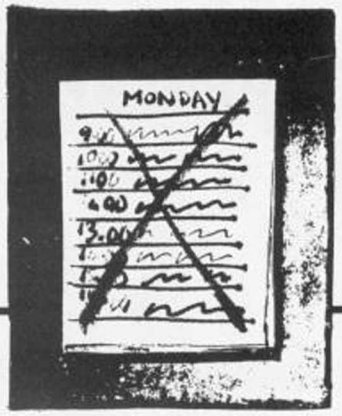


MEETING SCHEDULER

An invaluable business program for scheduling meetings between busy managers. Full listing and documentation by *Bob Chappell.*

If you've ever tried to arrange an office meeting, you will know full well the frustration and exasperation of attempting to get a number of people round a table at a given time on a certain date. You might find that six of the seven people are all available at the time you'd like to hold the meeting but you can bet your boots that the seventh cannot make the date, so off on the merry-go-round you go again.

This program sets out to assist in solving this perennial problem. Basically, it is a diary-type program except that it concentrates on several people and is concerned with vacant and filled time, rather than what the time is being used for. It has embedded in it all the names of the individuals that you might at any time need to arrange a meeting with. I have used a dummy data (as is startlingly obvious from the names!) and you will need to replace them. An arbitrary limit of nine names and abbreviations has been set for the purpose of this example.

The program first displays a menu of seven options and I will deal with each in turn. The first option allows you to create a set of data for a new week. Each data-set is based on a single week of six days (Mon–Sat) and each of these days is broken down into nine one-hour segments, notionally commencing at 9am through to the hour commencing at 5pm. Naturally, in these days of nose to the grindstone, no allowance has been made for lunch breaks! This first option simply asks for the week number (since it will use this to create a file called WEEK X) and pro-

```
10 REM *** MEETING SCHEDULER ***
20 REM *** BOB CHAPPELL 7/8/82 ***
30 P=9:D=6:H=9
40 LN$="======================================"
50 DIMM(P,D,H),N$(P),IN$(P),D$(D),H$(H)
60 GOSUB1440
70 PRINT"C"TAB(8)"MEETING SCHEDULER":PRINTLN$
80 PRINT:PRINTTAB(5)"1. SET UP A NEW WEEK
90 PRINT:PRINTTAB(5)"2. CALL UP A WEEK
100 PRINT:PRINTTAB(5)"3. SAVE A WEEK
110 PRINT:PRINTTAB(5)"4. DISPLAY SCHEDULES
120 PRINT:PRINTTAB(5)"5. UPDATE THE SCHEDULES
130 PRINT:PRINTTAB(5)"6. FIND A SPARE SLOT
140 PRINT:PRINTTAB(5)"7. FINISH
150 PRINT:PRINT:PRINT:INPUT"THE NUMBER OF YOUR CHOICE";A$
160 C=VAL(A$):IFC<1ORC>7GOTO70
170 ONCGOTO190,240,320,420,780,1110,1420
180 REM*** SET UP NEW WEEK ***
190 WF=1:PRINT"C"TAB(8)"SET UP NEW WEEK":PRINTLN$
200 PRINT:PRINT:PRINT:INPUT"WHAT IS THE WEEK NUMBER";W$
210 PRINT:PRINT"SETTING UP BLANK SCHEDULES FOR WEEK ";W$;"."
220 FORJ=1TOP:FORJ1=1TOD:FORJ2=1TOH:M(J,J1,J2)=0:NEXTJ2,J1,J:GOTO70
230 REM*** CALL UP A WEEK ***
240 PRINT"C"TAB(8)"CALL UP A WEEK":PRINTLN$
250 PRINT:PRINT:PRINT:INPUT"WHAT IS THE WEEK NUMBER";W$
260 PRINT:PRINT"SEARCHING FOR WEEK "W$;"."
270 F$="0:WEEK "+W$+",S,R":OPEN5,8,5,F$
280 PRINT:PRINT"READING IN WEEK "W$;"."
290 FORJ=1TOP:FORJ1=1TOD:FORJ2=1TOH:INPUT#5,M(J,J1,J2):NEXTJ2,J1,J:CLOSE5
300 WF=1:GOTO70
310 REM*** SAVE A WEEK ***
320 IFWF=0THENPRINT"C":PRINT"NO WEEK IN MEMORY":FORJ=1TO3000:NEXT:GOTO70
330 PRINT"C"TAB(8)"SAVE A WEEK":PRINTLN$
340 REM *** SCRATCH OLD FILE ***
350 F$="S0:WEEK "+W$
360 OPEN15,8,15:PRINT#15,(F$):CLOSE15
370 REM *** WRITE NEW FILE ***
380 F$="0:WEEK "+W$+",S,W":OPEN5,8,5,F$:PRINT:PRINT"WRITING WEEK "W$;"."
390 FORJ=1TOP:FORJ1=1TOD:FORJ2=1TOH
400 PRINT#5,M(J,J1,J2);CHR$(13);:NEXTJ2,J1,J:CLOSE5:GOTO70
410 REM*** DISPLAY SCHEDULES ***
420 IFWF=0THENPRINT"C":PRINT"NO WEEK IN MEMORY":FORJ=1TO3000:NEXT:GOTO70
430 PRINT"C"TAB(8)"DISPLAY SCHEDULES":PRINTLN$
440 PRINT"ENTER THE NUMBER OR * FOR ALL:-"
450 PRINT:FORJ=1TOP:PRINTTAB(7);J;TAB(11);N$(J):PRINT:NEXT
460 INPUT"WHICH NUMBER";PN$:IFPN$="*"GOTO490
470 PN=VAL(PN$):IFPN<1ORPN>PGOTO430
480 GOTO680
490 PRINT"C"TAB(8)"DISPLAY SCHEDULES":PRINTLN$
500 PRINT:PRINT"ENTER THE NUMBER OF THE DAY"
510 PRINT:PRINT"OR * TO SELECT ALL :-"
520 PRINT:PRINT:FORJ=1TOD:PRINTTAB(10);J;D$(J):PRINT:NEXT
530 PRINT:PRINT:INPUT"WHICH NUMBER";DN$:IFDN$="*"THENDN=0:GOTO560
540 DN=VAL(DN$):IFDN<1ORDN>DGOTO490
550 REM *** DISPLAY ALL SCHEDULES ***
560 FORJ2=1TOD:IFDN=0GOTO580
570 IFDN<>J2GOTO660
580 PRINT"CALL SCHEDULES FOR ";D$(J2);" WEEK "W$:PRINTLN$
590 X=5:FORJ=1TOH:PRINTTAB(X);H$(J);:X=X+4:NEXTJ
600 PRINT:PRINT:FORJ=1TOP:PRINTIN$(J);:X=5:FORJ1=1TOH
610 IFM(J,J2,J1)=1THENPRINTTAB(X);"**";:GOTO630
620 PRINTTAB(X);"--";
630 X=X+4:NEXTJ1:PRINT:PRINT:NEXTJ
640 PRINT:PRINT"PRESS SPACE TO CONTINUE"
650 GETA$:IFA$<>" "GOTO650
660 NEXTJ2:GOTO70
670 REM *** DISPLAY INDIVIDUAL SCHEDULE ***
680 PRINT"C";N$(PN);"'S SCHEDULE FOR WEEK "W$:PRINTLN$
690 PRINT:X=5:FORJ=1TOH:PRINTTAB(X);H$(J);:X=X+4:NEXT
700 PRINT:PRINT:FORJ=1TOD:PRINTD$(J);:X=5:FORJ1=1TOH
710 IFM(PN,J,J1)=1THENPRINTTAB(X);"**";:GOTO730
720 PRINTTAB(X);"--";
730 X=X+4:NEXTJ1:PRINT:PRINT:NEXTJ
740 PRINT:PRINT:PRINT"PRESS SPACE TO CONTINUE"
750 GETA$:IFA$<>" "GOTO750
760 GOTO70
```

PROGRAM OUTLINE

70-170	Menu.
180-220	Set up a new week.
230-300	Reads in a file from disk.
310-400	Saves a file to disk, first deleting the old file. Note that CHR$ (13) is only required by PET disks.
410-760	Displays schedules on screen, either by individual or by day.
770-1090	Update the schedules by cancelling or filling a specified slot on a particular day for one individual.
1100-1410	Searches and displays specified free slots.
1420	Ends the run.
1430-1430	Reads in fixed data of names, initials, time slots and days of the week.

MAJOR VARIABLES

M(P,D,H)	Where P is total number of people, D is number of days in working week, and H is number of 1 hour slots. A slot set to 0 is free, set to 1 is filled. The whole array represents 1 week.
N$(P) & IN$(P)	Names and Initials, the latter being used to save space on the screen displays.
D$(D)	Names of days of the week.
H$(H)	Names of the hourly slots e.g. 10.
WF	Set to 1 if a new file created or an old one read in.
W$	The selected week number.
PN$, DN$, HN$ PN, DN, HN	Selected person, day and slot – set to zero if all chosen.
L$ LG$, LG	Set to C for cancel or S to fill a slot. Length of slot on which search is to be made e.g. 3 means three consecutive free 1-hour slots are required.

The REM statements are for clarity and can be omitted. The underlined 'C' represents the Pet Clear Screen command. The program occupies just over 8k and can be reduced or increased by changing the DIM statements.

```
770 REM*** UPDATE SCHEDULES ***
780 IFWF=0THENPRINT"C":PRINT"NO WEEK IN MEMORY":FORJ=1TO3000:NEXT:GOTO70
790 PRINT"C"TAB(8)"UPDATE SCHEDULES":PRINTLN$
800 PRINT"ENTER THE PERSON'S NUMBER OR * TO EXIT"
810 PRINT:FORJ=1TOP:PRINTTAB(7);J;TAB(11);N$(J):PRINT:NEXT
820 INPUT"WHICH NUMBER";PN$:IFPN$="*"GOTO70
830 PN=VAL(PN$):IFPN<1ORPN>PGOTO790
840 PRINT"C"TAB(8)"UPDATE SCHEDULES":PRINTLN$
850 PRINT:PRINT"ENTER THE NUMBER OF THE DAY :-"
860 PRINT:PRINT:FORJ=1TOD:PRINTTAB(10);J;D$(J):PRINT:NEXT
870 PRINT:INPUT"WHICH NUMBER";DN$:DN=VAL(DN$):IFDN<1ORDN>DGOTO840
880 PRINT"C"TAB(8)"UPDATE SCHEDULES":PRINTLN$
890 PRINT:PRINT"ENTER C TO CANCEL THE MEETING"
900 PRINT:PRINT"OR S TO SCHEDULE THE MEETING"
910 PRINT:PRINT:INPUT"WHICH LETTER";LS:IFLS<>"C"ANDLS<>"S"GOTO880
920 PRINT"C"TAB(8)"UPDATE SCHEDULES":PRINTLN$
930 PRINT:PRINT"ENTER THE HOUR SLOT ("N$(1)"-"N$(H)")"
940 PRINT:PRINT"OR * IF FINISHED.":PRINT:INPUT"HOUR";HN$
950 PRINT:IFHN$="*"GOTO790
960 IFLEN(HN$)=1THENHN$="0"+HN$
970 HN=0:FORJ=1TOH:IFHN$=N$(J)THENHN=J:J=H
980 NEXT:IFHN=0THENPRINT"INVALID ENTRY":GOTO930
990 IFLS="S"GOTO1050
1000 PRINT:PRINT"CANCEL ";N$(PN);"'S MEETING
1010 PRINT:PRINT"AT ";H$(HN)" ON "D$(DN)"?"
1020 PRINT:INPUT"YES OR NO";AS:IFAS="Y"THENM(PN,DN,HN)=0:GOTO920
1030 IFA$="N"GOTO790
1040 GOTO1020
1050 PRINT:PRINT"SCHEDULE ";N$(PN);"'S MEETING
1060 PRINT:PRINT"FOR ";H$(HN);" ON "D$(DN)"?"
1070 PRINT: INPUT"YES OR NO";AS:IFAS="Y"THENM(PN,DN,HN)=1:GOTO920
1080 IFAS="N"GOTO790
1090 GOTO1020
1100 REM*** FIND A SLOT ***
1110 IFWF=0THENPRINT"C":PRINT"NO WEEK IN MEMORY":FORJ=1TO3000:NEXT:GOTO70
1120 PRINT"C"TAB(8)"FIND A SLOT":PRINTLN$
1130 PRINT:PRINT"ENTER THE NUMBER OF THE DAY"
1140 PRINT:PRINT"OR * TO SELECT ALL :-"
1150 PRINT:PRINT:FORJ=1TOD:PRINTTAB(10);J;D$(J):PRINT:NEXT
1160 PRINT:PRINT:INPUT"WHICH NUMBER";DN$:DN=0:IFDN$="*"GOTO1180
1170 DN=VAL(DN$):IFDN<1ORDN>DGOTO1120
1180 PRINT"C"TAB(8)"FIND A SLOT":PRINTLN$
1190 PRINT"ENTER THE START TIME
1200 PRINT:FORJ=1TOH:PRINTTAB(10);H$(J):PRINT:NEXT
1210 PRINT:INPUT"WHICH TIME";HN$:HN=0:IFLEN(HN$)=1THENHN$="0"+HN$
1220 FORJ=1TOH:IFHN$=H$(J)THENHN=J:J=H
1230 NEXTJ:IFHN=0THENPRINT:PRINT"INVALID ENTRY":GOTO1210
1240 PRINT"C"TAB(8)"FIND A SLOT":PRINTLN$
1250 PRINT:PRINT"ENTER THE LENGTH OF THE SLOT IN HOURS
1260 PRINT:PRINT:INPUT"LENGTH OF SLOT";LGS
1270 LG=VAL(LGS)-1:IFLG<0OR(HN+LG)>HTHENPRINT:PRINT"INVALID ENTRY":GOTO1250
1280 FORJ2=1TOD:IFDN=0GOTO1300
1290 IFDN<>J2GOTO1410
1300 PRINT"CFREE";LG+1;"HOUR SLOTS FOR ";D$(J2);" WEEK "W$:PRINTLN$
1310 X=5:FORJ=1TOH:IFJ<HNORJ>HN+LGGOTO1330
1320 PRINTTAB(X);H$(J);:X=X+4
1330 NEXTJ:PRINT:PRINT:FORJ=1TOP
1340 EP=0:FORJ3=HNTOHN+LG:IFM(J,J2,J3)=1THENEP=1:J3=HN+LG
1350 NEXTJ3:IFEP=1GOTO1390
1360 PRINTN$(J);:X=5:FORJ1=1TOH:IFJ1<HNORJ1>HN+LGGOTO1380
1370 FORJ3=HNTOHN+LG:PRINTTAB(X);"—";:X=X+4:NEXTJ3:J1=H
1380 NEXTJ1:PRINT:PRINT
1390 NEXTJ:PRINT:PRINT"PRESS SPACE TO CONTINUE"
1400 GETA$:IFA$<>" "GOTO1400
1410 NEXTJ2:GOTO70
1420 PRINT"END OF RUN":END
1430 REM*** NAMES & DAYS ***
1440 FORJ=1TOP:READN$(J),IN$(J):NEXT:FORJ=1TOH:READH$(J):NEXT
1450 FORJ=1TOD:READD$(J):NEXT:RETURN
1460 DATA APRIL ACORN,AA,BILL APPLE,BA,CHRIS ATARI,CA
1470 DATA COLIN COMMODORE,CC,OLIVER OSBORNE,OO
1480 DATA JEAN SINCLAIR,JS,SALLY SIRIUS,SS
1490 DATA GRAHAM TANDY,GT,TERESA TEXAS,TT
1500 DATA 09,10,11,12,01,02,03,04,05
1510 DATA MON,TUE,WED,THU,FRI,SAT
```

ceeds to initialise the data arrays, returning you then to the menu.

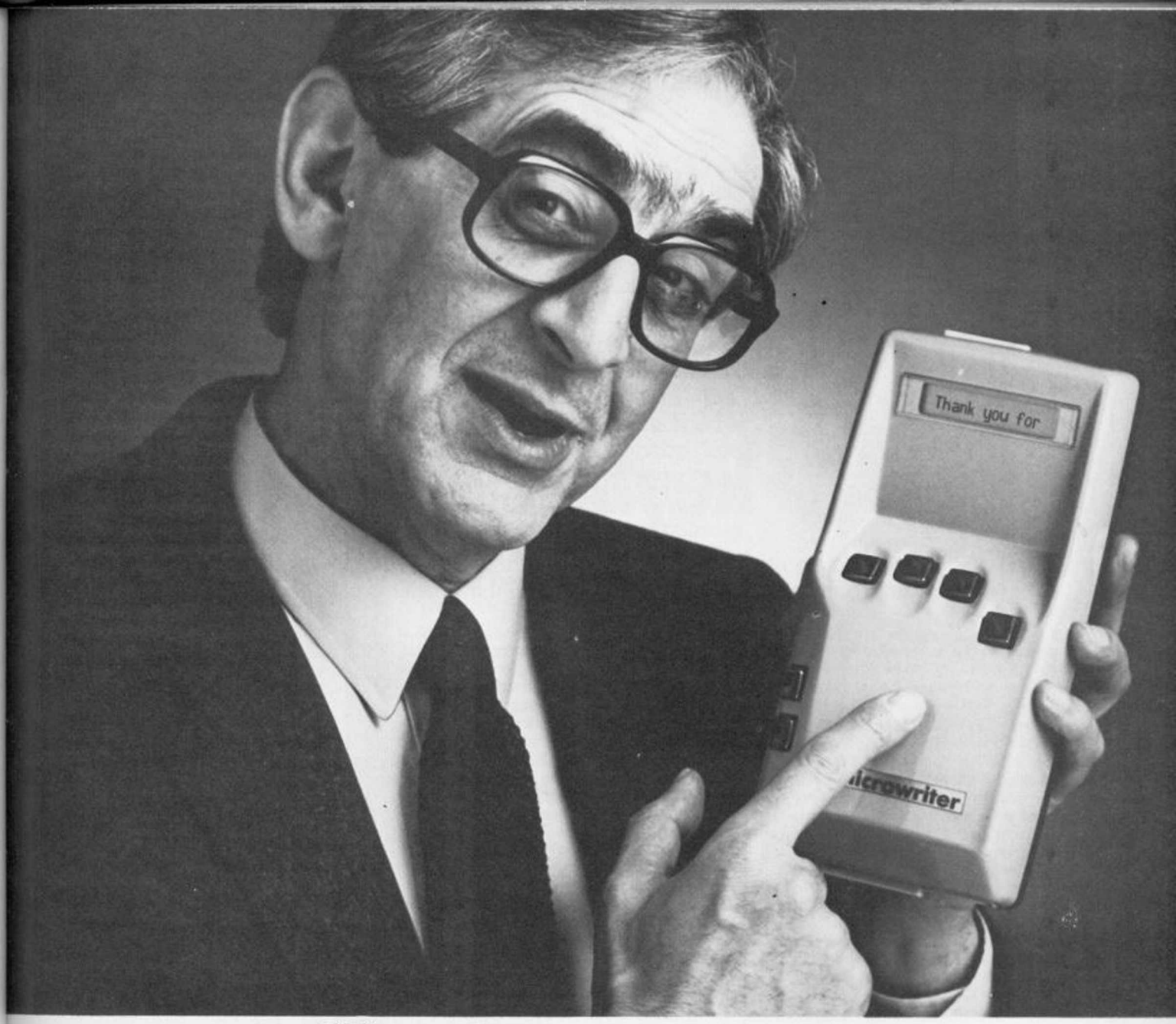
Option 2 allows you to call up a previously saved WEEK X file. Reading this in will overwrite any data already set up in this run so you are advised to save this before calling up another file. Option 3 gives you this opportunity to save a file. Note that it will not allow you to proceed if you have not either first created a new file or already called one in. It will scratch the existing file of the same name from the disk before it saves the new one. No error checks are made on reading, writing, or scratching disk files and as this program was written on a PET, you will need to substitute you own disk or tape routines.

Option 4 invites you to display the date. It displays all the names of the individuals for you to select either one or all of them. You are then asked to select one particular day or all of them, if you have opted to examine all individuals' schedules. If you have selected only one person, the whole week's schedule will appear on the screen. If, on the other hand, you have elected to examine all the individual schedules, only one day will be displayed at a time but it will contain all the details for all the individuals (their initials are displayed down the left hand side). Asterisks indicate engagements, dashes indicate that that particular one-hour slot is free.

The fifth option gives you the opportunity to update the schedules – this could be effected by calling in all the relevant appointment diaries at regular intervals. You may cancel an engagement in an individual's one-hour slot or fill it. A prompt message gives you the confirmation and the chance to escape if you have made a mistake. Option 6 is perhaps the most useful. You are invited to enter the day (or any day, if you're not bothered), start time and duration of a meeting and the program will display the records of all those people who have that particular time of day free, thereby giving them no excuse for refusing your invitation to that meeting, provided your records are up to date!

The final option allows you to exit gracefully from the program.

With a little adaptation, such as adding a printer routine, I'm sure harassed secretaries and others would find this utility useful and effective – alleviate executive stress now! □



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Alternatives to keyboards

"I'm closing my mind and throwing away the key..."
Chorus line from well-known purveyors of popular music.

Fishing around for an intro to this latest piece – not having one would leave me in a state Ron Pickering would describe as 'exposed at the front' – my gannet-like memory by-passed the easy Synonym Finder solution and floated out a fortuitous conjunction of closed minds and keys. For although the multiplicity of manufacturers may manipulate their machinery in multifarious ways, that old lump of Qwerty still hangs out at the important end. And the mental closure excludes the alternatives to the square lettered lumps.

Of course the vigilant reader may point out that my intro quote says pretty much the opposite of what I mean, as well as passing the opinion that my use of alliteration would have W.H. Auden rotating in his grave like an overexcited Catherine wheel. But who's writing this stuff anyway? My Synonym Finder didn't even *have* keyboard in it...

What I'm trying to say is that hitting keys is not the only way of getting data into a computer, and that according to several important sources it is one of the worst ways. These sources maintain that keyboards are slow, tricky, and – damn it – just not natural things for human beings to use, since if men and women were meant to tap messages to each other they would have been fitted with the equipment to do it.

Built-In Inefficiency

Keyboards have always caused trouble, ever since their introduction in the dim mists of the last century. The story goes that the operators of the early keyboards built up typing speeds that the mechanics of the machine just couldn't handle, and so the arrangement of the keys on the board was changed to slow the typists down. And this built-in inefficiency still survives in the familiar QWERTYUIOP layout.

The alternative story is that this layout was an honest attempt to place the keys most often used under the strongest fingers of the typist's hands, but this smacks of a cover-up to me. Consider the cases of the left little finger and the 'A', and the placing of the little-used 'V', Watson. Then there is the ridiculous positioning of the 'B' and the 'Y', which means that fast typing of the simple word 'by' almost inevitably means a tangle of metal hammers to unravel and strong language in the typing pool. One good thing about Sight and Sound courses is that they teach you to spot these things; and after spending lengthy periods staring at keyboards (thinking of intros, comtemplating BDOS Errors on A, and so on) my natural paranoia tends me towards the slowdown conspiracy theory.

Whatever, Qwerty has established itself despite the suspicious fact that the longest word you can type on the top row of keys is 'type writer', and computers have followed the office equipment firms in using keyboards for data entry and just about everything else. Juggernauts are hard to stop – ask any Buddhist monk.

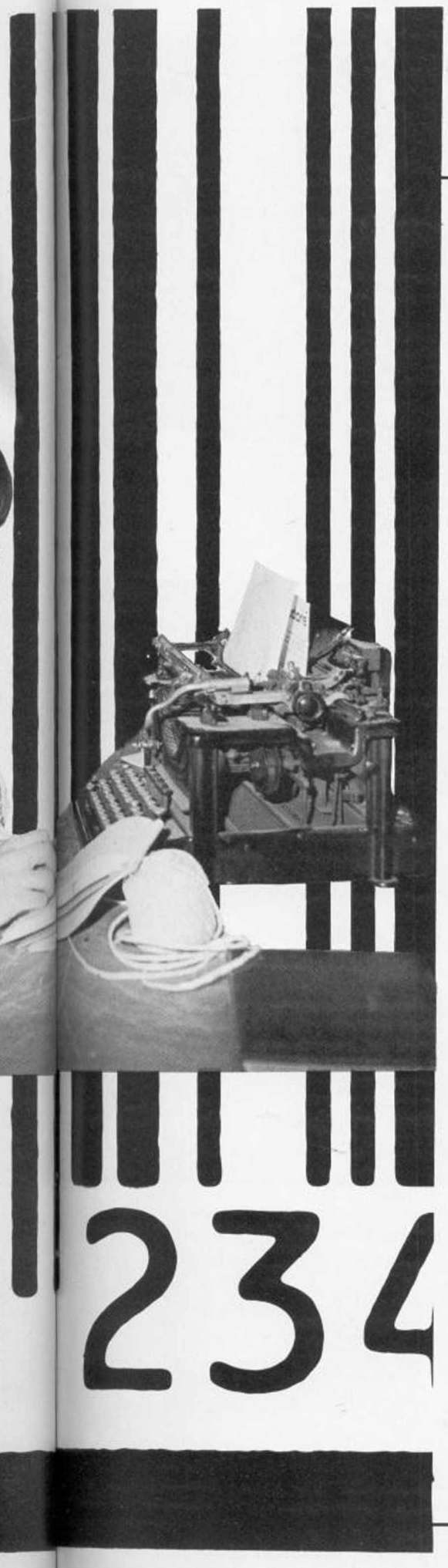
But with no mechanical parts to jam at speed, computer keyboards are different from early typewriter ones as Mr. Remington himself knew them. There might be strong arguments for the status quo, along the lines that vast numbers of people are used to Qwerty's quirks and that using this format on computers means that ordinary office workers can switch to computers easily. On the other hand, people using computers these days – at home, for instance – may never have touched a keyboard before. And lots of prospective users are senior managers who have a phobia for the menial task of hitting a keyboard. There must be other ways.

And so there are, lots of them. This springs naturally from the fact that a computer keyboard is by no means just a device to translate the operator's finger movements into carbonised graffiti on defenceless bits of paper. No, a computer keyboard is a device that squirts coded lumps of bits into the innards of the machine, and bit-squirting is a job that can be handled in a variety of ways. All you need is a device that accepts some kind of information from the user, produces the right codes, and fires them safely into RAM where they belong.

Human Voice

We were talking earlier about the unnaturalness of keyboards as a means of human communication. So it was natural for people to look for a way of using that wonderful all-purpose communications device, the human voice, as a data input device. Humans are used to talking, so computer operators would need no training apart from learning the right words to say; and you could work a computer successfully while keeping both hands free for...well, anything you might need both hands for while working a computer.

However, – regular readers might re-



Microcomputers are getting faster and more powerful all the time. But the main bottleneck in the system – the keyboard – has not changed in design since its invention. You don't have to use a keyboard to enter information however, now that devices are available to understand speech, written text or bar codes. John Gowans reports the State-of-the-Art.

member a brilliant earlier article on speech synthesis, where the difficulties involved in getting a computer to understand words were superficially spelled out. Spewing words out is no big deal for a chip, but taking them in is tricky.

The idea is simple enough though. Sound is just a waveform, and this can be accepted by a microphone, amplified, digitised, compared with a previously-stored digital model, and the appropriate action instigated. This simple statement conceals a minefield of practical problems, but we journalists are trained to gloss over such things.

The main problems are the information content of speech and the fact that each speaker says the same word in a different way. Worse, a single speaker says the same word a different way each time, so any speech recognition system has to allow for slurrings and mispronunciations; and once you start allowing things to be only roughly right in computer systems you hit trouble.

The information content of words – each one might need 10K bits to describe it reasonably fully – can be got round if you throw enough computing power and memory capacity at it. Companies like Federal Screw Works subsidiary Votrax have done just this, and you can get a pretty decent speech recognition system from then if you have £50,000 or so to spare. But for micro users to get into talking to their machines, corners have to be cut. The accuracy of the analogue-to-digital converters at the front-end can be reduced, so that the number of bits of storage needed per word is less; and the system can include some learning capacity so that its response is tailored to just one speaker's utterings and not to some Olympian standard.

This explains why systems like Big Ears from William Stuart Systems, and the Heuristics Speechlink, are on the market at more reasonable rates. As you might expect, the performance is not up at Votrax's vertiginous heights. But they do indeed work, and the cheap end of the market represented by Big Ears' UK101, Superboard, Nascom, Vic and ZX81 compatibility (among others) could get a fillip from recent work in Japan. There, Toshiba has already launched a TV set that can change channels, brightness, and so on to spoken command. There are drawbacks, of course, since the TV has to be spoken to through a microphone, needs a lengthy learning period before it can switch you from Nationwide to Where There's Life in response to a muffled curse, and only understands Japanese anyway. But it is a start. And giant conglomerate Matsushita, which I have had occasion to mention before, has announced that it is mass-producing speech recognition chips just begging to be built into hands-off systems.

Limited Vocabulary

Be that as it may, all this speech recognition stuff is a bit esoteric (abstruse, recondite, deep, profound, abstract, impenetrable, incomprehensible, et al – eat your heart out, Roget). Chips or no, there is little prospect of a usable speech recognising system in the punters' scope before 1985, if then. It should be made clear here that I am not knocking the firms already selling such things, but – in another of my instant definitions – I reckon that a proper speech-understanding system should accept its limited vocabulary from any speaker, however drunk or otherwise incoherent. And it should do it without errors, questions back to the operator, or synthesised utterances of 'Pardon'.

This should not be discouraging. We have already seen that keyboards are just not-very-handy ways of putting binary codes into the computer, and we have all also seen an alternative method of doing just that.

Yes, look at your Cornflake packet or brand-new paperback. Somewhere on the packaging there will be a demented Zebra crossing, that means that the item is bar coded. And bar codes are just the kind of thing we are looking for.

The reason for this is that bar codes are containers of information just waiting for the passage of a suitable reading wand to yield up their data. As an example, look at Hewlett Packard's system. The company has produced a cheap reading wand, the 82153A (if anybody cares), that will plug into even something as humble as its HP-41C pocket computer – programmable calculator, that is. This wand will read, reasonably enough, Hewlett Packard's bar code format where a wide black bar represents a '1' and a narrow one represents a '0'. What about the spaces, I hear you ask? These are supposedly the width of the '0' bar, and give the system some kind of benchmark for the current unit width.

The bars in that Zebra block are organised in 8-bit bytes, in rows that can contain up to sixteen bytes with three bytes used as a 'header' and thirteen for data. Each row includes start and stop bits to allow the row to be read in either direction. But enough of such technical stuff. In use, all the operator needs to do is run the wand along a bar code, in either direction, and the data will get where it belongs. The wand includes a light source and a light detector, and can tell a broad black band from a white stripe from a narrow black band; the codes are only as big as they are (*vide* the Cornflake packet) to allow for hand wobble in running the wand over the bars.

Laser Fight

More spectacular is the laser reader, being used in US supermarket checkouts and IBM's warehouse in Greenford (and if that tells you something about the UK's acceptance of technology, go ahead and listen). In its supermarket form this involves an eight-slot hole like an asterisk in the checkout counter with a laser underneath. The bar-coded goods are just slid or rolled across this aperture (opening, hole, eyelet, interstice – The Synonym Finder) and the till rings up the sales. The supermarket managers love it, since it reduces even further their dependence on the traditional lack of intelligence of the checkout operatives – but this is getting us some way from our brief.

Suffice it to say that computers are perfectly happy to read bar-code blocks rather than tapping keys – there is, as far as the computer knows, not a ha'porth of difference in the data.

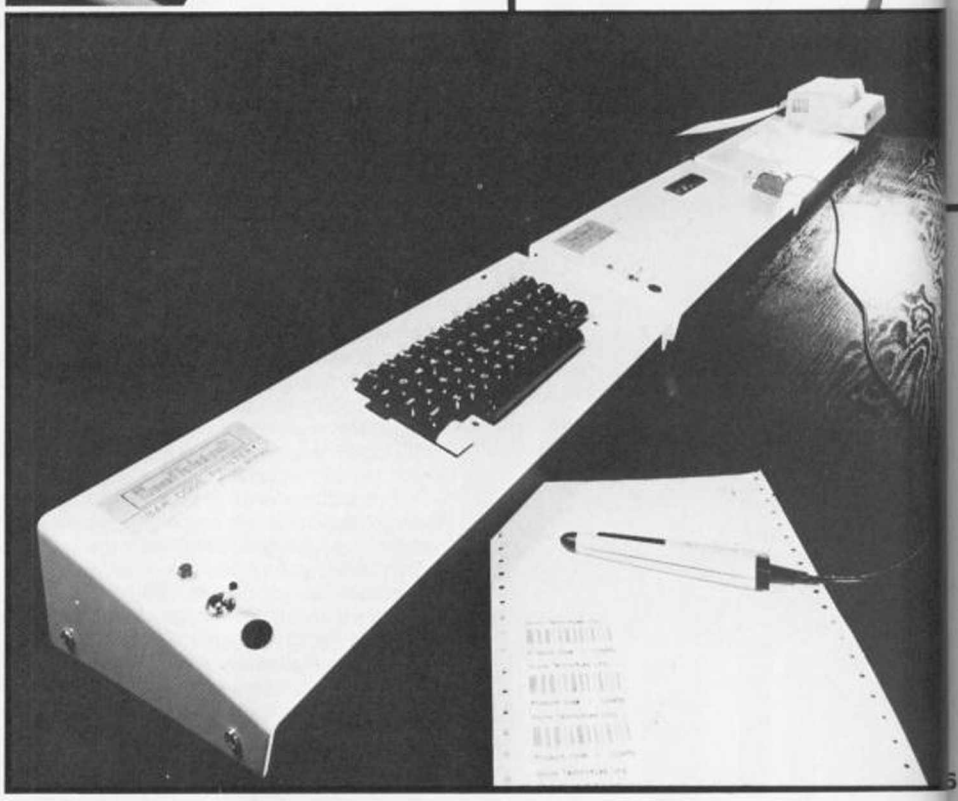
However, for the operator of a conventional personal computer bar-codes are another red herring, or green kipper if you prefer. Imagine," if you will, using a wand to enter the word 'print'. First run the wand over the block for 'p' on your code sheet – a big sheet, too, this – repeating it if the computer doesn't get it, and then repeat procedure for the 'r' and so on. Cumbersome eh? Much worse than hitting the qwerty keys to do the same thing. For data entry when the operator doesn't know anything, even the price, bar-codes are fine. For computer use they can do no more than introduce a feeling of discomfort in the fundament.

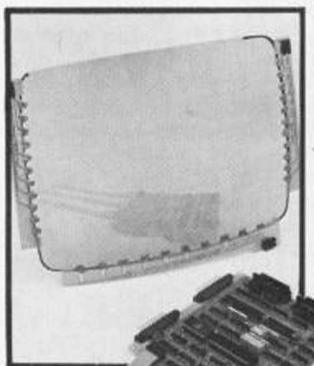
The same does not go for optical character recognition, or OCR to use the very original abbreviation used universally. What this means is that the computer is capable pf reading printed text and converting it into a form it can understand

One of the pioneers of this technique was one Ray Kurzweil, an engineering graduate from MIT (Massachusetts Institute of Technology, dummies) who turns out to be one of those revolting characters who started programming at age Twelve. Apologies to young readers, but I'm in the wrong generation. Ray got heavily into OCR and even speech synthesis, mainly to help out the blind; out of about 40,000 books published each year only about 350 are published in Braille as well, and these are hefty tomes since each Braille character takes up much more space than a printed letter. Kurzweil's scheme was to produce a machine that would read the text

1


2




6


7

3

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5

Alternatives to keyboards come in many shapes and sizes, according to the job they are intended to do.

1. *Microwriter* uses different combinations of six keys to represent letters of the alphabet. 'Converts' claim that it takes ony one hour to learn.

2. *The Mouse* is a means of inputting graphical information onto a high quality screen. The mouse is moved by hand on a special board (3) which detects its position.

4. *Datatab* is similar to the cash registers found in certain hamburger emporiums. The touch sensitive surface can be overlayed with an application sheet – making it very easy for non-computer users to select information.

5. *Bar codes*, as found on everything from cornflake packages to magazines, are rapidly becoming *the* standard way to store digital information on paper. A bar code reader enables information to be fed direct to the computer.

6. *Touch sensitive screens* are a new idea available in kit form or built into the VDU (7) – a sensitive surface can detect the presence of a finger.

8. *Sticks* are the most popular alternative to keyboards for game use, though *Lightpens* (9) are now being catered for in both home and business software.

8

9

from an ordinary book and produce either Braille or even spoken output from it.

One of the pioneers of this technique was one Ray Kurzweil, an engineering graduate from MIT (Massachusetts Institute of Technology, dummies) who turns out to be one of those revolting characters who started programming at age Twelve. Apologies to young readers, but I'm in the wrong generation. Ray got heavily into OCR and even speech synthesis, mainly to help out the blind; out of about 40,000 books published each year only about 350 are published in Braille as well, and these are hefty tomes since each Braille character takes up much more space than a printed letter. Kurzweil's scheme was to produce a machine that would read the text from an ordinary book and produce either Braille or even spoken output from it.

Reading For The Blind

He succeeded, to the extent that the company he founded (Kurzweil, oddly enough) was taken over by Xerox in its push to take over all aspects of the electronic office. The Royal National Institute for the Blind is using one of Kurzweil's machines to translate literature into Braille at an unprecedented rate, and the talking version is already in wide use in the US.

So what? Computer reading of printed text is so what. For instance, look at the program listings printed in micro magazines in such numbers. Wouldn't it be nice if, instead of slavishly typing these in, you could run a reader over each line and let the computer do it for you? This is certainly possible. The Japanese – who else? — have produced a cheap unit that will do just this, reading various character fonts and sticking the data down an RS232 interface into the computer. I would have more detail, but the information came from a Japanese magazine and my reading knowledge of Japanese is not what it might be. In fact, it is zero, so I picked this up thanks to a friend to whom Japanese is an open can of heiroglyphs.

Looking at the printed listings. Often they are not listings at all, but transcriptions with the inevitable errors – as you will have noticed, not even this organ is free from the Grauniad syndrome. Then again, even if the printed version is a photographed printout, the structure of each letter depends on the printer used by the computer operator. And lastly, magazine publishers are very conscious of space. With the wonders of photo-typesetting, a program listing can be printed slightly reduced or slightly blown up to fill the gap the advertising department has left.

In other words, the OCR reader will not be certain of what it is getting to read. And as we have observed before, uncertainty in a computer system either causes trouble or costs money to avoid. This was the reason for the oddly shaped numbers on your cheques, carried over into filmic productions of computer output. These 'machine readable' numbers are shaped to make any ambiguity more unlikely, with jutting out lumps in odd places.

So OCR is a reasonable bet for keyboardless input, particularly when programs and data are provided in a standard printed format that the machine can read without having to make any difficult or costly adaptations. But since this is not that often the case, and since random input like single letters commands is not really the domain of OCR reading, this too seems like a loser.

Touch-Sensitive Screens

So what is left? We need something that the operator can *do* to the machine that tells it, in an unambiguous way, what the operator wants to do. The best bets here are light pens and touch-sensitive screens.

Both these things depend on the quality of software to make them work well for the computer user. The hardware is nothing much, at least by today's standards, but the software has to be written right if these techniques are to be used.

The reason for this is simple, gentle reader. Both light pens and touch-screens depend on stuff actually being *on* the screen before the operator can take advantage. Both techniques depend on the user defining a particular area of the screen, sans keyboard, and on the computer knowing which area has been defined. For example, say there is a menu on the screen that requires the operator to make a choice. The Japanese, according to Fujitsu's head man, might find it hard to make a definite choice, but after all they will be talking to their machines. In the West, all the user has to do is pick and option – even if that option is 'go back to the last menu,' and multiple-choice questions are meat and drink to the Nuffield-trained computer generation of the 80's.

Light pens are old business already, as Groucho Marx might have said if he was still making films. They have often appeared on Tomorrow's World, in the Raymond Baxter era yet, and are now available for many cheap home computers. All they do is let the computer know where they are placed on the screen, which means that touching them to a point (a graphics square for example) attached to a menu option causes that option to be selected.

The same goes for touch-sensitive screens. Here, the screen is coated with a layer which builds up a matrix of points corresponding to the character positions in video RAM. So if a menu appears on the screen, and the screen is a touch-sensitive one, the user can activate any option or part of an option by sticking a finger at the appropriate point.

This is the cheap method, and it can be retrofitted to existing screens; Lear Siegler has introduced a touch-screen kit for its ADM3 terminals. There is a more accurate (and expensive) method that avoids greasy fingerprints on the monitor – here a fine net of light beams is projected horizontally and vertically just above the glass, and the computer can tell which beams are interrupted and so figure out which part of the screen you are pointing at.

The drawback with both types is that they only specify a particular screen position, and the computer software has to figure out exactly what is being displayed at that position at that particular time. Also, you can not enter data this way unless you have a character set displayed on the screen for you to build up words and numbers with – and prodding letters on a screen is as bad, if not worse, than hitting keys on a board.

So as we've seen, until speech recognition gets cheap and reliable and can distinguish between a sneeze and Wednesday or tell its R's from its L's, there is little alternative to the conventional keyboards. So perhaps we can improve the keyboards themselves?

The Demise of Qwerty

Not the layout, since Qwerty is as established as Margaret Thatcher unfortunately seems to be. Even though the French – typically – switch a few keys around to give an Azerty layout, and the Scandinavians have to add a few to give those strange vowels with lines through them, Qwerty is incorrigibly present just about everywhere. Even Clive Sinclair, who played such havoc with keyboard design in just about every other way, stuck to the archaic layout. He did use that single-key word entry technique though, now also adopted by Olivetti, and that certainly speeds things up if you can remember which combination of shift and function keys you need to hit to get the ZX81 producing the right words. And to show that his genius is not static, the Spectrum has an elegant rubber sheet to push the membrane keys through.

However, if Qwerty is fixed you can certainly think about reshaping the board itself. The Maltron keyboard is just such a thing, looking just like a conventional keyboard that has been left on top of a radiator for several days. The idea of this weird shape is that it positions the keys in the perfect places for typist's fingers, cutting down hand and finger movement and so speeding up the typing process.

And then you can reshape it really radically, and perhaps one of the few viable keyboard-like input devices to replace the keyboard certainly looks odd. The Microwriter, first invented by expatriate American Cy Endfield several years back, has only six keys that, pressed in different combinations, can produce any character you can name. And the advantage is that all six keys are positioned so that the device can be operated one-handed.

Fans like PCW editor Peter Rodwell claim that the key combinations are easy to learn, since the shape made by each combination is supposed to resemble the character it produces. And a single-line display means that the Mircrowriter can be used in the favourite location of PCW editors, viz: a hammock on a beach in Bali.

Recent additions to the box include an RS232 interface for connection to a screen or printer – and you will be relieved to know that the price has stayed pretty much the same at £500 give or take a few pee. I always said PCW editors were paid too much.

Apart from speech input – and keep an eye on that, if that's not a contradiction in terms – all these technologies are difficult, expensive, and/or inefficient. Just like conventional keyboards. Throwing away those keys is not going to be easy just yet. □

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Most people are familar with Parkinson's Law, Murphy's Law, and their endless variations. I thought we would start off this month with a few laws of computing which you may not have come across.

Brook's Law
Adding manpower to a late software project makes it later.

Laws of Computer Programming

1 Any given program when running is obsolete.
2 Any given program costs more and takes longer.
3 If a program is useful, it will have to be changed.
4 If a program is useless, it will have to be documented.
5 Any given program will expand to fill all available memory.
6 The value of a program is proportional to the weight of its output.
(Observation has led me to think that this law is in fact the reverse of the truth. My version reads "The value of a program is *inversely* proportional to the weight of its output.")
7 Program complexity grows until it exceeds the capability of the programmer who must maintain it.
8 Make it possible for programmers to write programs in English, and you will find that programmers cannot write English.

The Ninety Ninety Rule of Project Schedules
The first ninety per cent of the task takes ninety per cent of the time, and the last ten per cent takes the other ninety per cent.

Shaw's Principle
Build a system that even a fool can use, and only a fool will want to use it.

Weinberg's Law
If builders built buildings the way programmers wrote programs, then the first woodpecker that came along would destroy civilisation.

Meskinen's Law
There's never time to do it right, but always time to do it over.

Finally in this vein, do you know Ginsberg's theorem?

1 You can't win.
2 You can't break even.
3 You can't even quit the game

****

Some months ago in these pages (*February 1982, p.55*) Dennis Jarrett told the true story of the origins of the word de-bugging, a word coined by Captain Grace Hopper, USN, the world's first programmer when working in the 40's with the Harvard Mk 1. What follows is also a true story, but one which occurred a quarter of a century later.

Around 1970, a GEC Elliott Automation Field Engineer for the Elliott 903 system based at Borehamwood was called to investigate a fault on such a system at Sheffield University. It was the days of paper tape readers, and the student was having a problem which no-one could identify. When his tape was read in, it would occasionally stop, but to confuse matters not always in the same place. The engineer arrived and ran his test programs in front of the student, but no fault was found. He then ran the student's problem tape through the tape reader several times, and still no fault occurred. The engineer left, leaving behind the instruction that he should be called if the fault recurred.

Within a few days the tape reader again failed, and in precisely the same way. So the engineer came back, re-ran his test programs, but he still could not find the fault and neither could the student reproduce it with the problem tape.

So the engineer asked the student to go through the motions of reading the tape in in exactly the same way as he would normally do when on his own.

The engineer went to the back of he room to observe. The student loaded the tape reader with the problem tape and set the reader off. Because it was a long tape, he turned off the lights and went out of the room as he normally did.

After a few minutes, the tape stopped. The engineer immediately approached the tape reader, and the reason why it had stopped immediately became obvious. The only light in the room was that of the tape reader. And that had attracted a fly which was buzzing away flying in and out in front of the photo sensitive cell.

****

The following is not reputedly true. It is one of those stories told by salesmen, each saleman so casting it that the punch lines apply to a competitor.

The DP manager stood outside the pearly gates waiting for admission. He had however to admit to his profession, on hearing which St. Peter sent him straight down to hell.

"What is your profession," said the duty Devil.

"I was a DP Manager." said the applicant.

"In that case," said the duty Devil "you have a choice of three hells. There's an IBM hell, a Univac hell, and an ICL hell."

"What is the difference," said the DP manager.

IBM hell he was told was 22 hours a day of trying to complete a JCL pack for a 140L program still running under emulation on a 4331, followed by two hours of being nailed to a cross and pelted with hot coals by IBM salesmen.

Univac hell was 22 hours a day of trying to understand communications protocols on a thinly disguised EXEC 8 manual called OS 1100 followed by two hours of being nailed to a cross and pelted with hot coals by Univac salesmen.

And the ICL hell was 22 hours a day of trying to convert a George 3 program to run under VME 2900 followed by two hours of being nailed to a cross and pelted with hot coals by ICL salesman.

The choice did not seem particularly wide, so the DP manager stood there and pondered. A passing imp who in life had been a computer operator took pity on him however and suggested that he pick the ICL hell.

"Why?" said the the DP manager.

"Well, it's like this," said the imp. "By the time those ICL salesmen have found the bits of wood to make the cross, found their support engineers and got them to nail the bits of wood together, and then sent to St. Paul for the stones, the two hours are nearly always up."

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CBASIC Compiler Systems £75/£12
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C COMPILER (Whitesmith's) £455/£25
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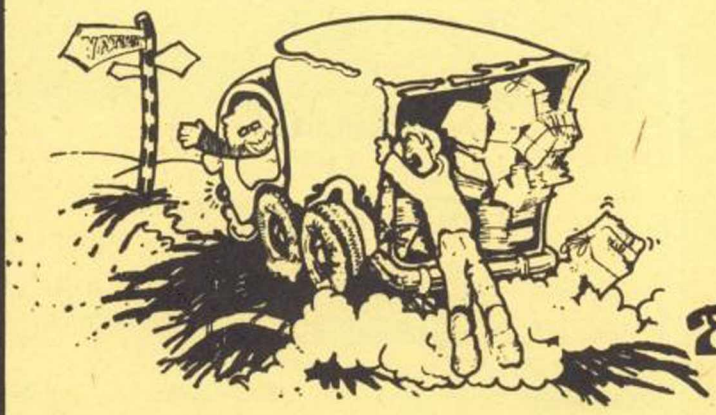

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meet the manufacturer ...

Thumbnail sketches on all the most popular manufacturers, as seen by Guy Kewney.

It was meant as a joke, I think. He (oh, call him Jon), was thumbing through his lunch in order to find the other copy of the diskette he was sure he had put over there a minute ago. On the box which said pu edis siht. The one with the smudged coffee stain. Ah, yes, there it was, you could tell, because the diskette envelope had the same smudge on it. For some reason, the diskette loaded correctly. Jon didn't even seem surprised. Unfortunately, it turned out to be the wrong diskette. Naturally, it wasn't labelled.

"You know," said Jon disarmingly, "I really wouldn't recommend that you buy a system from anybody stupid enough to sell me one."

As I say, presumably it was a reworking of Groucho Marx's famous joke about not wanting to belong to the sort of club that would give him membership. But it rang true. What kind of people would supply a system which this happy-go-lucky nerd would want to buy?

Computer companies do, indeed, have personalities. Sometimes, the manufacturer takes on the personality of its founder in my mind. Sometimes, however, they take on a personality of their own, compounded of certain events in their past, certain attributes of the machines they sell, or even attributes of the people who buy the machines.

Commodore

The fascinating thing about Commodore is how much it varies from one country to another.

In Britain, Commodore has a distinctly gorilla-like feel to it. It isn't going to actually hurt anybody—not on purpose anyway—but it likes to let you know, now and then, that if it wanted to, it could.

At the moment, for instance, it is busy releasing its new Commodore 64 (a big Vic with a proper 40 column display and a full 64 Kbytes of memory) with its sights aimed firmly at the BBC Microcomputer, built by Acorn.

The price will be £300 sterling and that is a good price for the user, and a profitable one for Commodore and its dealers.

But the price was originally going to be either £500, or £100! Both were seriously considered—the £500 price was presumably meant to indicate the enormous amount of profit Commodore UK would make, and the £100 was definitely designed to put the Sinclair Spectrum out of business.

I'm told that the gorilla is actually a very gentle beast, even though its main means of communication is the stare-down, to intimidate rivals. But for all its gentleness, it is pretty big, and you should never forget that if you

Jack Tramiel — 'gorilla'

inadvertently step into its territory.

Now, the odd thing about Commodore is that its founder, Jack Tramiel, does in many ways remind me personally of a gorilla. He is, physically, a substantial figure. He brooks no rivals inside the company. His word is law, even when it defies gravity—if he says "jump" people leave the ground.

They also leave the company. If there is one difference between Commodore here and in America, it is the number of people here who have been here since the year dot—and the number of people (senior people especially) in America who have been in and out in a few weeks.

That leads naturally onto the other big difference. Commodore in the UK is Number One. In America, it isn't even Number Two. In my opinion (and I can't be sued for my opinions) there is a direct correlation between these two big differences.

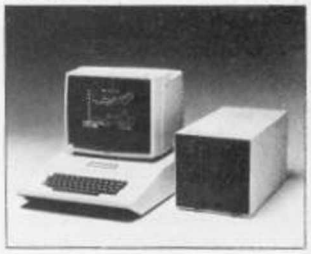
Commodore 64 — sights set firmly on the BBC

Apple

Apple is a remarkable company. It is almost exactly what the Hitch Hiker's Guide to the Galaxy would be if Douglas Adams had not written a book, nor a radio script, but a computer company profile. Inside it, a great many truly incredible things happen without apparent reason, sense, or effect. Outside it, the world buys and buys and buys.

A year and a half ago, while visiting California, I contacted Apple and requested a chance to visit one or two key executives. Modesty isn't one of my worse faults, and I laid on the importance of my visit pretty thick, when dealing with the publicity people.

It's a shame, in this case, to cut a long story short because it would be a very funny story—but in essence, I drove down to Cupertino on two separate days, and on the second, met a kindly old man called Fred Hoare,



Apple II — classic design

who took down my name and said he would be very pleased to arrange an interview some day, if I was ever in town.

This year, back in California, I contacted the publicity people again. This time, I made no mention of the amount of publicity I could generate, nor of what papers I wrote for, nor of what I needed to know. I merely told the publicity agency that I

was prepared to condescend so far as to visit Apple, if they were able to make a substantial contribution to my travelling expenses. They agreed like a shot, arranged two very interesting interviews, and, of course, never got round to paying my expenses.
There are a great many people inside Apple. Sometimes, they say, when two or three or a dozen or so key executives are gathered round a table at a senior progress meeting, only two or three have actually met each other before. Sometimes, two of them find they have the same job.
I'm afraid the news that co-founder Steve Wozniak has left with his millions to start up a Woodstock type peace and love festival is the least surprising news of the year.
In Britain, Apple is trying hard to be allowed more freedom from restraints imposed from the American wonder show. It has, over the years, tried to set its own prices, adjust its own margins, fit its own peripherals, and even design its own power supplies—all to get round the problem that the American standards just didn't work over here. Eventually, it has managed to get to be a real competitor to Commodore.
Never underestimate Apple. Every time you decide that it is just a collection of comedians, it comes out with a flash of real profundity—such as the well-known internal slogan, "software sells hardware", or the mere fact of the Apple II itself, a classic design which many would-be rivals still can't emulate, let alone compete with.
Its future is not predictable. At the moment, a lot of people will tell you that it has a great future behind it, and has squandered its chances. And when you look at its failure to compete at the VIC level, its failure to produce an integrated Apple II, or even a portable one, it's easy to understand why people say this.
But you never know what's round the corner, like Visicalc was two years ago, to utterly change the whole picture.

Tandy

Tandy is not a computer company. It is an electronics odds and sods retailing and manufacturing chain.
Its main contribution to computing was to prove that people bought computers just because they saw them. There were so many shops selling TRS-80 computers that it became the world's biggest selling machine.
My image of the company is that of an office block. It has tinted glass walls, and reflects quite a bit of light.
Behind the glass, occasionally, a face can be seen, smiling, waving and trying to say something. Was it important? Was it just a friendly greeting?
We will never know—the structure of the building gets in the way.
The advantage of being a Tandy customer is that you know you're not going to get inside it. Do not waste your time, the big block seems to say, trying to get in touch.
Instead, enjoy wandering around the big grassy field that surrounds the building.
The result is an unusually well-organised user group camped around outside.
People have started out supplying software to users on a level that no other machine knows. Possibly only a third of TRS-80 users run Tandy's own operating system, for instance. But the alternatives are, by common consent, at least as good as anything available on other machines as native products.
The main difference between Tandy here in Britain, and its Texas-based parent, Radio Shack (oh, by the way, never make the mistake of referring to Radio Shack as "American" in the hearing of one of the Texas directors) is that it has all the disadvantages of its parent's remoteness, but doesn't have the strength of that giant retail chain of outlets.
The result is that young customers, meeting Tandy for the first time at exhibitions, tend to giggle and ask "what's that?" when they see a Colour Computer running the dinosaur battle. They tend to giggle at the tradename "Realistic" on its audio equipment for rather similar reasons. But they can afford the equipment. So they buy it.

Tandy — odds and sods

Sinclair

Siinclar Research is, in many ways, rather more like a church than a company. There is Clive Sinclair, the great moon, and around him, either devoted Moonies, or heretics.
Clive is a remarkable man, and has done remarkable things to the computer industry. He is also the only person I have ever seen to be applauded by the assembled press when speaking at a news conference.

Sinclair — a passion for jogging

At the same time as being somebody it is easy to like, he very obviously has a hot temper. I've never seen him lose it to the point of shouting, but I can see how people inside his small company might hold him in nervous awe as well as respect.
The result is that there are very few people there who show much personal profile outside the company. There are, of course, no workers, since everything is subcontracted out. Just a few carefully chosen office staff.
The one thing that Sinclair Research has in common with another small computer company, Sirius, is the fact that the founder likes jogging. Clive runs in marathons, Chuck Peddle has become a fitness fanatic. Strangely, a high proportion of the ambitious juniors in both companies are very keen on jogging.

Peddle — also a passion for jogging

Acorn

One of the most famous heretics in Clive Sinclair's little band of devoted followers was a young man called Chris Curry. He was, for some time, involved in all the hard work of getting Sinclair going with the Science of Cambridge Mk 14—a crude Nat Semi chip and display with all the disadvantages of a computer and of a pocket calculator combined, and none of the disadvantages.
Chris Curry set up the Cambridge Processor Unit with Herman Hauser, an elegant Austrian who is often, regrettably, known in the trade as Herman the German. I suppose the trade has no sense of fitness.

Acorn — part of the establishment

The CPU (a joke, it normally means central processing unit, you see) was their way of doing "real" computers, instead of the toys which Sinclair was producing—and something of that attitude can be seen in the contrast between the BBC Microcomputer and the Sinclair Spectrum, Clive's answer to the BBC machine.
The rivalry is getting less and less friendly, and more and more intense, between the two Cambridge based firms.
For example, Acorn believed (so Clive assured me, and Acorn didn't deny it) that one possible reason that manufacture of the BBC micro fell behind was the fact that Clive Sinclair is a very good friend of ICL boss, Robb Willmot. ICL is one of the builders of the BBC micro, and had fallen rather behind schedule.
Nobody is going to convince me that they know what actually happens in this sort of case—the interesting thing is not whether it is true, but that the Acorn people thought it might be.
The reason for the rivalry is not Chris Curry's defection, however. Clive doesn't easily give up his friends, and is extremely shy—so if he works with someone, even someone he doesn't particularly like, he seems to develop a personal, rather than business, relationship with them.

When it started up, it was a small group of brilliant Cambridge graduate engineers, all doing incredible stuff. It faced the need to turn itself into a big company early, and simply failed to do it, even once it got the BBC award.
There are some signs, now, that company structure is evolving inside Acorn. It has taken on some company trained men from ICL, from other computer and technology companies, and the like, and they are starting to actually do things without Chris Curry having to monitor the phone calls.
So convinced is Acorn that this trick has been learned, that it has taken the mail order distribution job away from Weetabix's BL Marketing subsidary (at BL's request, they say) and set up its own mail order firm, Vector Marketing.
The proof of this pudding is one we shall have to wait for. Like the job of producing the BBC micro, it may turn out to be bigger than they think.
No, the conflict arises because Clive has a deep-grooved dislike of the Establishment, from government departments to Uxbridge. And Acorn is part of the establishment, bound into the University life of Cambridge, and acclaimed as good enough to wear the BBC badge.
That said, it has been, most of its existence, a hopeless shambles. (My opinion again!).

Digital Equipment

You may not have seen a micro made by this company, but you certainly will, so a brief mention is worth putting in.
DEC, as it is known to minicomputer experts, this year because the world's second largest computer company, behind IBM. It is in fact not one company but about ten, all capable of launching a project without actually telling anybody else. Even when all ten companies are all being coordinated on the same project, they can come out with more than one, differing and incompatible solution.
But the strength of this company is the fact that no one department is in a position to kill off the ideas that another

DEC — impressive product

division has, simply because it will derive them of status or business.
Hence the fact that, alone of the established minicomputer makers, DEC has produced a CP/M machine—not just one, but three—and one that is not just a token gesture to the executives who liked the idea, but a genuinely impressive product.

Osborne

This company looks likely to become the Ford of the new industry of microcomputers, producing affordable, standard, easy to use and low-price hardware, in order to sell profitable high volume software.
Adam Osborne must be highly amused by the fact that, every time somebody produces a computer weighing less than 30 pounds, everybody announces the machine as a "rival to the Osborne 1".
His computer does weigh less than 30 pounds, true, and has a handle to carry it. That is an irrelevant detail which is used merely to attract attention.
What Osborne understands (amongst a lot of other things) is the simple fact that micros differ from ordinary computers by one thing only. They are cheaper.

Osborne — the new Ford

Large volumes, captive market

He has produced a standard machine that will sell in large volumes, first, because it will make money, and second (and much more important) because it will provide him with a captive software market.
If "rivals" are not insisting that dealers send the customer's name and address back to the manufacturing HQ before getting the 40% dealer discount, then they have entirely missed the point of Osborne's operation.
It's so simple. A program costs £30,000 to get onto a world market, whether you sell three or three million copies. The more users you have, the more you sell. Osborne aims to have the most users, and to have a list of their names and addresses.
It's a bit like going into the publishing business by buying up all the public libraries—and the strange thing is that nobody is even trying to stop him.

The Rest

You may think that IBM is a strange company to lump in together with Ohio Scientific, Shelton, British Micro, Nascom, Atari, and the new machines like Sirius, Lynx, Oric, and all the little ones.

But in Part Two of this article, the Rest of the world will be analysed, showing that IBM will do what it likes, and the rest of them won't matter.

IBM — does what it likes

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HOW IT

HARDWARE

Last month *Chris Preston* looked at the mechanics of a disk drive, and how information is stored on the disk in tracks and sectors. This month he looks at the Disk Operating System, which manages the information and provides the interface with the main computer.

Up till now we have considered the very lowest level of the disk system, the data coming from the computer being processed and sent to the disk. We have not actually concerned ourselves with what the data is. The data sent to the disk drive is under the control of the *disk operating system*, DOS for short. It is the job of the DOS to organise the data on the disk efficiently and to provide a convenient model for the computer programmer to use. Programmers do not normally want to bother with tracks and sectors, worrying about which parts of the disk are free and which are not, and whether their data will fit exactly into a sector or not. Rather, they want to organise their data into files, with meaningful names, and to be able to rename, copy and delete files. They also want to know what files are on a particular disk, when the file was last used and when it was last updated. Some files they might want to designate "read-only", so that previous data cannot be lost. Other files, such as a hospital patient file or a company payroll file, might need to be restricted to certain privileged users. When a programmer sends data to a file, he doesn't want to be forced to fit his data into a particular sector size, but to be able to write *records*, of whatever length he likes, not only less than a sector length but also greater than it. He should be able to select a record by means of a record number, or a key which contains both letters and digits, such as a customer reference number: PRE1435. All these tasks are done for the programmer by the DOS, or rather should be, because very few microcomputers have such a complete array of facilities.

How is this done? Well, as in the case of the Dormouse, it is a long tale, although not a particularly sad one. As far as the disk itself is concerned, the most important part is the *disk directory.* This is a part of the disk which holds all the control information such as the file names, which sectors are allocated to each file and so on. In addition, the directory will hold a map of all the free space left on the disk, called a "free sector list". Whenever a new sector is needed, the DOS consults this map to find a free sector. We will discuss this in depth later on in the article. .

The directory itself is often the centre track on the disk. This is to cut down on the amount of head travel needed during disk use. If the directory is on the outside track, then the head may have to go right to the inside track to write a sector, then come back to the directory again. With the directory in the middle, the maximum distance the head has to travel is halved. Following this philosophy a little further, if we start with a blank disk and begin to write to it, the DOS will first allocate sectors close to the directory, moving in a few tracks, then out a few tracks, so that the data "grows out" from the directory track. This is why it is best, when creating a new disk, to put the most commonly used files on first, because they will be accessed most quickly, being nearest the directory.

So what does a directory look like? Assuming that the DOS supports only the more common file types, sequential and random, then the directory consists of a list of entries, or slots, one for each file. The amount of space allocated to the directory determines the number of slots and hence the number of files can be stored on a disk. By having a large directory we can store hundreds of small files, but if we only want to hold three large files on the disk, we may regard the space taken up by the directory as wasted.

The data held in each slot depends very much upon what features the DOS offers. Figure 2 shows a simple example.

The first 20 bytes hold the name of the file itself, bytes 21-23 hold a three-letter filetype, such as BAS for a BASIC program, ASM for an assembler source file, FOR for a FORTRAN source file and so on. Having a filetype allows related files to be grouped together by their name. For instance, a FORTRAN program called FRED may have a source program file FRED.FOR, an object program FRED.OBJ, a listing file produced by the compiler called FRED.PRN and a listing called FRED.XRF. Our DOS, which we will assume is fairly intelligent, will allow us to copy all the files relating to our program FRED onto another diskette by using just the filename FRED.

The access type field allows a file to be restricted in some way, perhaps by making it read-only (R/O), or privileged, which means that only certain people, the personnel manager in the case of a payroll file, can access the data in the file. Such a file may be "write-only" to non-privileged staff, so that an operator can key employee timesheets onto the payroll, but cannot find out how much the directors are taking home!

The Backup Indicator is a flag which is set when a file is altered, and cleared when the file is copied by the backup program, which our super DOS, of course, has as a standard utility. This means that we can put a backup disk into another drive and give the DOS a simple command: BACKUP. The DOS will then copy those files which have altered since the last backup onto our security disk, without wasting

WORKS

time by copying unchanged data. No more worrying about which files need to be copied! In case some of you are wondering, "Why bother? Why not just copy the whole disk?", I am thinking here especially of backing up a hard disk containing say 20 MB of data, which believe me, takes some time to copy!

The last item in our directory is the pointer to the "track/sector list". This is best discussed with the "free sector list" we mentioned above. The free sector list is a list of all the sectors on the disk which are not currently in use. Whenever the DOS wants to allocate a new sector from this list, adds the track and sector number to the "track/sector list" for that file. When the free sector list shows all the sectors to be occupied, we get a "DISK FULL" error message on the computer screen.

When the DOS wants to access the fifth sector in the file, say, it just looks at the fifth entry in the track/sector list for that file. To speed file handling, on many systems, this list is read from the disk into memory whenever the file is opened from a program, which is why some computers do not allow you to change disks easily. This disadvantage is balanced by the increased speed of operation though, so it is not all bad!

When a file is deleted, or shortened for some reason, some sectors from the file become free again, and go back into the free sector list. If the disk is being used over a period of time, with files being created, enlarged and deleted, then the disk becomes "fragmented". This does not mean that it breaks into little pieces, but that on a disk which is half full, we do not have one half of the disk containing data and the other half free. Instead, the free space may be scattered around the disk as a few free sectors on track 13, a few more on track 3, and so on. Similarly, a file called FRED (which by the way is the British Standard Filename) may not occupy a series of adjacent sectors but may also be scattered all over the disk. Fragmentation can dramatically slow down the disk accessing speed, because the head has to move in and out continuously while the file is being accessed, and this is quite a slow operation on most floppies. Many DOSes have a file copy utility which copies all the files from one disk to another and compacts each file to a contiguous block of sectors, rather than a disk copy utility, which copies sector 1 to sector 1, sector 2 to sector 2 etc. Such a file copy program can considerably speed up file handling.

In the way of a short aside, it is a good idea, when setting up a new program, to arrange for it to have a "file creation" section, where all the files it is going to use are created onto a blank disk. This means that the files are created "contiguously", that is each file will occupy a number of consecutive sectors on the disk. If the files are allowed to grow in a random fashion as the program is used, sectors will be allocated all over the disk, and the file accessing will be slower than it need be because the head has to spend a lot of time seeking. Reducing the amount of seeking in this way not only speeds things up but may also reduce the possibility of a disk error occurring.

Now that we have discussed the directory format we know how to find the particular piece of information we are looking for, but how does that information get transferred to the computer? Let us suppose that the program running on the computer has asked for record number 10 from a particular file. By using the directory, the DOS can find out which sector on the disk contains record 10. This sector is now read into an area of memory called a *buffer*. The buffer is usually one sector long on microcomputers, but we will talk about the pros and cons of different lengths later. Now the chances are that the record length is not the same as the sector length, so record 10 probably starts in the middle of a sector. This means that the *pointer* which DOS uses to remember where it is in the buffer starts some way along.

The data in the buffer can now be sent to the computer, one character at a time. After each character is sent, DOS will move the pointer along to the next character. This process (which is a lot faster than it sounds) continues until the DOS recognises the end of the record. This is usually a carriage return character, CHR$(13), but for certain types of files with fixed length records, the DOS will stop when it has transferred the correct number of characters (the record length is of course held in the directory entry for that file).

After record 10 has been sent, the pointer now points to record 11, ready to send that if the computer requests it. However, only part of record 11 is in the buffer, the rest of the record is on the next sector on the disk. This means that half-way through sending record 11 to the computer, the DOS will come to the end of the buffer. When it does this it has to stop sending data, and get the next sector in the file. If this is physically the next sector on the disk it can be found quite quickly by waiting until that sector comes round under the head again. If the disk is fragmented, the head may need to move to another track, which as we know is rather slow. When the DOS has found the next sector, this is read into the buffer, the pointer is set to the start of the buffer, and now DOS can carry on sending data to the computer.

A similar process occurs in the opposite direction when the computer is writing to a record. Again, the DOS reads the sector containing the record (because we do not want to lose data from the surrounding records). As characters are sent from the computer they are put into the buffer, until end of the record is reached, marked, as above, by either a carriage return or a character count. However, the data stays in the buffer for the time being. The buffer is only written back to the disk when the computer wants to read from or write to a record which is not in the buffer. Now the current sector is written back to the disk and the new one read into the buffer ready to continue. The buffer is also written back to the disk when the file is closed, which is why you should always close your files before turning your machine off!

There is one difference between reading and writing to the disk, because when we are writing, we may need to write to a sector which has not yet been allocated to the file. When this happens, the DOS has to find a free sector from the free sector list, and allocate it by updating the file's own track/sector list. Now it can begin writing data to the buffer. Note as the DOS is extending the file, by writing to a new sector, it does not have to read the sector

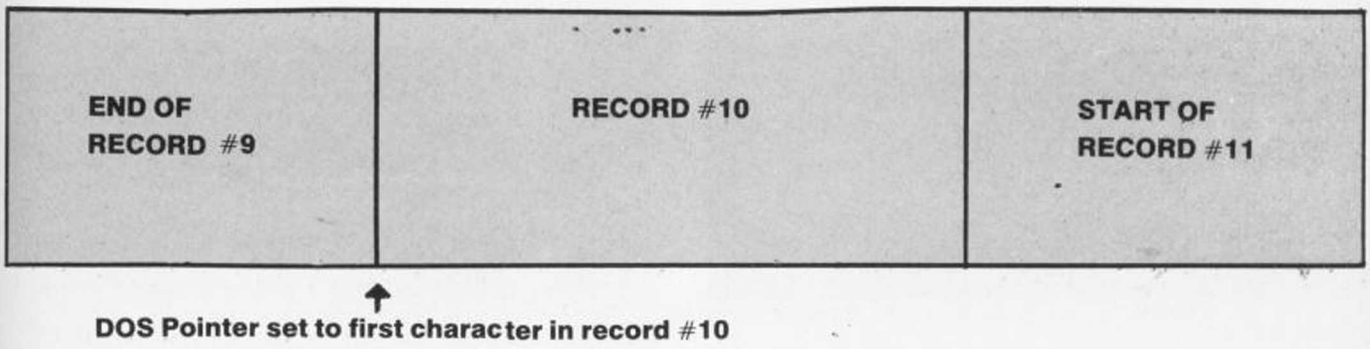

Figure 1: *Contents of the disk buffer. An internal pointer is used to keep track of where the computer is reading from within a record. Note that it is usually not the same size as a 'block' (one sector).*

	FILE NAME	FILE TYPE	ACCESS TYPE	BACK UP INDICATOR	POINTER TO TRACK/SECTOR LIST
Entry for File number 1					
Entry for File number 2					

Figure 2: *The directory of a disk contains details of each file currently on the disk. If a large amount of space on the disk is reserved for the directory then it can cope with a large number of files. The space is wasted, however, if your application uses fewer, larger files.*

first, because the data in the sector is garbage, as far as it is concerned. As we said earlier, the free sector list and the files' track/sector lists may be held in RAM, and again only written back to the disk when the file is closed. Another good reason for closing files properly!

Each file which is open requires a separate buffer, so if a program wants to have three files open at once, it needs three separate buffers. If a buffer is large, this can be expensive in terms of memory, especially if the DOS uses the computer's own memory, as on the Apple. This means that there is a good reason to use buffers as small as possible. However, on the other hand, using large buffers improves the speed of disk handling, especially if the disk unit is separate from the computer, with its own processor, as in the PET. This means that the disk can be reading the next sector into the buffer while the computer itself is busy doing something else. So we can see that there are two opposing pressures on the system designer when it comes to deciding buffer sizes: small buffers economise on hardware and possibly program space, while large buffers speed disk access. On minis and mainframes, there are often facilities to change the buffer sizes by reconfiguring the operating system, so that the best tradeoff can be selected by the user rather than the manufacturer. As the hardware itself becomes cheaper, we will see buffer sizes increasing steadily on microcomputers.

This brings us to the end of our discussion of how a DOS works. You should now be able to go back to the list of things a DOS should do, and work out how each of the facilities can be implemented on our simple system. □

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MICRO SCOPE

The new generation of 16-bit microcomputers offer far more RAM memory than their 8-bit predecessors. But what can you use all that memory for, and how much would be ideal for a business system? *Chris Preston* takes an in-depth look at memory requirements.

It is not so very long ago that an 8k computer was considered adequate for most uses, and 32k was a large machine. This was not only in the hobby market of two or three years ago, but also in the rest of the computer industry up to quite recently. In the old days, the only kind of memory available was magnetic core, and this was bulky, costly and slow. Nowadays of course, we have semiconductor memory, which is very cheap, small and fast. Apple, one of the first home computers, is now no longer available with less than 32k memory, which is more than many of the older mainframes had!

What is all this extra memory used for? We can divide the factors which tend to eat up memory into two groups: System uses and Program uses.

System Uses

One factor to bear in mind is the current trend towards soft-loaded operating systems. On the old personal computers, the idea was to make the unit as simple to use as possible, so the operating system and BASIC language software were put into ROM, which meant that as soon as the machine was turned on, all this software was immediately available, without any messing about by the user. This was especially important on a machine whose only form of mass storage was a cassette deck. Even the most patient of enthusiasts soon gets tired of waiting for fifteen minutes while his operating system is loaded.

On the other hand, having all the operating software in ROM does have its disadvantages. It is difficult for software houses to tailor the system to their own requirements, and provides an excuse for the manufacturer not to correct the bugs which turn up in the machine. It also means that any user not needing BASIC, either because they are writing completely in assembler, or because they are using another language such as PASCAL, has to waste a lot of the computer RAM to hold the new operating software, while the space occupied by the ROM software is lying idle.

In short, having the operating software in ROM has some advantages, but can restrict the machine's expandability. The obvious thing to do is to put the operating system into RAM, loaded from a floppy disk. However, the user does not want 20k out of his 32k lost to the operating system, so now we need more RAM, at least 64k for a 'soft' machine.

Another fairly recent development which really eats up memory is high resolution colour graphics. The Sirius I has a resolution of 800 x 400 dots, which occupies 40k, and this would be doubled for a colour display. It is possible to avoid losing this amount of program memory by having the high resolution screen memory separate from the main processor memory, but this tends to restrict the speed of the display, unless the screen hardware has its own intelligence, such as that provided by the new video controller chip from Thomson-EFCIS. This chip has its own character generator, and allows all the characters to be expanded, tilted or turned around, has plotting facilities to draw four kinds of lines on the screen, 512 x 512 resolution, and only occupies 256 bytes of computer memory!

Disks and communications facilities function faster if they are given large buffers, and while this is not as significant as losing 40k to the screen display, it nevertheless takes up some more of the precious RAM, especially if the operating system allows many files to be open at once.

Program Uses

There are now a large number of modelling programs, VISICALC for example, which require large amounts of data to be held in memory at once. VISICALC is a large and powerful program: it alone occupies over 20k. If a reasonably large model is to be set up, say to show the cash flow in a group of companies, or the results of a series of laboratory experiments, it ideally wants to be held in memory, at least until removable hard disks become popular, because recovering data from even the fastest floppy disk is still too slow for many purposes. Even a medium-sized model can easily run to 30 or 40k, so again, larger amounts of memory are required. This also applies to such programs as word processors, where again large amounts of data are held in memory.

The BASIC language is coming in for a lot of criticism nowadays, but it does have the advantage that an interpretive BASIC program does not take up much space. Once you start moving to compiled languages, PASCAL, COBOL, ALGOL etc., you find that these really

The first microcomputers, such as the Commodore Pet 2001 (left), were launched with as little as 8K of RAM memory. At that stage, 32K was thought to be as much as anyone could use.

Now, third generation machines such as the Sirius 1 (below) come with 128K as standard-expandable up to a megabyte!

Additional memory can be used for storing text (in word processing applications) or indexes to disk file, thereby speeding up programs considerably.

start to eat up memory – anything from 2 to 4 times as much as the equivalent BASIC program. It is a fact in computers as in everything else that you cannot get anything for free (or as my colleague Tommy is fond of saying, "Yer doan get owt for nowt!") and the penalty for the speed and power of the more advanced compiled languages has to be paid for in terms of memory usage.

As more and more people in commerce and industry are buying microcomputers, more money is becoming available to fund software development. This is one reason why software is becoming steadily more complex and powerful, and thus obviously taking up more memory. Many programs have appeared in the past masquerading under the title of "database" which are really only glorified file maintenance programs, but some packages are now appearing which offer quite sophisticated file handling techniques. However these techniques often require a large amount of index information to be held in memory to allow fast access, because it would slow down file accessing too much if it was stored on disk.

When a software designer is specifying a program, whether it is a piece of business software or a language sytstem, he often has to decide between two different ways of solving a particular problem. Generally speaking, the faster and more efficient solution will use up more memory. So a machine with larger memory will encourage development of more efficient programs, which in turn will put pressure on the manufacturers to put more memory in their new machines. This, however, is one vicious circle turn which the user benefits.

Where will it end?

The Sirius 1 has a possible memory capacity of 1 M Byte, and some 16-bit devices are capable of addressing 20 times this amount. How long will it be before we see a 20 MByte micro? My opinion is that while the floppy disk is the main form of backing store for a computer, then the size and speed of the floppy has now become the limiting factor. Nobody will be interested in a machine with 20 MBytes of memory if it takes 20 minutes to fill it from disk and 20 minutes to store it all after updating. This will cause a drop in the upwards pressure until fast, hard disks are commonly available. When this happens though, we may well find that there is still no great upwards trend in memory size, because data can be got from the disk so quickly that it is not worth holding it all in main memory all the time, where it can easily be lost in the event of a machine or power failure. Notice that the standard Sirius has only (!) 128k Bytes of memory, although it is necessary to add another 128k if you want to use any of Microsoft's fancy new languages.

In short then, my thoughts are that a few hundred k are all most people will need (although there are exceptions – please do not write to *MicroComputer Printout* to say that *your* pet application absolutely demands 3 MB of memory, how could I be so blind etc.), and that the next dramatic area of improvement is going to be in terms of disk storage, such as a 50 MB *removable* cartridge, possibly shared between several computers. This of course is only my humble opinion, and contrasts markedly with the spiel dished out by the computer salesmen, who insist that the more memory you have, the better. We will see who is right!

□

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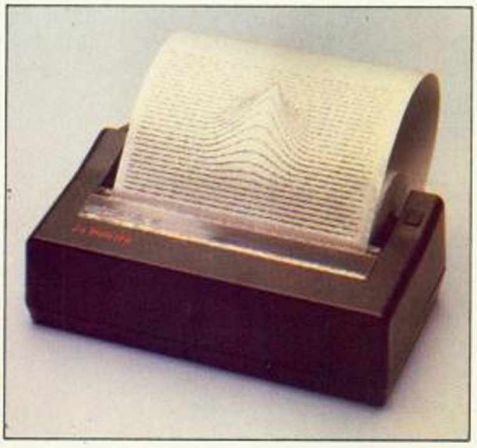
A remarkable breakthrough at a remarkable price. The Microdrives are available later this year, for around £50.



How to order your ZX Spectrum

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INSIDE TRADER

I am pleased to report that Keith Hall's reputation for tact and diplomacy appears to have survived the move from Commodore to Apple. Since the rugger playing thespian took over, the number of Apple dealers has shrunk by a third.

Such has been the embarrassment caused by non-deliveries of Acorn's "BBC" Micro, that the Guvnors have privately decided that no future system may bear the Corporation's hallowed name. However, I note that the decision is not due to be formalised until a week after the Government rules on the license fee, so greed may yet triumph over common sense.

Having lasted a month at Microsoft, the industry is agog to see how long their favourite bull-in-a-software shop, David 'Exocet' Low will now survive at Intelligence UK. Helpful suggestion: previous employers ACT gave him a sound proofed office and stood it a year.

Greetings to Mr. Jack Schofield, newly appointed editor of Practical Computing, *and the sincere wish that he escape the mysterious curse which struck down his predecessors. Dennis Jarrett was poisoned, Richard Hease's head swelled up, whilst poor Peter Laurie went into software. Alas longevity does not appear to be amongst Mr. Schofield's many attributes; he lasted one issue in his previous post of Editor of* You and Your Camera.

More great news from the multi-talented Desperate Dave Tebbutt. This former *PCW* editor and publicist to *The Last One*, how a leading radio comedian and software publisher, has achieved a remarkable software breakthrough. Called *Source Writer*, it is a program that writes programs. Indeed Dave feels it may well be the last one you ever need...

Despite the rumours there will be no head hunting of Osborne's feminist Vice President, Ms. Georgette Psaris. She assures me she is "both involved and committed" to the company. What is the difference? "Think bacon and eggs," advises Ms. Psaris. "The chicken is involved; *the pig is* committed."

In negotiating to buy a stake in GRID systems, it is only natural that the Commodore should wish to know the secrets of their pocket size GRID computer and its amazing electro luminescent fold-flat display. I trust that no one will be unsporting enough to tell GRID that Commodore already own a company who just happen to be working flat out in this field.

The Bug That Ate Boca Raton cont: *It is comforting to learn that all bugs in the IBM Personal Computer have now been "accounted for". Let us hope that no-one is fool enough to load UCSD Pascal and ask for the sine of – 6.4 ...*

Apple executives are causing discreet enquiries to be made as to the whereabouts of their co-founder Steve Wozniak, last seen enrolled at Berkeley University under a false name and moustache. It is feared that the great man may be about to blow his entire fortune on a series of pop concerts. "Mr. Wozniak is not mad", said a spokesman. "He is an impressario"....

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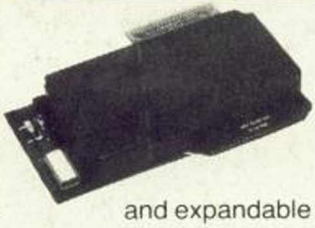

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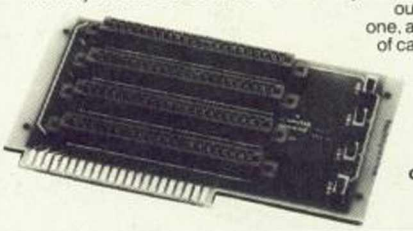

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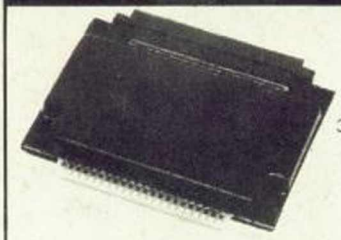

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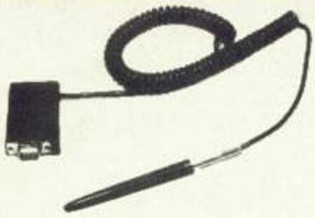

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