Australian Personal Computer

HP joins the AT fray

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AUSTRALIA'S TOP SELLING COMPUTER MAGAZINE



QUILL POWER FROM AMSTRAD
First full benchtest of the PCW 8256

NOW WITH 80286 & Z80H

Universe

Security and speed
Software compatibility, and

Forget conventional networking. Universe provides superior speed and security necessary in multiuser applications. Running the widest range of 8 and 16 bit software, it has the ability to network IBM PCs and workalikes in the fastest multiuser/ networking microcomputer system in the world.

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Networking – flexibility

Up to 255 MS-DOS machines. IBM PCs and workalikes can be linked into the Universe system using a high speed DR Net local area network.

IBM PCs and workalikes can run applications written for Concurrent PC DOS, CP/M-86 and PC-DOS, while having access to all the benefits of the network. PC users share files, records, printers and other network resources.

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Dual processor design, provides access to the world's largest software base via CP/M, MP/M and MS-DOS. With AED's new Concurrent DOS you have the best of all worlds.

DMA hard discs and the new high-speed 80286/Z80H dual processor CPU furnish performance necessary to handle multiple 8 and 16 bit programs.

Tough
The Universe is built on a strong square tube frame.

Stays Cool
No fancy operating environment needed. Every Universe is tested at 42 degrees C.

Flexible
Universe accepts an extensive range of terminals, printers, modems, even electronic telex.

Expandable
20 slot shielded S100 buss. Obsolescence proof using IEEE 696 S100 cards.



Speed and Security – essential to your business

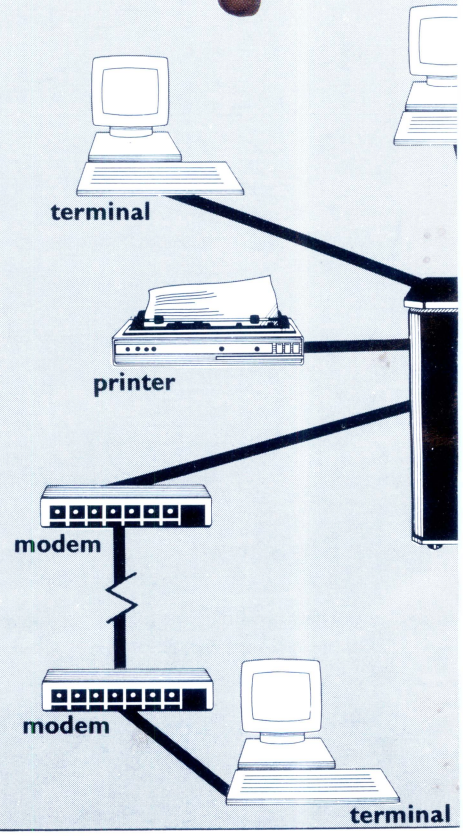
Most networks are slow and insecure. Universe shines here, with full multilevel security enhancements normally found on well engineered minicomputers. Universe is engineered from the ground up to provide facilities essential for the smooth running of a large multiuser system.

Important Security features

Encrypted login passwords. Users are restricted to specific terminals, directory areas, programs and nodes on the network.

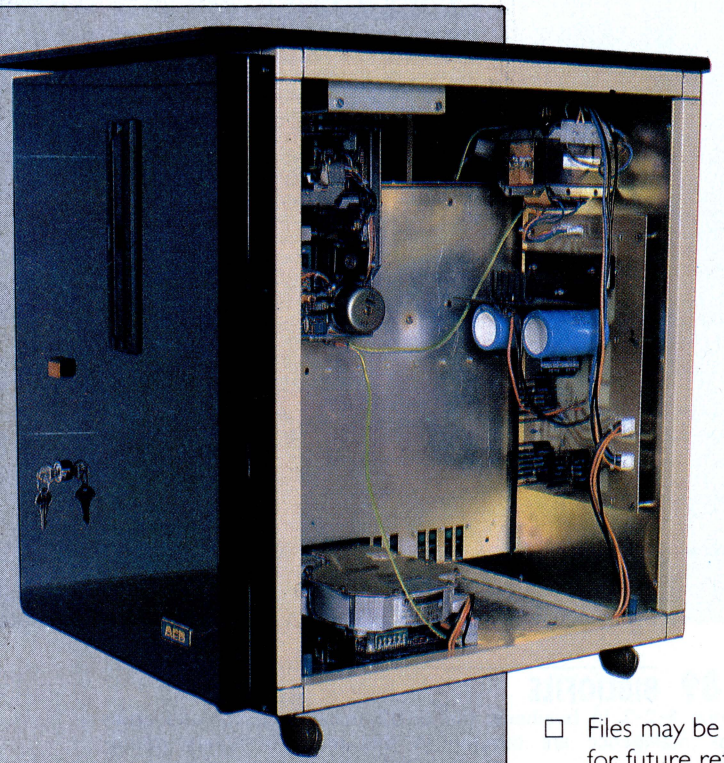
File passwords. File and record lockout and a full password hierarchy. Your System Manager can quickly and easily configure the system so that each terminal only has access to those facilities and data its operator needs. For example:

- ☐ Option to restrict any account to specific programs or workstations



Multiuser

of a minicomputer. reliability of a supermicro.

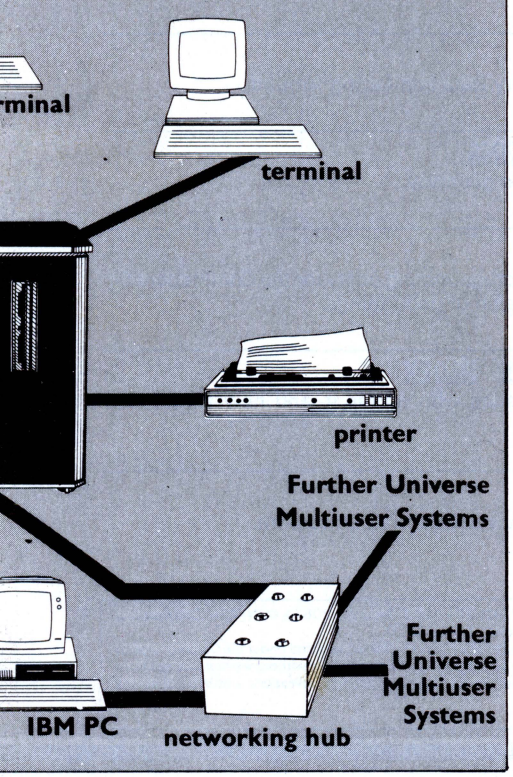


Smart
Powerful file I/O processor makes Universe operation faster, leaving the CPU free of repetitive tasks.

Fast
High speed (8MHz) dual processor design (80286 plus Z80H) with options for 68000, 16032 etc.

Durable
Ebony glass top and acrylic epoxy finish

Capacity
3 Winchesters plus removeable cartridge totalling up to 300 Megabytes total storage.



- ☐ Files may be automatically dated for future reference. Optional timestamping shows both creation and last access.
- ☐ Optional passwords on computers within a local area network.

Operating features

- ☐ Low cost serial terminals support both 16 bit (CP/M, Concurrent DOS, MP/M-86) and 8-bit (CP/M, MP/M II) software
- ☐ 200 character type-ahead buffer per terminal
- ☐ Fast 'hashed' directory searches
- ☐ A secure electronic mail facility. Optional electronic Telex.
- ☐ A multiuser appointment calendar
- ☐ Optional 8087 maths coprocessor
- ☐ Inter-terminal communication. Electronic mail is here!
- ☐ A programmable keys utility so users can redefine their keyboards
- ☐ Optional telecommunications with remote computers via modem

Full Field Support

We were the first company in Australia to introduce full 12 month on-site maintenance (now extendable to 2 years at time of purchase). All service and engineering support is carried out by AED directly.

Australia wide network

Field service is presently within 24 hours on the east coast and within 48 hours for country areas.

Our network is being aggressively expanded.

Inherent high reliability and modular construction minimize downtime and make service to the most remote locations feasible.

Customer support

Our very first system buyer is still a valued customer. We take special pride in supporting every existing customer and in providing the highest standard of service at every stage. As part of this support, the Universe is continually being refined in reponse to the needs of existing customers and Australian business.

AED

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2 Stoddart Road, Prospect NSW 2149.
Ph: (02) 636 7677. Telex: AA 70664

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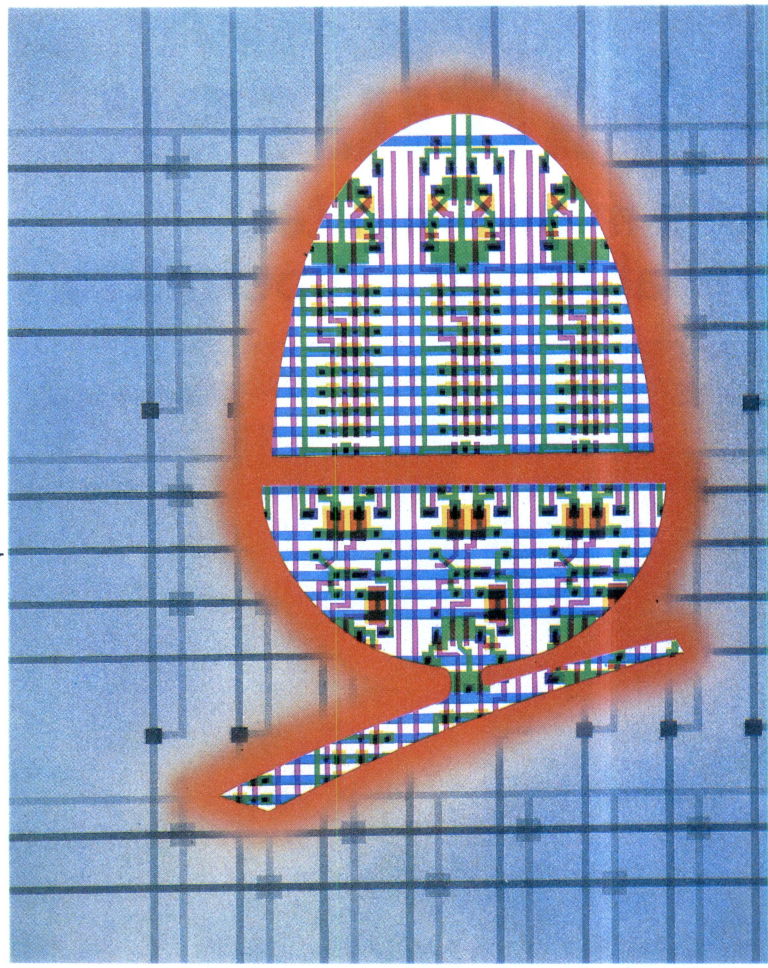
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Glover & Assoc.

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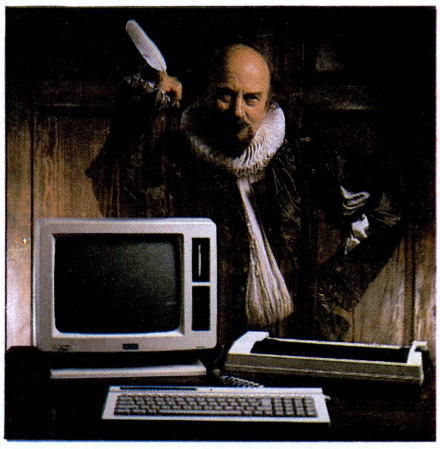
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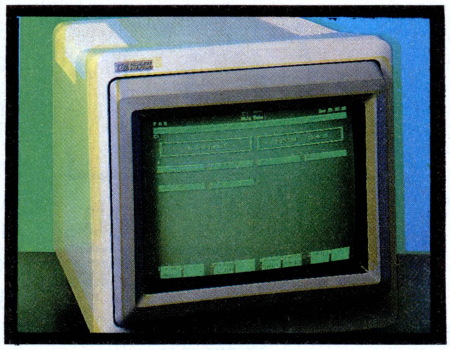
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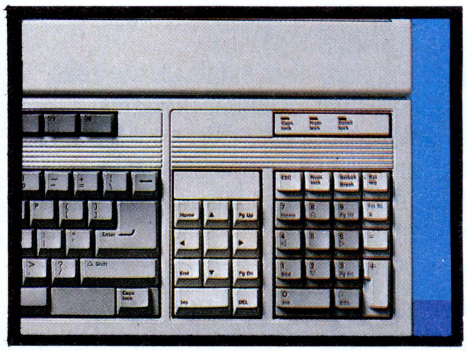


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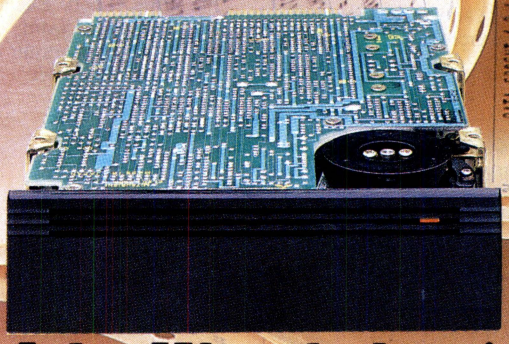
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One 20mb hard disc from John Waugh Components stores the same information as 60 floppy discs...and it suits all IBM PC's and compatibles.

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Don Graphics 5574

APC's reporters reveal Microsoft's 'decision' to support IBM's JX and give a foretaste of what you can expect from the new Apricot Xen, in the pick of the industry's news and views.

The Apricot XEN in brief

The new Apricot is both a fast PC-type machine (a replacement for the current Apricot Xi) and a cheap multi-user Xenix machine. It is aiming to compete with both the Apple Macintosh and the IBM family: the windows and icons are provided by Microsoft Windows, while the speed is provided by the Intel 80286 chip.

The version of Xenix which Apricot will supply is brand new — it's Microsoft's Xenix 286, which is the same as the official Unix version V from Bell. That's not just Microsoft's claim, but Bell's, as AT&T has tested Xenix V and it meets the new standard.

The speed of the Xen is increased (by comparison with the IBM AT) by two things. Firstly, the clock speed is faster, by about 30 per cent; and secondly, there are no wait states for the processor.

A chip like the 80286 gets much of its speed by grabbing more than one instruction at a time from the program. If it has four instructions (call them add, subtract, multiply and divide) to perform, it can prepare the subtract data while the addition is still going on, and can start multiplying before the addition is quite finished. It should be doing the first part of the division while it puts the addition results out to dry, with subtraction now nearing completion.

The 80286 can have as many as four instructions in this pipeline at once, if the memory and other circuits work fast enough.

On the AT, however, they don't, so one instruction in three is a dud — a 'wait' instruction.

Apricot claims to have tested the speed against the IBM AT by running standard programs, and says that the Xen is 60 per cent faster.

Barson Computers, the distributor, would not release prices for the Xen before its launch date in January. However expect it to be 'very competitive'.

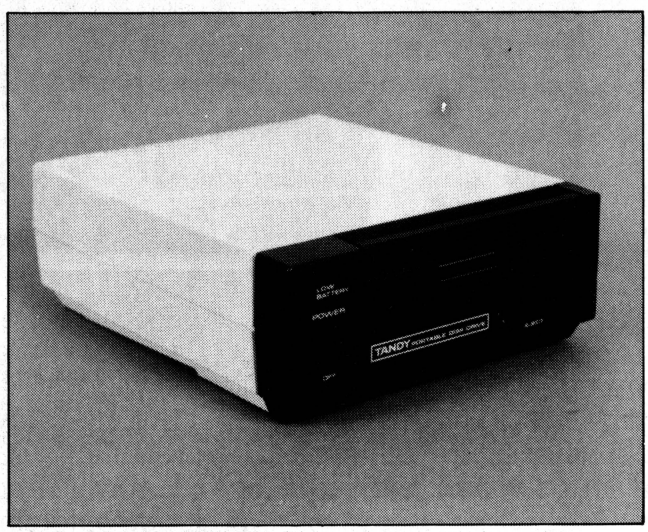
Look for a Benchtest in a future issue.

Faster Basic

One of the irritations of knocking up an application in Basic is that, having got the program to work bug free, it usually runs pretty slowly. Yes, you can purchase a compiler, but they're usually not cheap and it's difficult to justify the cost for the odd homebrew application.

Microsoft has produced QuickBasic as a proposed remedy to this situation. It will sell for $175, giving a claimed three to 10 times interpretive Basic execution speed.

QuickBasic is compatible with Microsoft Basic, as you'd expect. But it also includes some new features among which is the ability to produce 'subprograms' which can be compiled separately and then linked with the main program before it is run. The subprograms, most importantly, can have either local or global variables; also line numbers are not required — instead, program lines are executed in the order listed and can be referred to by alphanumeric labels by GOTOs etc; and QuickBasic also supports the IBM and Microsoft network standard with file and record locking and file sharing.



This is a 3½inch battery powered disk drive for Tandy Model 100 and 200 owners.

While it only has 100k capacity per disk it'll no doubt be warmly welcomed by a sizeable number of frustrated lapheld users.

Retail price is $350. It's available from all Tandy stores.

Above Board

The news that Microsoft has decided to support the Above Board comes as a surprise only to those who don't know about Microsoft's determination to make Xenix a success.

A question: what can Xenix do that PC-DOS cannot?

An answer: it can address 16Mbytes of memory.

Let's start by saying that the IBM PC (or any computer using the 8086 chip) has not one, but three memories. We may, in this way, be able to explain the daft situation into which Intel, Lotus and now Microsoft have placed the PC family with the Above Board memory expansion.

The chip has 64k of memory for programs. It can have another 64k for data, and a third 64k for a stack. These three areas of memory can be anywhere in memory, but only in 1Mbyte.

Anything more, and the chip becomes confused and starts counting from zero again. The rules are simple: you can't put a program into data segments unless the program and data segments are in the same 64k. Neither can you put the stack into a data segment. At any one moment, your computer can refer to 64k of memory only, and you can only plug a megabyte into the chip.

It does everything the most pow



The problem with most desktop computers is simply that.

They're desk bound.

And the trouble with most transportable computers is, apart from being under-powered, they look more at home in the boot of your car than on your desk.

Now fortunately, a computer has been designed to fit neatly between the two.

The Apricot.

In a nutshell, it's a 16-bit desktop computer that folds into a briefcase.

So it can take home work when you do.

While at the office, it competes on equal footing with the desktop heavies.

Unbelievably, it's more powerful than the equivalent IBM PC.

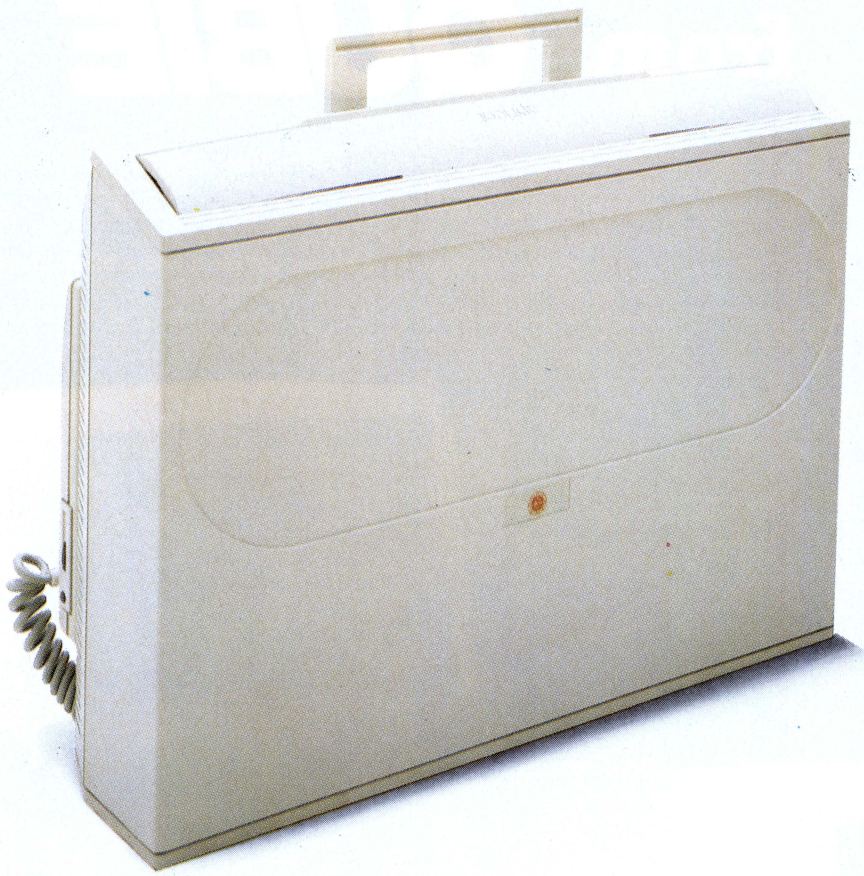
It also incorporates a few practical advances in computer technology that no other desktop has caught up with.

For example, a Microscreen on the keyboard which operates as a calculator, digital calendar, time display and as a window on the main screen.

What's more, the Apricot comes ready to go.

*From $4444 with sales tax and $1000 worth of software included in the price. And the software includes Supercalc,

erful desk top computers can do.



And one thing they can't.

It already has its own business software.
(In fact, over $1000 worth of it is included in the purchase price.*)
But as well as that, the Apricot is readily compatible with the computers that boast the most software in the business, the Sirius and the IBM PC.
So there you have it.
A computer that does anything any other desktop computer can do.
And you don't have to hire a removal van to take it home.

apricot

The Apricot is brought to Australia by Barson Computers, Australia's leading independent computer company.
For your nearest Apricot dealer, phone Barson Computers, in Melbourne on (03) 419 3033, Sydney (02) 436 2588, or Auckland (09) 54 1030.

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Superplanner, Microsoft Basic, Personal Basic, System Configuration, System Manager, Async and Utilities programs.

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Languages

Basic is the most common language used in schools, but does it fulfil all the criteria for a good educational programming language? R J Elliot presents the case for Comal as a better performer in the school stakes.



The history of educational computing has a close link with the history of the micro, as one has followed closely — and sometimes blindly — in the footsteps of the other. As the micro has become more technically sophisticated and the accompanying software more varied and useful, school computing has similarly evolved, and at last curricula are appearing that reflect the role computing plays in the real world. Today micros, running good applications packages and supporting a number of programming languages, are available at prices that schools can afford.

However, while schools seem to have taken aboard the better applications, programming remains in the doldrums. In the early eighties, when micros were first introduced into the curriculum, there were precious few applications packages available and even fewer programming languages. Invariably the language supplied with the machine was Basic, and as there was a chronic shortage of computing expertise among staff, crash courses in programming were undertaken and many computer studies classes degenerated into short courses in Basic.

Why teach programming?

Before I'm condemned as yet another Basic basher, let me examine why programming needs to be taught at all.

Firstly, programming can be a vocational requirement. Students who plan careers in the computing field should be introduced to proper programming techniques: that is, techniques consistent with those used in commercial programming environments.

Secondly, it can give an insight into the workings and logic of a computer. Anyone who has ever written a computer program will realise certain fundamental aspects of the workings of the machine that cannot be gained by using any number of applications packages. In particular, writing even one program (and especially your first) belies the commonly-held notion of computer infallibility.

Lastly, programming will develop students' analytical and problem-solving abilities. Much school mathematics is based on this objective.

The more a programming language satisfies the above criteria the better, so how does Basic shape up? Basic does not satisfy the vocational requirement. Although it is used as the main programming language in a few installations, it is a non-standard language in many respects. In particular it is almost impossible to apply normal problem-solving techniques to this language, and experience in Basic programming is not considered a good basis for progression to more standard high-level languages. In the preface to *Pascal from Basic*, Peter Brown writes: 'The task of the Basic programmer (in learning Pascal) is probably harder than that of the novice, because Basic is actually the maverick among programming languages. It is harder to learn concepts and then to relearn them in a new way, than to start from scratch.'

On the second point, Basic scores highly. Indeed, minimal Basic has similarities with assembly language and provides a better insight into the workings of the machine than most other high-level languages.

As far as Basic's problem-solving properties are concerned, it performs poorly. The unstructured, almost algebraic notation conceals the nature of the underlying problem.

One out of three is not very good, so what of the competition? Most serious micros can run Cobol and Pascal, and although they achieve better marks than Basic (especially the vocational aspect of Cobol and the problem-solving properties of Pascal) they are both complex languages requiring far more than the 30 or 40 hours usually allocated to programming in a typical computer studies syllabus.

There is another language that scores full marks for each criterion, and is as simple to use as Basic. That language is Comal. Comal (common algorithmic language) was first developed in 1974 as a set of extensions to Basic to facilitate structured programming, and was not then a programming language in its own right. By 1979 so many changes had been made that it was decided by the working group not to have Basic as a proper subset, and Comal-80 was born.

Comal is really a mixture of Basic and Pascal, retaining the simplicity of use of Basic with the comprehensive control

These days, a megabyte is barely enough for most users, but on the IBM PC, they can't even get that much because IBM stole 360k's worth when it wired up the board. 640k is the maximum on an IBM PC. On the PC/AT, however, the 80286 chip can go much further. It can, if you nudge it, suddenly count as far as 16Mbytes, in what Intel calls Protected Virtual Address Mode.

Ah, but the PC/AT doesn't know it can do this! It only knows what PC-DOS tells it, and PC-DOS works on the 8088, not the 80286. Under PC-DOS, the 80286 pretends it is just a fast 8088.

But take the AT, load Xenix, and suddenly, you can plug in all 16Mbytes. Xenix 286 understands Protected Virtual Address Mode.

Users of Lotus 1-2-3 have long complained that there just isn't room in memory for all the numbers spread around their spreadsheets, and they need more than 640k.

So Lotus and Intel have cooked up a little extra memory card. It plugs into the IBM bus and contains quite a lot of memory, above and beyond the PC's 640k.

Get the right version of Lotus, and it will tweak a little register on the Above Board when it runs out of memory, and presto! — more space for your spreadsheet.

But not, I'm afraid, for your program. Nor, I'm afraid, for the stack. And not more than 64k at a time, either, because the register on the Above Board can't cope with more than four bits of 16k each. They have to be contiguous, too.

The new Rampage board imitates the Lotus Above Board, but it goes further, giving four registers, not just one.

It can pretend to be a simple 64k window inside the extra memory, or it can pretend to be four separate windows. And its windows can be data, or program, or stack, or anything.

New software like Ashton Tate's Framework II can use the Above Board and the Rampage, as it can look into more than 640k.

On the PC/AT, it can still only look at more than 640k through the Above Board or the Rampage, and it can still only look at an extra 64k at a time. It can only use the extra memory for data — not for stack, or a program.

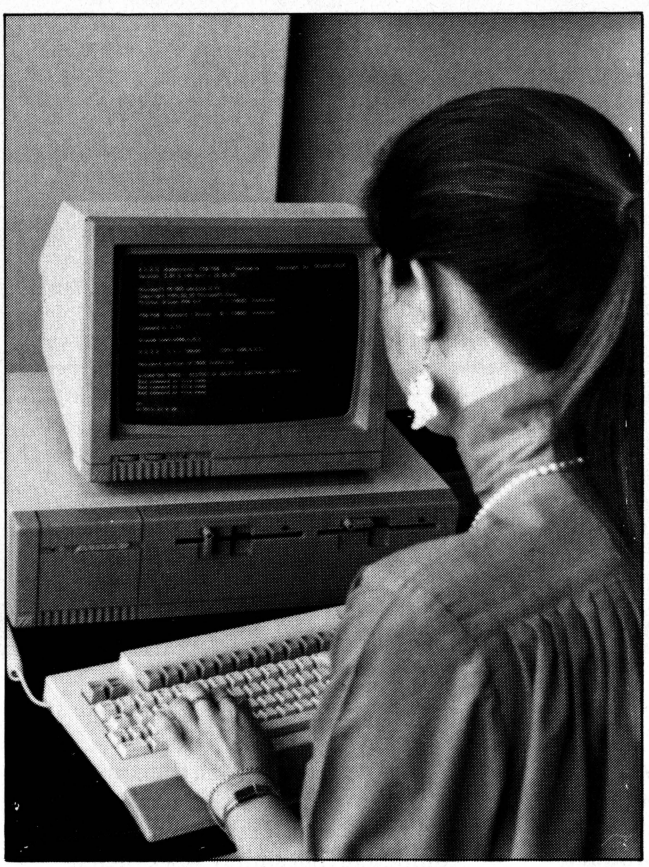
The Above Board improves on the basic PC in the same way that an outboard motor can improve a basic rowing boat. An outboard motor, that is, attached to a separate coracle, too small for a pilot to sit in, and controlled by a pair of fishing rods held by the rower in the rowing boat.

On the AT, using the same Above Board is as silly as taking the coracle and its two fishing lines, and using it to drive, not a rowing boat, but a powerful ocean cruiser with two onboad engines.

Until Microsoft rewrites PC-DOS to use Protected Virtual Address Mode, that's the only way to drive your ocean cruiser — without Xenix.

Anyone who didn't know better would imagine that Microsoft was trying to make Xenix look good.

Guy Kewney



If you're in the office automation/electronics business you've just got to have a PC-compatible in your arsenal. Or so it seems at the moment: the latest to enter the foray is Adler with its Alphatronic.

Adler's angle is 'superb engineering' and a no deposit, no interest purchase plan. For $268.41 per month over two years Adler will deliver an Alphatronic with 256k of RAM, two 360k drives, mono monitor, Epson LX80 printer and Lotus 1-2-3. Other configurations are also available.

Glory (and $5,000) to the winner

An easy $5,000 cash would appear to be the reward for the smartest tactician/negotiator in Microtex's multi-player competition, to be launched early next year. This is the prize for the first player to achieve 'control' over a fictional galaxy created on Viatel's computer. Up to one thousand players can be accommodated in the 'Great Galactic Conflict' — a game of skill and believed to be the world's largest-ever multi-player electronic game.

It's a simple 'rub-out-the-opposition' strategy game and should prove an interesting forerunner to what could potentially revive the home computer market — dual and multiplayer strategy and action games. Although obviously $5,000 cash prizes will not be commonplace. Call (03) 419 0666 for details of entry.

Expansion solution

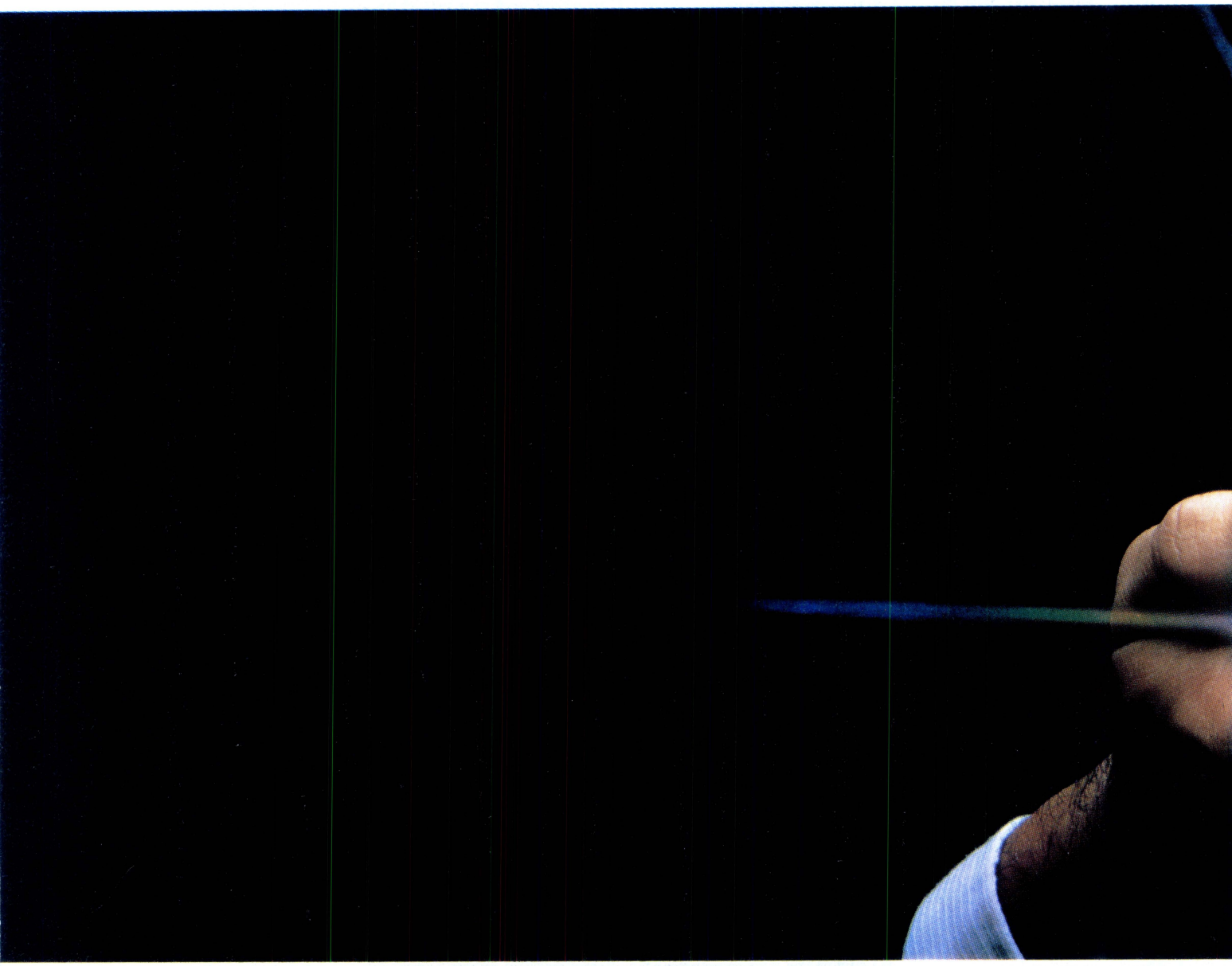
Purchasers of the Amstrad PCW 8256 machines will have one thing in common: they won't be able to get enough disks.

Here is a suggestion for dealing with part of the problem — expand the memory.

If you look inside an Amstrad PCW 8256, you will void your guarantee, but you will also see a strange thing. You'll see a row of empty chip sockets on the board.

These sockets are for memory. Officially, they don't exist, but the machine can be persuaded to look at them with a very small wire added to the circuit board,

"The Compaq Idea." Where to



"The Compaq Idea."

In 1982 Compaq decided to produce an "Idea."

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*SOURCE: DATAMATION MAGAZINE.

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and they cost less than $3 each to fill with chips.

At the moment, I don't have details of the wiring change. When I get it, I'll print it, or perhaps TJ will in his Workshop.

The effect, however, is to give an extra 256k of memory, and that can be used as RAM disk space.

Real disks, come Christmas, will be the type of things that you'll happily swap your entire collection of hen's teeth for.

Due to the world's conviction that the Sony-style 3.5in diskette is 'the one', several manufacturers have been reluctant to make 3in diskettes in real quantity. 'Amstrad', said one Japanese supplier, 'is just one swallow.'

Current production of the CPC 6128 and the PCW 8256 looks like putting 100,000 3in disk drives onto the market per month. After Christmas, this may drop off, or it may go up. My money is on the 'go up' theory. Some swallow, you might reply.

Apart from the Hitachi disks, from the makers of the drive, Maxell has begun to make disks. Its production line has coughed once or twice, and by October, perhaps 200,000 disks had been produced.

Well, each owner wants between 10 and 20 disks, straight away.

Software suppliers sell their programs on disks: they buy in bulk, in advance. To put a new title onto the Amstrad disk machines, the duplication firm involved will have to acquire something like 50,000, just to get first stocks into shops. If the program sells well . . .

So, by Christmas, we'll have close to half a million people, all wanting around 20 disks, and a couple of dozen software people, all wanting 50,000 (or more) per title. And the Japanese manufacturers are saying 'just one swallow'.

True, upgrading your system to 512k isn't going to cut your need for disks in half, but it might reduce it.

The question of why those eight empty places are there on the board is an interesting one, by the way.

The best information I have suggests that the machine was originally going to be the PCW 8128, with 16 chips, 64kbits per chip. Then the 256kbit chips became cheap, so things were changed. The extra sockets were ignored.

Don't mess about with the board if you don't understand soldering, memory address decoding, and circuit boards. Wait for a full explanation.

Guy Kewney

Shame about the name

If you can put up with the irritating appendage, plan on having a growing business and are looking for an integrated accounting package, Advantage! from Paxus Information Services should be short-listed.

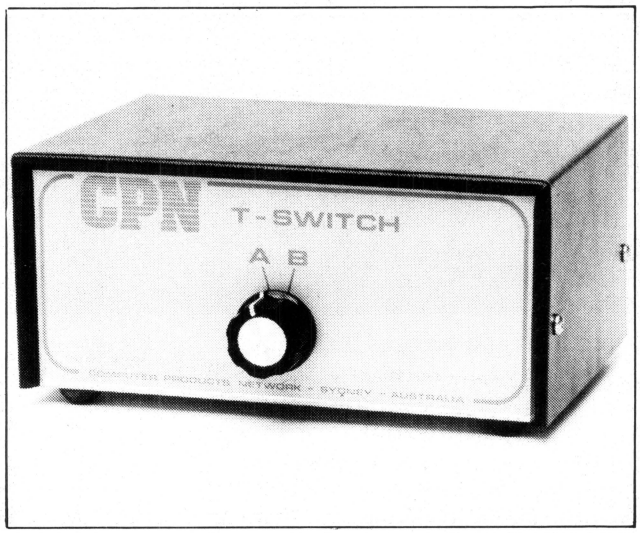
It is a derivitive of Hartley Computer's IBS package, designed to run on IBM's PC/AT or XT or work-alikes. Hartley Computer was purchased by a New Zealand public company, now known as the Paxus group, and had its name changed to Paxus Professional Office Systems when it was amalgamated with Merret Professional Systems.

The $3,000 package is not as confusing as its origin and does have the advantage (!) of being upwardly compatible with the full IBS package. As it stands, though, it can support two terminals on an XT and up to four on an AT. Details on (02) 925 8333.

Expanded PC Show

PC-86, the Seventh *Australian Personal Computer* Show, will be a larger event with a broader perspective. It'll also be at a different time of year and at a new site.

The Royal Exhibition Building, from June 1 to 4, will be the venue for two new exhibitions which will be run in conjunction with the personal computer show. Communications 86 will cater for products and services in the areas of local area networks, videotex, data communications, computer-based telephones and PABX systems; and Office Technology 86 will broaden the previous year's exhibition profile of microcomputers in office automation and efficiency, to include word processors, electronic typewriters, facsimile machines, photocopiers and ergonomic furniture.



An inexpensive solution to resolving the dilemma of having two micros and one printer could be the T-switch from Computer Products Network, especially if both micros don't have a large capacity requirement for the printer.

It's a simple device which allows for, say, two computers to be plugged into it and one modem or printer connection to emerge from it. Switching from position 'A' to 'B' connects one or other of the computers.

The sincerest form of flattery

When GEM first appeared on a micro, that machine's manufacturer said it was a proprietary desk-top idiom, and everyone else said it looked incredibly like the Macintosh.

Apple agreed. Apple didn't take Digital Research to court for writing GEM, but the out-of-court agreement which they both signed did involve two things. Firstly, DR paid Apple a sum of money; and secondly, DR went away and re-wrote GEM, GEM Write and GEM Paint, so that they looked different from Macintosh.

In exchange, DR will be doing some work for Apple.

JX support

You wouldn't have to go too far to find out when IBM intends to leave all its current Australian JX purchasers in the pooh by releasing the 720k drive version, it would seem Microsoft, which you'll

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remember if you've been reading *APC* lately, has signed a sort of pact with IBM. So it's not surprising that the first Aussie JX had barely made it to the shops when Microsoft announced a range of JX software. On 360k disks.

So, where do you go to get the nod on 720k machines? Microsoft's Sydney headquarters, naturally.

Our moles are digging.

As an aside:

Linda Graham, head of Microsoft in Australia, gets our 'incredulous quote of the month award':

"Microsoft looked at the Australian market carefully, we polled our dealers and after giving a large amount of consideration to the JX we decided to give it a chance."

Could anyone seriously expect Microsoft *not* to support IBM's latest PC release?

How wrong can you be?

'Product never installed.'

That's the message that greeted me after I tried to 'uninstall' Spotlight from my hard disk.

You might justifiably wonder why I was doing this. The answer is that it had suddenly ceased to work.

The software was lying, of course, I had 'installed' it, not just once, but twice. It wouldn't work, and all the data I'd laboriously entered into it was unavailable to me.

I wouldn't revive my own private hell in the backwoods of copy protection, except for the fact that Lotus, which now owns Spotlight, has just relaunched it. It's cheaper.

Credit to Lotus: it quickly sent me another copy, and the original floppy disk allowed me to run the program from drive A:, even if it wouldn't admit that I had a hard disk on the Olivetti M24. Eventually, I managed to re-write the data files into another directory and get at them again.

I never found out what caused the problem. It may happen again at any time.

When is the software industry going to realise that copy protection like this is as endearing as those parish priests who preach 20-minute sermons on the evils of not attending church services — to the people who are there!

I've paid for the wretched program (I may wish I hadn't, but I have) and why should I have to suffer because someone else might steal it? The heck with it, and I'm getting a copy of Sidekick, non-protected version, as soon as possible. Who needs this hassle? What this is all about, is copy protection.

I hope that you will take warning from my experience and refuse to buy 'protected' software.

Spotlight is a 'pop-up' package on the IBM and similar micros. When it was launched, I greeted it with quite a lot of enthusiasm. 'It sounds,' I think I recall saying, 'like what I've been looking for for some time.'

Guy Kewney

New in the jungle

We seem to be stuck with the fact that dBaseIII is now one of the inhabitants of the computer jungle — a programming language.

This fact is announced by the launch of Nantucket Software in Nantucket, selling the Nantucket-produced dBaseIII compiler, Clipper.

Clipper, say the authors, can speed up dBaseIII programs between two and 20 times.

It produces native machine code for the PC.

'There may be better programming languages, better "databases", and better solutions, but dBase is something which thousands of companies now have thousands of routines for. They work, nobody is going to re-write them, and they'll be very pleased to speed them up' says Nantucket.

Osborne's other sides

The impressively named Thomson Grand Public claims to be the world's largest manufacturer of monitors. So it's reasonable to expect a bit of a shake-up in that corner of the market early next year when the company's distributor, Osborne Australia, launches a campaign aimed at attracting a significant share of the monitor market.

Also from Osborne is the PC-College, a PC-compatible which is being targeted at the education market in conjunction with the Trans-Net local area network. The lan is capable of interactive screen to screen monitoring for classroom situations of up to 255 stations. The twin drive, 256k PC-College is being sold, without monitor, for under $1,500 to educational and government bodies.

NEC chases 'number one'

NEC's Daniel Petre, product manager for PCs, has informed us that "NEC APC III sales are now 1,000 units a month. This clearly places NEC as Australia's second largest supplier of personal computers to the business sector."

It is obviously NEC's intention to retain this position it sees itself in with the announcement of an eight percent drop in the price of its hard disk system. (The new price for a 128k RAM, single floppy machine with a 10Mb hard disk is $4,261 excluding tax). NEC has also bowed to pressure and gone for IBM PC compatibility with its 'Software Library Expander' board. No mention of compatibility or IBM just a 'library expander'. So NECers can now run Lotus 1-2-3 et al.

First — at a price

Trust Digital Equipment: first out with a nice, useful standard for using compact disks for data storage, the world's second-largest computer company has spoiled the porridge by pricing it at $3,500.

DEC has found 11 companies, starting with the big names like Lotus, 3M and Tecmar, which will support its CD ROM standard, and it has also found five databases to sell on compact disk, which are attachable to its Rainbow personal computer.

And then it asks this kind of money!

When is compatible not compatible?

Full marks to Hewlett-Packard for getting away with an 'IBM AT-compatible' machine that doesn't have a hard disk.

Half of the attraction of the AT is, of course, the 80286 chip inside it. This is fast. The other half is the provision of a 30Mbyte hard disk.

The Hewlett-Packard Vectra comes with one floppy disk of 360k for $6,890, and goes up to a

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maximum of a 1.2Mbyte floppy. The diskettes, by the way, are not 3.5in Sony diskettes, but good old-fashioned 5.25in bendies.

The company rather unnecessarily adds that this machine 'will not replace the HP 150'. I'll say not.

Come on, HP. What about a hard disk controller, at the very least, so that people can plug in standard hard disk subsystems?

Guy Kewney

Tailor-mades

Owners of PCs can now avail themselves of the electronic form of the successful 'Book of Letters'. The book is a collection of responses, complaints, demands etc for a wide variety of dilemmas from complaints to neighbours about industrious but noisy handyman activity to suggested tacks in lobbying the local MP.

The book sells for $19.50 and the disk for between $40 and $50 depending on format. Call (02) 389 1198 for more details.

Clones clobbered

Focus Research has published a report on the Australian PC marketplace showing that IBM has consistently increased its market share throughout 1985. IBM's September volume share was 25% and value share was 31%.

In the same period compatibles and clones achieved only 4.5% of IBM shipments. Focus concludes that "Australian PC buyers have been extremely reticent in acquiring PC clones," but it expects "this to change with Compaq's arrival."

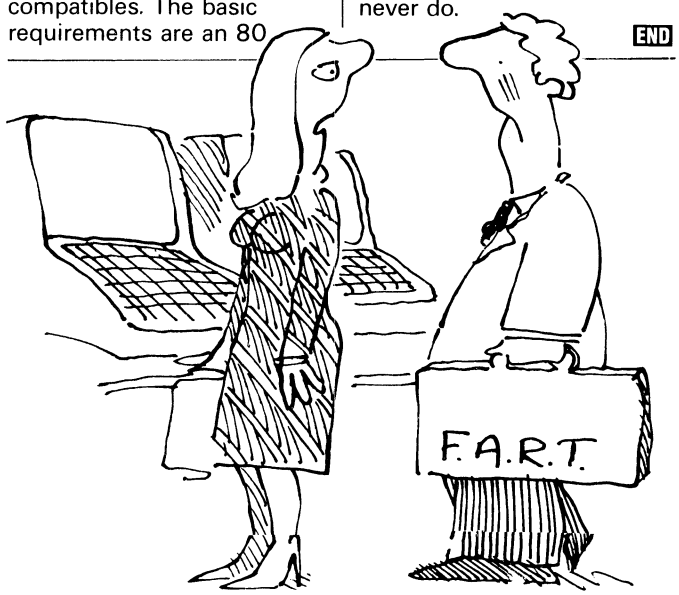
Briefs

Sendata has taken last month's Newsprint comment to heart (regarding the price of its All-In-One Modem) and knocked $200 off the price tag. It now sells for $1,100 . . . AED Computers has received a quarter million dollar grant to undertake a "top secret" research project for the government aimed at enhancing the performance of the Universe Supercomputer to "a level considerably superior to most minicomputers" . . . Jodee Rich, founder of Imagineering, last month lived up to his name when his company was publicly floated, raising $4.8 million for 40% of the firm . . . NEC has followed Tandy's footsteps in producing an upgraded version of its ageing lapheld.

The new machine, dubbed the PC8401B, has an 80 column 16 line LCD display, four built-in applications programs (word processor, spreadsheet, communications and database) plus CP/M and 64k of RAM. Basic and an internal modem are not included in the retail price of $1,450 . . . Plus-Works from Techflow modifies an Appleworks start-up disk so that it will run on most Apple IIs and compatibles. The basic requirements are an 80 column card and 64k of RAM. With additional memory an extended Plus-Works-XM will allow Appleworks to access up to 1Mb of RAM and 4,200 records. The standard version of Plus-Works sells for $35.75 and the XM version for $79.95. . . There are those who still don't believe it, but Atari ST micros are, at last, available.

The proof of this is the complaints that are starting to come in, suggesting that the machine doesn't work properly. Well, what did you expect? New machines never do.

END



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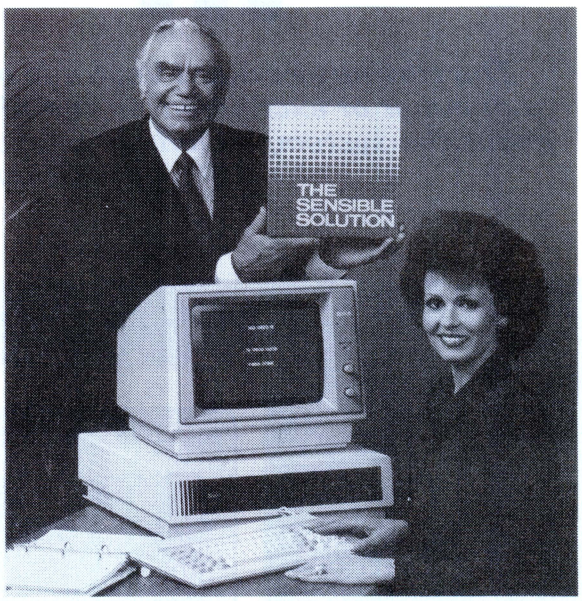
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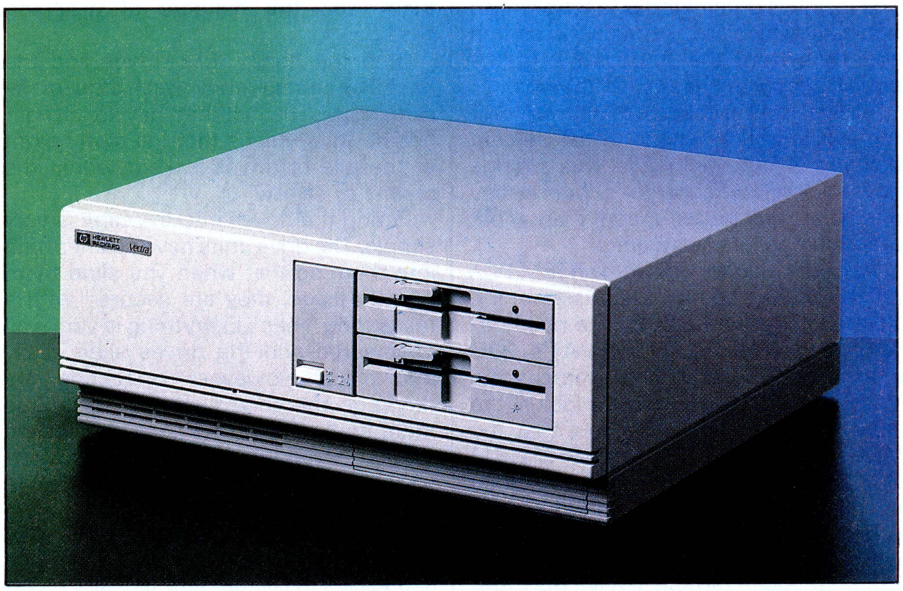
HP Vectra

The Hewlett-Packard Vectra is an IBM PC/AT lookalike — which raised a glimmer of excitement in the APC office. Peter Bright found lots he liked about the system, including an excellent keyboard and display, coupled with HP's customary style and engineering.



Whenever Hewlett-Packard launches a new micro, we usually get quite excited in the *APC* office, because even if it isn't very interesting, we can always marvel at the way it's put together.

Hewlett-Packard has always had something of a reputation for going its own sweet way in the micro market, but recently it has decided that if it is to survive in the mass market, it needs to be able to access the pool of hardware and software generated by the likes of IBM. The first machine that showed signs of this was the HP150 touch screen which used an Intel 8088 processor and ran MS-DOS. Now Hewlett-Packard has gone a stage further and launched an Intel 80286-based IBM PC/AT compatible machine.



The main system box is smaller and less imposing than the PC/AT's

Hardware

The first impression I had of the Vectra was one of quality and style. The design is similar to the majority of other business micros — three cream-coloured boxes containing the display, keyboard and digital electronics, but the quality of the casings and the way they all fit together are a hallmark of Hewlett-Packard.

The main system box is significantly smaller than that of the IBM PC/AT and is less imposing when it is placed on a desk. Having said that, I still used the machine with the main system unit on the floor and the monitor and keyboard on the table.

The casings are made of metal and high-quality plastics, all of which are finished in par-for-the-course cream. The front panel houses the on/off button as well as either one or two half-height floppy disk drives. Beneath these, out of view, is a half-height hard disk, although the only sign of it is an amber read/write light in the middle of the front panel. Other than these, the front panel is fairly empty apart from the Vectra badge.

Optionally you can have an IBM AT-style barrel lock fitted to the front of the system box to prevent unauthorised access to the electronics and use of the master console. The review machine excluded this lock.

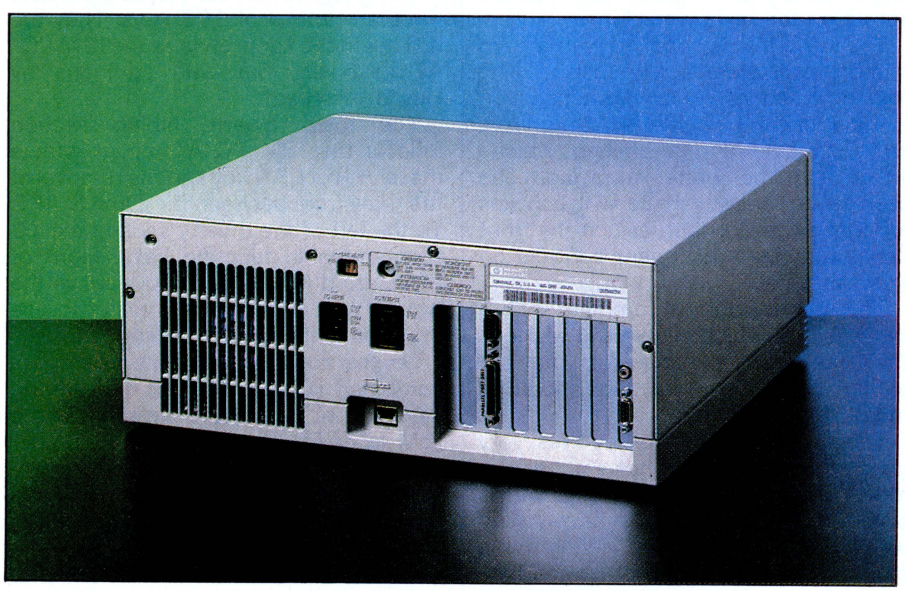
The rear panel of the system box is standard PC/AT clone layout. To the left is the vent for the system fan, in the middle are power in and out sockets, and to the right are seven expansion slots. On the review machine two of these slots were in use; one for the monitor output and one combined RS232 and Centronics card.

Unfortunately Hewlett-Packard has followed IBM's route here and has not only used a 25-way D plug for the Centronics connector, but also a cut-down nine-way D socket for the RS232 cable. This can make it difficult to hook up some RS232 devices.

When the review system arrived at my home, it came in no less than nine cardboard boxes. Unusually for a consumer product, the Vectra system box is delivered to customers without disk drives, video cards, and so on, fitted. It is up to the customer to put his system together and check it out.

Hewlett-Packard reasons that if the product is sold through a dealer, he will asssemble the system, and if it is sold direct to a large firm, the staff will be well-educated enough to do it for themselves. If the idea of assembling the machine upsets you, Hewlett-Packard offers the service at extra cost.

Assembling the system took about half an hour. The first stage was to unpack the main system box and take off the lid. Access is gained by removing three screws on the rear panel and sliding off the top. Unlike a number of PC clones I have seen recently, the lid on the Vectra is well engineered and slid on and off extremely easily with no catching or graunching.



The system box's rear panel is standard PC/AT clone layout

As it was shipped to me, the system box contained the main PCB, the power supply, the RAM board and nothing else. The inside is dominated by a long length of plastic which forms the on/off switch and runs from the front panel to the power supply at the rear of the box.

The main PCB takes up just over half the available floor space in the system box and is very well made. It is strange how Hewlett-Packard's pre-release machines are better made than most other companies retail units.

As you would expect from an IBM PC/AT thinkalike, the main processor in the Vectra is an Intel 80286. The main difference is that the IBM PC/AT's 286 chip is clocked at 6MHz, whereas the Vectra runs at 8MHz. A quick look at the Benchmark timings will show that the Vectra is significantly faster than the IBM PC/AT. The response times and screen speed were very fast, especially when running Digital Research's GEM when windows opened faster than you could see them being formed. Unlike the Compaq Deskpro 286 I Benchtested in September, it is not possible to slow down the Vectra's processor to match the PC/AT's. A large proportion of the rest of the main PCB is occupied by expansion slots.

The Vectra has a total of eight expansion slots. Of these, five are IBM PC/AT compatible, two are IBM PC compatible and one is specific to the Vectra. Unlike the IBM PC/AT, the floppy disk controller is built into the main PCB of the Vectra rather than living on an expansion card, but the other side of the coin is that the system RAM lives on a card plugged into the Vectra's machine-specific expansion slot. If you have a hard disk fitted, you will need an extra hard disk controller card.

The review machine was supplied with its full complement of 640k of RAM in the form of 256 kbit chips with parity. The code in the MS-DOS ROM BIOS is supplied by Phoenix Software which supplies IBM-compatible ROMs to a large number of IBM clone makers, so IBM compatibility shouldn't be too much of a problem.

The first stage in setting up the review system was to fit the disk drives. The machine was supplied with one 5¼in 360k IBM PC compatible drive, one 1.2Mbyte PC/AT compatible drive and a 20Mbyte hard disk. The 360k and the 1.2Mbyte drives look very similar, although the 360k drive has an asterisk embossed on its front bezel to distinguish it. As with the 1.2Mbyte drive on the IBM PC/AT, you need special high-capacity floppy disks to make it work.

All three drives arrived carefully packed in foam in their own boxes. They also came with instruction leaflets warning of the dire consequences of static electricity and the dangers of dropping hard disks.

Both the floppy disk drives and the hard disk all stack above each other in the same cage. The fact that they are all half-height units means that the total height of the pile of drives is kept within the realms of sanity.

Fitting the drives into the cage is very simple. The drive units have catches built into them so that when you slide them into the cage, they are secured with a reassuring 'snap'. Everything is very well engineered and the drives slide easily into place. However, connecting the drives to the controllers can be a little more fiddly. If you fit a hard disk for the system, you have to go through the set-up procedures before you can access it. The first step is to initialise the disk using a utility supplied with the machine. It takes about a minute per megabyte, so if you have a 40Mbyte disk you can go off and have a nice, long cup of tea. After initialisation, you can partition the disk and finally you format it. After all this has been done, you can copy files onto the beast.

After fitting the disk drives and the hard disk controller, it only remains to install the graphics card and the RS232/Centronics card before you can replace the lid on the system box and switch on.

The graphics card supplied with the review Vectra imitates the standard IBM colour graphics adaptor. It also comes with a composite monitor output which allows you to attach a monochrome monitor, in which case the colours are displayed as scales of grey. This was the set-up on the review machine.

The system was supplied with a 12in monochrome green screen monitor. The first thing I noticed when I switched it on is that it doesn't whistle. Most monitors and TVs emit a high-pitched whistle which can be quite annoying. The casings are very well made, with controls for contrast and brightness on the front panel and fine adjustment controls on the rear panel.

The monitor comes complete with a swivel stand which allows you to move the screen from side to side. If you want to tilt the unit, the display tube and bezel move, but the casing doesn't.

The quality of the display was very good. The display tube has a good anti-reflective coating; the characters on the screen were well formed and everything was sharp. I couldn't help feeling that a monitor of this quality was wasted having to display low-resolution IBM-style graphics.

The review system was also supplied with Hewlett-Packard's touch screen attachment first seen in the HP150. It fits around the display tube in place of the standard bezel and plugs into a socket supplied for the purpose in the main casing. The touch screen works by projecting a grid of invisible light beams just above the surface of the display tube. When you point at an area on the screen, you break two of the light beams in the grid and the system works out what you are pointing to.

Although the system works well, the touch screen is very much an optional extra on the Vectra. The PAM applications manager works well with the touch screen, but much IBM PC software wasn't designed with the screen in mind and won't work with it.

The Vectra keyboard is totally wonderful. I have always rated Hewlett-Packard's keyboards among the best in the business, but it has surpassed itself this time.

The keyboard is massive — 52.5cms wide by 22cms deep. Usually it is directly connected to the main unit via a length of coiled cable and two large plugs to a socket on the back of the main system unit. But this is no ordinary keyboard link: it is in fact a HPHIL (Hewlett-Packard human interface loop!) link. As well as connecting the keyboard, this interface can be used to chain in the touch screen or HP mouse if you have them fitted.

Therefore, on the review system the keyboard cable was connected to the back of the monitor to the touch screen, and another cable ran from the HPHIL output on the monitor to the keyboard socket on the main system box.

With regard to the keyboard itself, there are a total of 103 keys. They are laid out in the same style as the IBM PC/AT keyboard, but with additions by Hewlett-Packard.

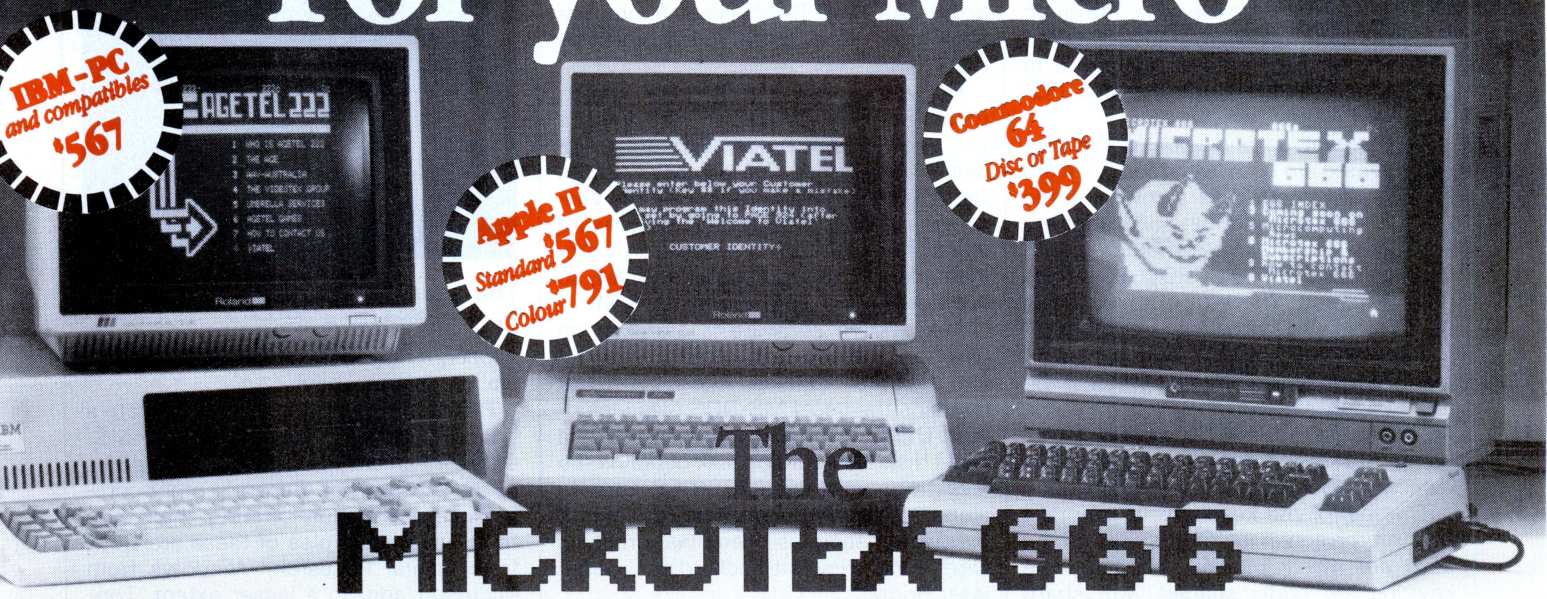
The main qwerty typing section follows the IBM PC/AT layout with a massive RETURN key and the removal of the / key from between the Z and SHIFT. To the left of the qwerty section are 10 programmable function keys. Eight of these are duplicated in a row above the qwerty section to make it easier to use the keys with Hewlett-Packard's PAM.

On the far right of the keyboard is a combined numeric keypad and editing key section. This is also the same as the IBM PC/AT, where you select whether you want to use the keys to enter numbers or for cursor control by using the NUM LOCK key. This approach has always been criticised by IBM PC users who avoid using the numeric keypad as it is too easy to become confused about which mode you are in.

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To get around this problem, Hewlett-Packard has duplicated all the cursor control keys and put them in a block between the qwerty section and the traditional IBM-style numeric keypad. This is a great idea, and means you can have full cursor control and the numeric keypad both at the same time. Although this removes the need for a NUM LOCK key, Hewlett-Packard has retained it to remain compatible with the IBM PC/AT layout.

The general feel and layout of the Vectra keyboard are both very good. Like the PC/AT, the Vectra has a row of three LEDs in the top right-hand corner of the keyboard to indicate whether CAPS LOCK, NUM LOCK or SCROLL LOCK has been engaged. The layout is about the best I have ever come across on a computer keyboard, and the only criticisms are the sheer size of the unit and that the ESCAPE key still lives in its PC/AT home on top of the numeric keypad instead of being in the top left-hand corner of the qwerty section where it should be.

The feel of the keyboard is generally soft but the action is still positive. All the keys are nicely pitched, although the keytops are oddly shaped with sharp straight edges along the top of some of the keys. The key colouring conforms to Hewlett-Packard's usual practice of using red lettering for the main typing keys and green lettering for functions, accessed via the SHIFT key.

System software

As you would expect from an IBM PC/AT compatible system, the Vectra runs MS-DOS version 3.1. This is basically a rehashed version of MS-DOS, designed to make partial use of the extra facilities of the Intel 80286 chip. The idea always was that IBM would release its version of the Unix multi-user operating system which would take full advantage of the 80286 chip, but something seems to be wrong because IBM's version of Unix still isn't out and we're still stuck with an operating system that doesn't take full advantage of the system.

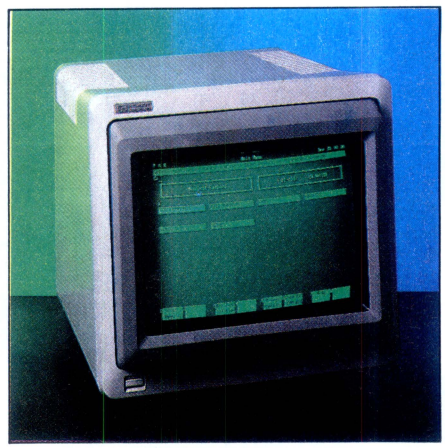
One of the most glaring examples of this is that the operating system can only access 640k of RAM, even though the hardware can access considerably more.

However, Hewlett-Packard's implementation of MS-DOS 3.1 is as good as any, and I had few problems getting popular PC programs such as Lotus 1-2-3 to run. The ROM BIOS software on the Vectra was produced by Phoenix Software which has extensive experience in providing legal copies of the IBM ROM, so compatibility shouldn't be a problem.

The system software is supplied on two floppy disks, one marked 'System' and the other 'Utilities'. The system disk contains the usual MS-DOS files including VDISK, which allows you to set up a RAM disk. The utilities disk contains the less frequently used MS-DOS utilities along with a number of device drivers for hardware, such as Hercules graphics cards and Hewlett-Packard's Laserjet laser printer.

When you first run the system, it is necessary to run a utility called Set-up. This alters the data in a special battery-backed area of RAM which contains system configuration information. Using the main Set-up option you can set the date, time, memory size and floppy disk characteristics, and tell the system which display adaptor you are using. You can also use Set-up to realign the touch screen if you have one, prepare the hard disk to be moved, and initialise the hard disk if you are using it for the first time.

Most Hewlett-Packard machines come with the applications program, PAM (Personal Applications Manager). I first saw this on the HP150 micro and subsequently on the HP110 portable, as well as this machine.



The applications program, PAM

PAM was an early attempt to create a 'friendly front end' to sit in front of MS-DOS and shield the user from the perils of the A> prompt. Recently other companies have begun offering their own front ends. Examples of these are GEM from Digital Research, Windows from Microsoft and, to a lesser extent, TopView from IBM.

The main difference between these front end systems and PAM is that they are generally graphical in their approach. GEM does a fairly good job of making IBM clones look something akin to a Macintosh, with icons, windows and the rest. The same is also true of Windows, and TopView.

PAM, on the other hand, is mainly textual. The main PAM screen can be divided up into five functional areas. At the top of the screen there is a prompt line which usually tells you what to do next. Below this is the MS-DOS A> prompt which is mainly there to reassure dyed-in-the-wool DOS users. For real MS-DOS enthusiasts, Hewlett-Packard supplies an applications program called 'DOS Commands' which leaves PAM and runs COMMAND.COM to give you the usual MS-DOS screen. When you have had enough of this, you can type 'Exit' and be returned to PAM. Under the command line are two windows: one displays the Hewlett-Packard name; the other displays the current date and time.

The main part of the PAM display takes up about half of the total screen space below the date and time window. This area shows the names of all the currently installed applications programs on disk, and is the area where you select the program you want to run. Below this there are eight function key boxes which match the duplicated function keys on the keyboard.



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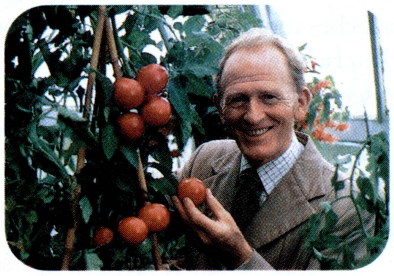
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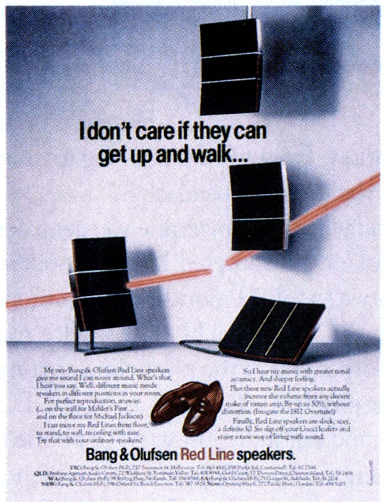
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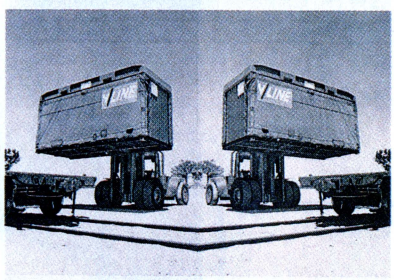
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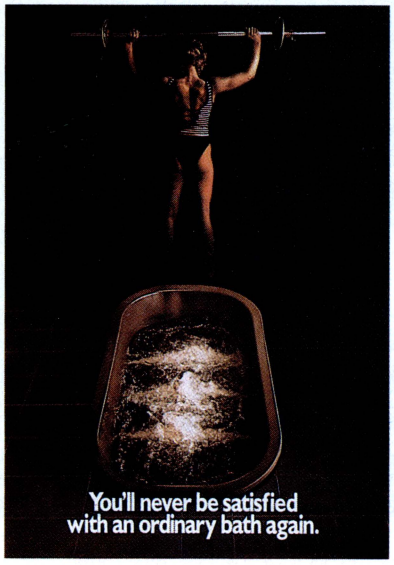
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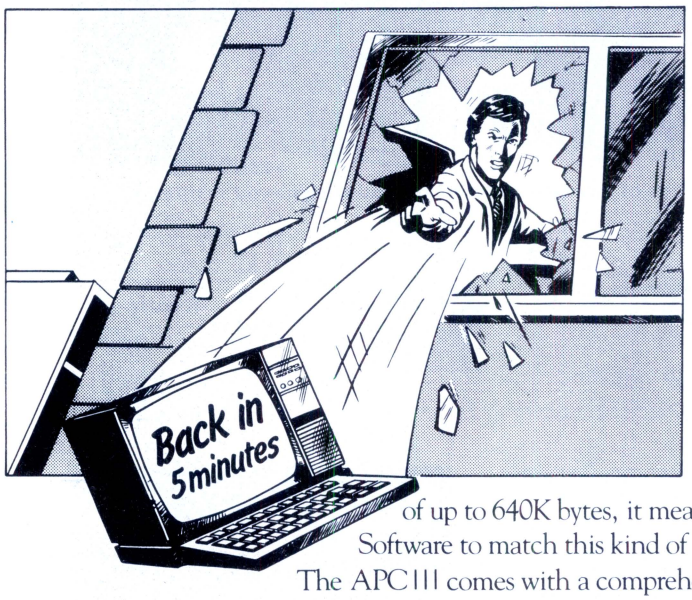
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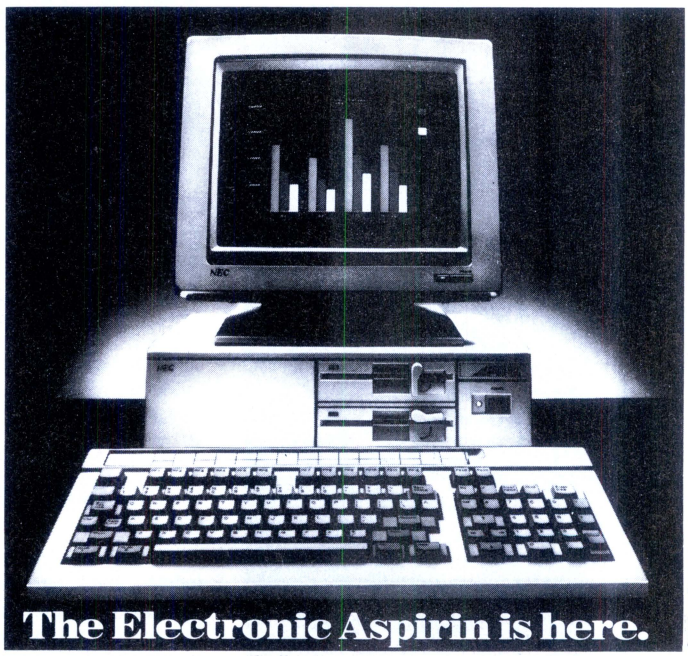
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In the main PAM screen, only five of these function keys are used. These are marked Start Applic, Set Date and Time, Manage Applics, Show .EXE.COM.BAT and Help.

The most commonly used function is Start Applic which, as its name suggests, starts the applications program selected from the list of applications in the main section of the PAM screen.

The method of selecting the applications program you want to use varies according to your Hewlett-Packard hardware. If you just have the keyboard, then you can use the cursor keys to move the cursor around and highlight the application you want to start. You then press function key 1 to run the program. If you have a Hewlett-Packard mouse, you can use this to move the cursor instead of the cursor keys.

If you have the touch screen attachment and you want to activate an applications program, point to the name of the program on the screen (say, Lotus 1-2-3) and then point to the words 'Start Applic' at the bottom of the screen. Then sit back and watch it go. When you have finished with the applications program and have exited to DOS, PAM automatically reloads with the message 'Press any key to continue'.

If you want to run a program which hasn't been installed into PAM, you have two options: either install it, or select it using the Show .EXE.COM.BAT function. This is useful for selecting a program which is used infrequently and, therefore, isn't worth installing into PAM.

Selecting Show .EXE.COM.BAT displays a list of all executable files on the screen. To run a program, you touch its name and Start Program or hit function key 1.

To install an applications program into PAM, you select the Manage Applics function. This brings up a secondary display with function key labels marked Add, Delete, Modify, Recorder and Auto Start. If you select Add, PAM displays a list of applications programs it already has the necessary details for. This list includes most of the popular applications programs such as Lotus 1-2-3, Microsoft Word, dBaselll, and so on. If your program is on the list, you select the name and press Add Applic. PAM then asks you which sub-directory the program file is stored in and adds the program to the list of installed applications.

If your program is not on the list that PAM already has details for, you press the Add Unlisted key. PAM will then ask you which sub-directory the program is stored in, what you want it to be called in the main PAM screen, and which MS-DOS command runs the program. When you have entered these details, the program is added to the list of installed applications in the normal way.

As well as having functions built in, PAM is supplied with an applications program called 'File Manager' which makes it easier for users to manipulate disk files and sub-directories. The file manager program is run from PAM just like any other application by selecting the name and then Start Applic.

When File Manager has loaded, you are presented with a partial list of the files on the current disk. You can use the PAGE UP and PAGE DOWN keys to scroll through the list of files.

Six of the function key legends at the bottom of the screen are used by File Manager. These are labelled Delete File/Dir, Make Dir, Choose Dir, Copy File, Rename File and Exit File Manager. These generally duplicate functions provided by MS-DOS but present them in a more understandable form.

For example, if you want to change to a sub-directory in MS-DOS, you would type CD/MYDIR. Using File Manager, you just point at Choose Dir which displays a highlighted list of available sub-directories. You then point at the sub-directory you want to enter, and File Manager moves you in there.

I found the PAM/File Manager combination easy to use, but less than inspiring graphically. The touch screen makes PAM even simpler to use, although I doubt if I would buy a touch screen just to run PAM.

Benchmarks

BM1	0.5
BM2	1.5
BM3	3.0
BM4	3.1
BM5	3.3
BM6	5.8
BM7	9.1
BM8	9.6
Ave	4.5

All timings in seconds. For a full listing of the Benchmark programs, see End Zone.

Technical specifications

Processor:	8MHz Intel 80286
ROM:	64k
RAM:	640k
Keyboard:	103 keys; IBM PC/AT style with Hewlett-Packard improvements
Display:	Composite monitor; IBM colour graphics, adaptor compatible
Size:	42.5cms x 39cms x 16cms
I/O:	Five PC/AT compatible slots, two PC-compatible slots and one dedicated slot
DOS:	MS-DOS version 3.1, PAM user interface

In perspective

This machine represents quite a departure for Hewlett-Packard. Until now, the company has made very nice, extremely well-engineered machines which went their own way and were probably the better for it.

The rot set in with the HP150 which had an 8088 processor and ran MS-DOS, Hewlett-Packard pulled back from the brink by giving it a touch-sensitive screen and 3½in disk drives. The HP150 was a superbly well-engineered machine as Hewlett-Packard didn't have to follow anyone's example but its own.

With the Vectra, Hewlett-Packard has finally jumped into the fray with an IBM PC/AT clone, and at the same time it can be said to have compromised some of its standards. There can be no doubt that the Vectra is an extremely well-made machine. It is designed to sell both to Hewlett-Packard's traditional markets and to the wider business audience who want the software and hardware standardisation that IBM brings, but who also want the kind of quality engineering that Hewlett-Packard has always offered.

Unlike most other PC/AT clones, the Vectra has enough distinguishing features to mark it out as superior to the competition, while at the same time it retains the compatibility with the PC/AT necessary to its acceptance in the IBM market-place. The Vectra should do very well.

Applications software

The review machine wasn't supplied with any applications software, so I tried

some IBM software that happened to be in the office. The Vectra ran Lotus 1-2-3 without any problems and even booted a copy of PC-DOS version 2.1. It also happily ran our de-kludged version of Digital Research's GEM. In fact, I have never seen GEM run as fast.

Hewlett-Packard didn't supply Basic, so for the purposes of Benchmarking I used an Olivetti M24 version of Microsoft's GW-Basic. This ran quite happily as the Benchmark timings show.

Documentation

When the Vectra goes on sale, it will be supplied with four printed manuals entitled Book 1, Book 2, Book 3 and, not surprisingly, Book 4. Book 1 covers setting up the machine and installing the various bits necessary to make it go. Book 2 tells you how to hook peripherals such as printers and the touch screen to the system. Book 3 is a general user guide, and Book 4 is an MS-DOS reference manual.

At the time of writing, the final printed manuals weren't available, so I was supplied with giant photocopied versions of the proofs. These were generally useful and indicated that the final manuals will be very good indeed.

The main thing that amused me was that in all the manuals, I couldn't find one direct reference to IBM or the PC/AT which the Vectra is based on. It's as if Hewlett-Packard is trying to pretend that it just happened to come up with a specification that matches IBM's PC/AT.

Prices

Hewlett-Packard has never been known for cheap prices, but this time, it has come in substantially below the cost of an equivalent machine from IBM — and Compaq. A machine with 256k of RAM and a 360k 5¼in floppy disk drive retails (including sales tax) for $6890; the same machine, but with a 1.2Mb floppy disk drive sells for $7320; and a 640k machine with a 1.2Mb floppy drive and 20Mb hard disk costs $11,350. An IBM PC/AT with 256k of RAM and 1.2Mb floppy disk drive currently retails for $8470 — $1150 more than HP's equivalent machine.

The touch screen attachment is expected to retail for around $500.

Conclusion

I was worried when I received the Vectra for review. It's usually very difficult to get excited about IBM PC or PC/AT clones: by their very nature there is usually little new to say about them.

But this machine is good enough to make it all worthwhile. The basic hallmark of Hewlett-Packard has always been well-made, well-engineered machines. I am glad to say that even though the company's machines have been hampered by the PC/AT design, this still holds true. Everything on the Vectra fits together very well, and neat touches abound.

A great many IBM clone makers fall into the trap of just copying the IBM design and not making their products any better than the original. I am glad that Hewlett-Packard hasn't fallen into this trap. The Vectra is better engineered than the PC/AT; it is faster, looks better, has a nicer display and a superior keyboard. If you like the idea of the touch screen, then that's a plus too, although I doubt it's worth when you are running PC/AT software.

If you are looking for an IBM PC/AT clone and money is no object, I would advise you to take a close look at the Vectra.

END

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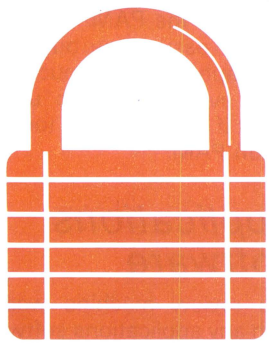
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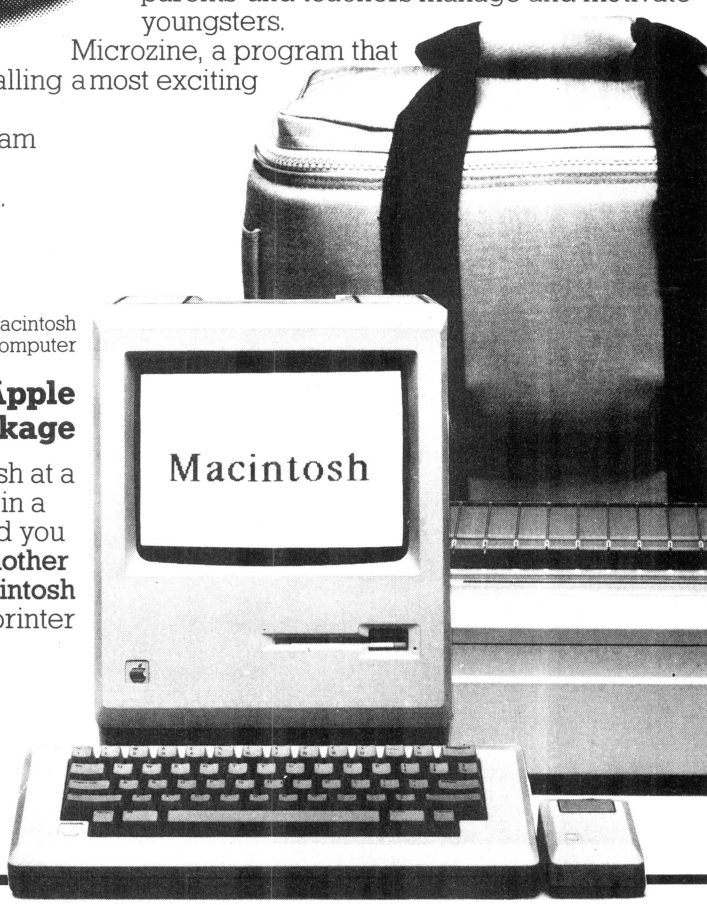
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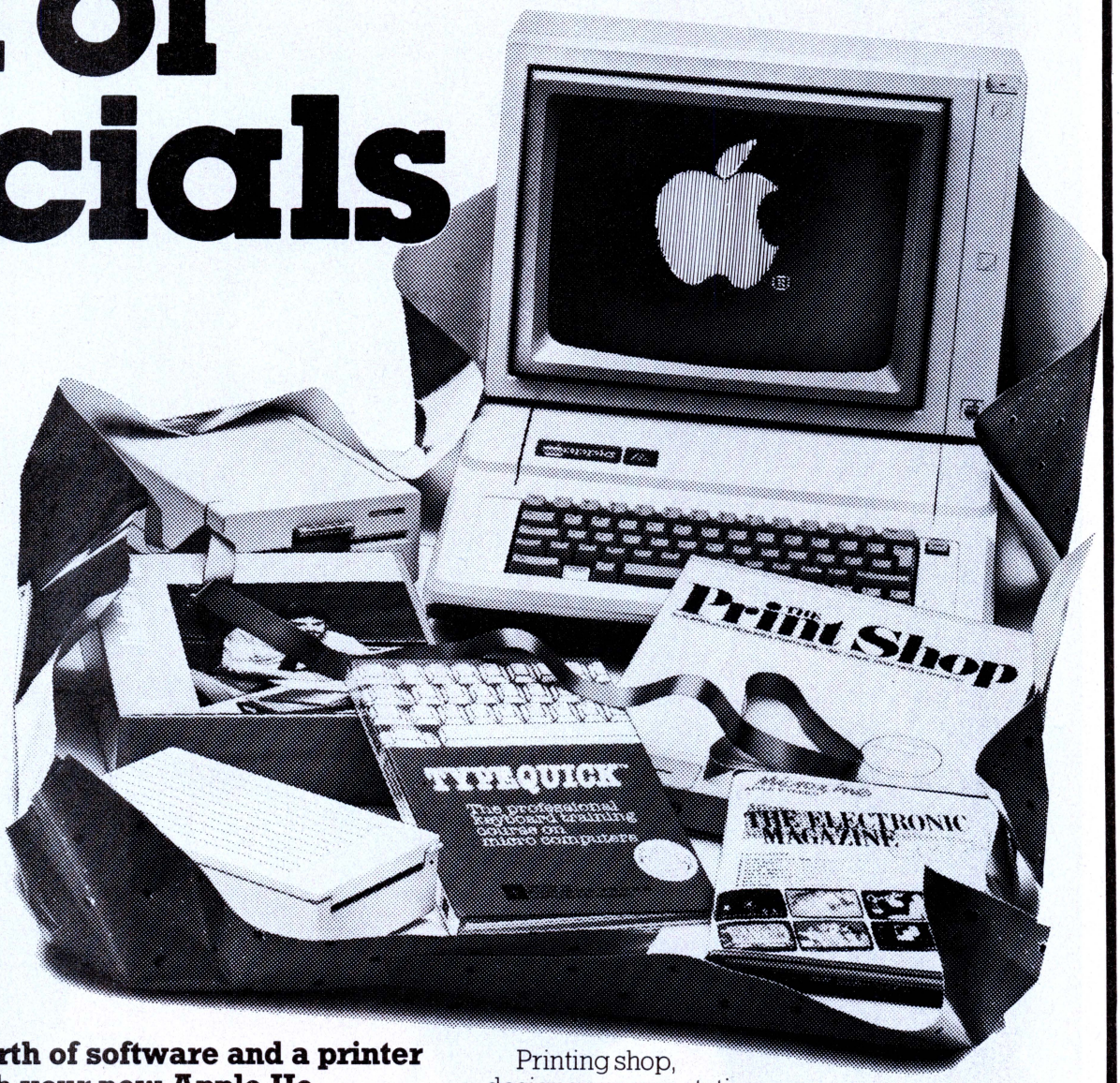


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Above board

Martin Banks examines the tricky area of copyright on CP/M-based applications software when the author of the piece no longer exists.

Several years ago, I wrote in this august journal about CP/M. Remember CP/M? The operating system that everyone says is now dead and gone: long live MS-DOS!

I wrote at the time that it probably wouldn't go away that easily, and that it would constitute a goodly slice of the operating system market for some time to come.

There were those who gently denigrated the idea, so I have watched with interest over the last few months as CP/M has 'surfaced' again as a frontline operating system. This is through the emergence of machines like the new Commodore and Amstrad systems. CP/M not only lives, it is regaining much of its importance.

The reappearance of CP/M on the front line has suddenly posed an interesting problem. That problem is the legal one of copyright.

CP/M was the leading general-purpose operating system for the first batch of 8-bit personal computers. Apple and Commodore had their own systems, and these proved good spawning grounds for a great deal of applications software. It was for CP/M, however, that the majority of applications software appeared, and the reasons for this are well charted. The system ran on a wide range of computers which gave the software authors, as long as they wrote to the CP/M standards, the chance to sell their products across that whole range of machines, rather than risking the selection of just one machine type.

Several companies, such as Ashton-Tate and Micropro, became extremely successful on the back of that popularity, but there were many other companies and individuals who also tried this market with markedly less merit. For every software company that has made a profitable business from CP/M-based sales, there are probably hundreds which have failed. The number must rise to thousands if the individuals who aspired to but failed to make company status, are included.

In general, these companies and individuals failed for the most obvious of reasons: their products were hopelessly bad. Sometimes the execution of the coding was brilliant, but it was applied to the wrong idea. Sometimes, however, the idea was good, but the product failed due to the company or individual lacking the skills required to make the produce survive in a cut-throat business. It is an unfortunate but unavoidable fact that, regardless of the excellence of an idea or product, it is management skills which eventually prescribe its success or failure.

Consequently, the world is left with a whole bunch of CP/M-oriented applications software of varying quality from authors who have long since gone out of business. This would have remained a quaint, historical observation had it not been for the re-emergence of the operating system on such new machines as the Commodore 128.

This system comes with some applications already pre-configured, and it's quite possible that the majority of purchasers will be satisfied with that supply. It is part of the nature of the system, however, that downloading applications software from one CP/M machine to another, regardless of the differences that may exist between them, is not all that difficult. It has to be considered likely, therefore, that people are going to do it.

To some extent it is encouraged, as there is already a lot of CP/M applications software in the public domain. This is freely available to anyone with an RS232 cable and a package such as BSTAM to control the data transfer.

The aspect that has struck me, and to which the legal question is applied, is not this freely available software, neither is it those users who copy the occasional application from a trusted friend.

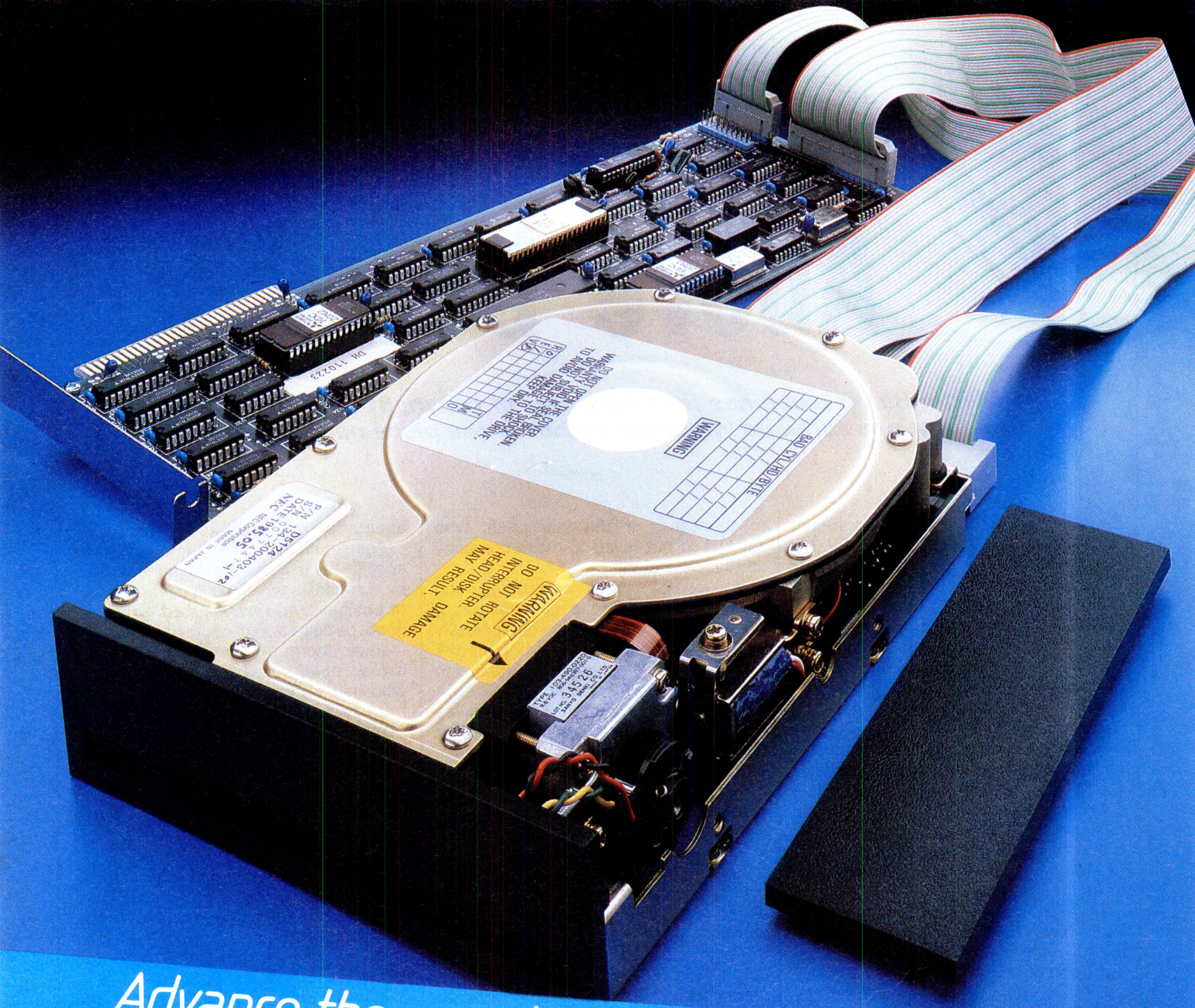
The question that interests me specifically is those applications written by companies which have now gone out of business. As I have stated, some are good packages and could find a ready market among the new breed of CP/M users. Therefore, what is to stop a dealer who has a copy of such an application from selling it? We are all aware that, should the same thing be attempted with an application written by one of the big names, the full weight of the law — and the legal profession — would immediately be down on the culprit. But what of the company which has gone out of business?

As one software retailer put it to me recently: 'Well, you just take a calculated gamble on two things: one, you hope that they don't find out; and two, that even if they do, they won't have the resources to take you to court.'

It is not my intention to accuse the software distribution and retail industry of being full of sharks and charlatans, but even they are not going to turn down the chance of a really significant margin on a sale. If they have a copy of a program that will work on one of these new CP/M machines and the authors are now defunct, there is going to be a strong temptation to try to sell a few copies, isn't there?

If the only costs to be considered are those of a new blank disk, the photocopying of the manual (if it still exists) and the time taken to do the deed, the profits can be quite high. Only a few copies need be sold to make healthy additions to the bank balance, even if the price is just a few dollars.

And royalties to the authors? Ah well, if they don't find out and can't afford to sue anyway, who's to care? And the users who have bought these products? There could be lots of new CP/M users with a legal problem, technically speaking.



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EXPANDING COMPUTER POWER



Olivetti M24SP

Peter Bright looks at the M24SP, Olivetti's upgraded PC clone which sports the new enhanced graphics card (EGC), offering a very fast graphics system.

Ever since IBM launched the PC/AT, I have been waiting for Olivetti to come up with an alternative. However, it looks as if we shall have to wait a little longer, as instead of launching an AT clone, Olivetti has introduced an upgraded version of the M24. The new machine is to be known as the Olivetti M24SP.

Visually, the M24SP is very similar to the M24. Both machines share the same casings although the front panel on the SP is plain grey rather than black, which makes the machine look taller than the standard M24. The monitors and keyboards offered on the SP are exactly the same as on the M24.

The method of getting inside the SP varies according to whether you want to get at the expansion boards or the main processor board. If you want to get at the main board, you remove the bottom panel; everything else is accessed by removing the top cover.

Like its sister the M24, the SP comes with RS232 and Centronics ports built into the main board. On the M24, if you want to plug in more than one extra IBM expansion card, you have to buy a bus converter board which allows you to attach both IBM and custom-designed Olivetti boards. On the SP, the bus converter is included in the price.

The main processor in the SP is similar to the 8086 used in the M24. The only difference is that its speed has been pushed up to 10MHz from the M24's 8MHz. This compares with the IBM PC which uses a cut-down version of the 8086 processor running at 4.7MHz.

The only omission in this area that I could find on the SP is that it is not possible to slow down the processor to IBM's speed. A minority of IBM software relies on the machine's 4.7MHz clock rate for correct timing, and becomes confused when the machine runs faster.

As you would expect of a top-end machine, the M24SP is supplied complete with 640k of RAM. This is the maximum that PC-DOS can access, and should be sufficient for all but the largest spreadsheets.

The SP also comes complete with a 20-Mbyte hard disk and one IBM-compatible floppy disk drive. Again this is in line with Olivetti's aim of providing AT-level performance in a PC package.

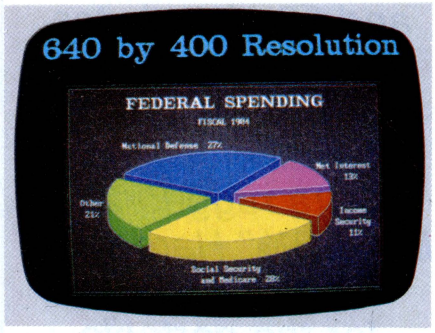


GEMPaint's house in 640×400 pixels

Like the M24, the SP can be supplied either with an IBM PC style keyboard or with one of Olivetti's own.

Of the two, the Olivetti design is better. The keys are well spaced with decent gaps separating the different functional groups. The Olivetti keyboard also has twice as many programmable function keys, which run along the top of the keyboard unit. Its main disadvantage is that it isn't IBM compatible, and therefore keyboard overlays and documentation designed for the IBM keyboard cannot be directly related to the Olivetti keyboard. However, Olivetti does supply its own function-key overlay on which you can scribble your own legends.

The IBM-style keyboard has an identical layout to that of the IBM PC. The only difference worth noting is that the NUM LOCK and CAPS LOCK keys have on/off LEDs built-in. Since the M24 was launched I've used its IBMstyle keyboard extensively, but the more I've used it the less I've liked it. The main problem has been that the contacts on the keys tend to get dirty, and after a while they stop registering the keypresses. You then have to take off the key and clean the contacts. While this is quite easy to do, it's still annoying.



Business graphics on the EGC card

Display

In keeping with its M24 roots, the SP is supplied with Olivetti's standard colour graphics adaptor.

The standard Olivetti graphics card works in two modes — IBM-compatible

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and native mode. In IBM mode the screen displays standard 640 × 200 pixel IBM graphics. In native mode, the resolution goes up to 640 × 400 pixels.

As well as the standard graphics card, Olivetti has recently launched an enhanced graphics card offering up to 16 colours in 640 × 400 pixel resolution. This will work on either the M24 or the M24SP, and I was interested to see how it performed in the SP.

One of the advantages of Olivetti's enhanced graphics card is that it works with Olivetti's standard monitors. This is not true of IBM's enhanced graphics card, which needs a new monitor as well as a new card. The main problem with Olivetti's card is that it isn't compatible with the IBM card. Olivetti, however, says that only specialised users will want the card, so they can write machine-specific software to take advantage of its features.

The enhanced graphics card (EGC) installation kit consists of a full-length expansion card, an MS-DOS driver, an enhanced version of GW-Basic and a new set of BIOS ROMs. The card will only work with ROM versions 1.21 or later, so new ROMs are included in the kit in case an upgrade is necessary. The MS-DOS driver is a filter to ROM-BIOS interrupt 10 which drives the card.

Fitting the EGC card into the M24SP is very easy: you simply plug it into a spare slot in the bus expander card next to the standard colour graphics card, and attach a ribbon cable between the standard graphics card and the EGC. If you have a standard M24 without the bus expander, the card has been designed so that you can attach it to the standard colour card without having to go out and buy a bus expander.

The enhanced graphics card is based around an NEC 6845 video controller chip. The card piggybacks onto the standard graphics card, and adds three more graphics planes to the one already on the standard card to give a total of four independent graphics planes. Each plane has its own 32k chunk of RAM on the card, with the result that the full enhanced graphics system has a total of 128k of RAM totally independent of the main system RAM. The combination of having its own graphics processor and its own RAM means that graphic displays can be produced on the enhanced graphics card with virtually no demand on the main 8086 processor. This creates a very fast graphics system.

Inherent in the design of the enhanced graphics card is the use of a look-up table (LUT) to determine the colours displayed onscreen. The video hardware supports 'dithering', which allows you to mix the basic 16 colours to produce a palette of 16,576 different colour shades. Using the LUT, it is possible to change the colour of the image onscreen very quickly without having to re-draw the image.

As the enhanced graphics card has four independent graphics planes, the programmer is allowed a large degree of flexibility of graphics resolution.

In transparent mode, most of the board sits around twiddling its thumbs and you have standard IBM PC 640 × 200 pixel colour graphics. In graphic mode, you use all four planes to display 16 colours out of a palette of 16,576 colours in full 640 × 400 pixel resolution. In overlay mode, you can mix text and the graphics bit-map by using one or two of the graphics planes for 80-column by 25-line text and the others for high-resolution graphics. By using three different modes, it is possible to produce a very impressive variety of effects.

GEM

The review M24SP was also running a pre-release version of Digital Research's GEM friendly user interface. For those of you who haven't come across GEM before, it sits on top of PC-DOS and provides a user-friendly graphical interface which looks very similar to the Apple Macintosh.

The great advantage of GEM from a programmer's point of view is that it will run on a wide range of machines, and it is easily adapted to suit the capabilities of the hardware.

The major problem with GEM is that if you want it to run in high-resolution colour, you need a lot of computing power to make it work at an acceptable speed.

With this in mind, I was very interested to see how it ran on the SP. In theory, the SP is an ideal GEM machine. It has a hard disk for fast disk access, a very fast processor for computing the shapes, and a dedicated graphics controller to make sure that the screen display is fast.

To take advantage of the extra capabilities of the enhanced graphics card, Digital Research has written a special GEM screen driver to allow GEM to use the full 16-colour 640 × 400 pixel resolution allowed by the card. If you don't have the card, technically there is no reason why you shouldn't run the IBM version of GEM on the M24. However, Digital Research has played a dastardly trick, and patched the GEM program so that it will only work on an IBM and not on any other compatible machine.

The reason for this is that the company can then obtain licencing money for GEM from each individual PC-clone

manufacturer, rather than just from IBM. This is all very well, but it does mean that if you use an IBM in the office and an Olivetti at home, you need to buy two different copies of GEM to run on what are basically two compatible machines.

If you are a programmer, you can get around the patch merely by changing one machine code command in the GEM program. This is what we have done in the *APC* office, but our lawyers advise us against making the patch public.

Even if having machine-specific versions of GEM can be a problem when buying the product, it does at least have the advantage that the Olivetti version of GEM uses the full resolution of the machine. It also allows you to use the Olivetti mouse, which is plugged into a D socket on the back of the keyboard. I found the Olivetti mouse easy enough to use but it was under-geared, which meant that I had to move the mouse a long way to get the cursor from one side of the screen to the other.

In use, I found GEM on the SP with the enhanced graphics card to be generally very good, although not quite up to my expectations. GEM is certainly fast but it still doesn't seem as fast as the version on the Atari 520ST. I was disappointed that the colour capabilities of the machine weren't put to better use in the GEM Desk-top program. Out of all the colours available only two are used for the Desk-top, and while the others are available in GEMDraw and GEMPaint, the overall effect could have been more colourful.

Having said that, you can certainly get some very impressive effects using all 16 colours in GEMDraw and GEMPaint. The review machine came with a very impressive GEMPaint picture of a house using all 16 colours.

In addition to using GEM to access the high-res card, Olivetti also supplies an enhanced version of GW-Basic so that you can make use of the card from Basic. The enhancements take the form of four new or altered GW-Basic commands. These are COLOR, SCREEN, PALLETTE and PALLETTE USING. Using these commands, you can control the extra graphics modes and all the additional colours allowed by the enhanced graphics card.

Prices

The EGC card costs $1,280 including sales tax. No prices were available for the SP at the time of going to press, but should be available by the time you read this — call Olivetti.

Conclusion

The Olivetti M24 has always been one of my favourite IBM clones, so I had high hopes for the M24SP.

The average Benchmark timing was 5.9 seconds, which shows that the M24SP is certainly fast. In fact, it is significantly faster than the IBM PC/AT even though it doesn't use the AT's 80286 processor.

I think that the main reason that people are buying IBM PC/ATs at the moment must be that they want to run IBM PC programs faster. At the time of writing IBM still hasn't come out with Xenix for the AT, and I have yet to see an applications program designed expressly for the AT, so these users aren't using the AT to its best advantage.

Given that ATs are being purchased by speed freaks, it makes sense to use a fast IBM PC style machine such as the M24SP rather than the not-particularly-PC-compatible IBM PC/AT. However, this can only be a short or medium term advantage because when dedicated IBM AT software starts to appear, the M24SP's advantage will be lost.

To a lesser extent, the same argument applies to Olivetti's enhanced graphics adaptor. It certainly is very impressive, but its main problem is that it isn't compatible with IBM's EGA card/monitor combination. This isn't a problem at the moment as very few people are prepared to buy IBM's card and monitor, and very few software companies yet support the EGA display.

However, this situation is likely to change as more software companies standardise on the EGA card. Nonetheless, Olivetti's strategy of encouraging specialist software suppliers to write specifically for the card should help its prospects. Also, the fact that Digital Research has written a GEM driver means that most GEM software should run on the card.

Overall, if you are looking for an IBM PC style machine to do heavy computational work and were previously thinking of buying an IBM PC/AT, this could be the machine for you.

END

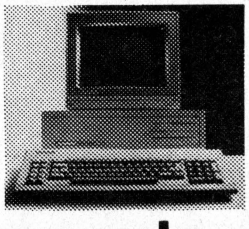
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Apricot F10

While others flounder and fall, ACT marches on with the Apricot F10, a high-end addition to the Frange started by the F1 last year. Is an F1 with a hard disk and more RAM better than the Apricot Xi? Peter Bright takes a look.

ACT is a successful company, and there aren't many volume British micro manufacturers you can still say that about. It seems to have a penchant for old embassies, white Porsches and racing yachts, as well as value-for-money business micros.

The latest additions to the increasingly wide range of ACT micros are two new re-designed versions of the F range — the F2 and the F10. The F2 comes complete with twin 720k microfloppy disks, while the F10 has an integral 10Mbyte hard disk.

Here we take a look at the F10.

Hardware

Externally, the Apricot F10's system box looks just like the Apricot F1 it is based on and quite unlike any other micro you are likely to see. Although it conforms to the standard micro three-box design, it is much smaller than comparable micros.

The main system box is very low and thin, although it is quite deep, and it is higher at the back to accommodate the power supply unit. All the units in the F range are finished in par-for-the-course cream, and all the casings are construc-



ted from moulded plastics which I found to be fragile. None are very thick and they deform easily. This is a point to watch.

Although the front of the system box is physically small, it still manages to house the single 3½in disk drive, LEDs representing power, caps lock, stop and disk access, and the infra-red receivers for the keyboard and the mouse.

At the back, the F10 comprises composite and RGB video outputs as well as an RS232 serial port and a Centronics parallel printer port. There is also a strange-looking two-pin socket marked '12 volts' which apparently is used to power ACT's monochrome monitor. Finally on the back panel there is a blanking plate for an expansion card, and at the bottom of the right-hand side is a system bus slot for add-on boxes.

Getting inside the unit is straightforward. Remove the two Phillips screws securing the back panel, which you then also remove. Next, you simply lift off the lid.

Inside, everything is extremely tightly packed. The layout is broadly the same as on the F1. The main PCB is along the bottom of the system box with everything else on top. The power supply occupies most of the available space at the back of the box, and the single disk drive takes most of the space at the front. In between, ACT has somehow managed to squeeze a 3½in 10Mbyte Rodime hard disk. It is such a tight squeeze that the only way to make it fit was to put it sideways across the middle of the box.

The upshot of all this squeezing is that you can hardly see the main PCB for all the add-on bits and pieces. The only thing which I thought was missing was the metal strengthening shield which usually supports the weight of the monitor on the lid of the system box. Without it, the lid bowed quite alarmingly under the weight of the colour monitor which made the monitor rock about alarmingly if the table was rocked.

The main PCB has been extensively rehashed over the original F1, which *APC* Benchtested last November. The main processor is the same 4.7MHz Intel 8086 as used in the F1, but the system RAM has been increased from 256k in the F1 to 512k in the F10. This is achieved by the simple expedient of substituting 245kbit RAM chips for the 64kbit units in the F1.

The other major change made to the PCB on the F10 is the addition of an extra expansion slot. This is necessary due to one of the expansion slots on the F10's motherboard being taken up by a very compact hard disk controller card. The extra slot means that you can still plug in your modem card or Point 32 network card.

As the main PCB is obscured by all the bits and pieces above it, actually removing the unit is now harder than on the F1.

While in theory it still slides out, you now need to remove the hard disk controller card and seven cables, one of which you can't extract without removing the hard disk itself.

One thing which did annoy me during the test is that the noise levels of the F10 are significantly higher than the F1. Part of this is due to the hard disk, but the main reason is the fan which seems much louder than I remember on the Apricot F1.

As already mentioned, Barson Computers, the Australian distributor, has launched not one but two additions to the Apricot F range. As well as the F10 on test here, it has also released the F2. This is basically an F1 with twin half-height 720k 3½in disk drives on top of each other at the front of the machine.

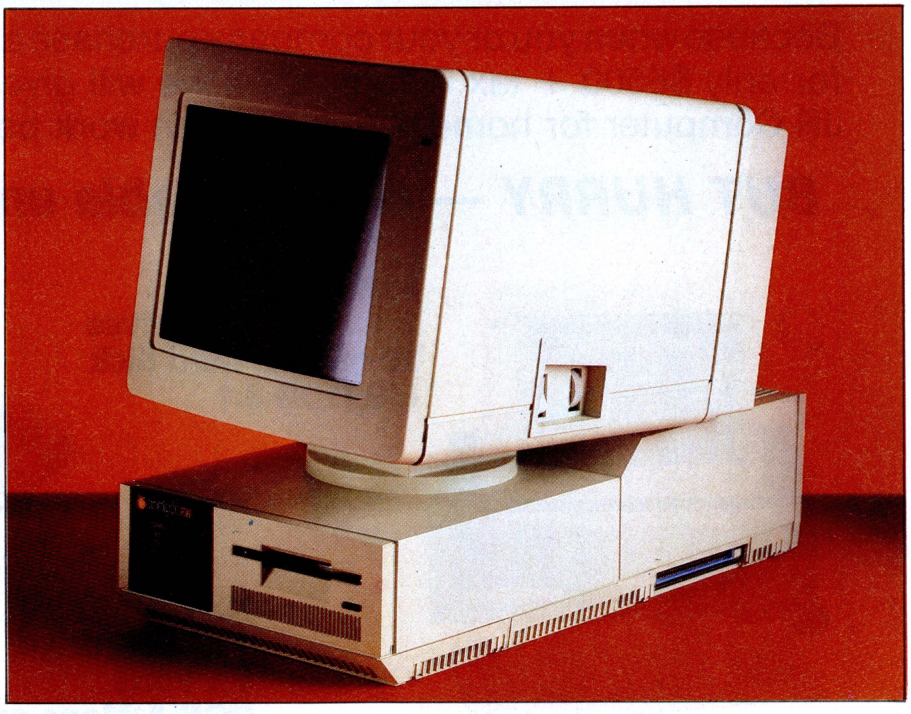
I chose the F10 over the new twin-floppy F2 for this Benchtest primarily because I was concerned about how well a hard disk would perform in this machine. The basic F1 circuitry does not contain a DMA controller, and I was interested to see if hard disk access times would suffer as a result. In order to find out, I ran a series of disk speed tests and was surprised to find that hard disk access on the F10 is actually faster than on the Apricot Xi or the IBM PC/XT. In fact, its disk access times are the fastest I have figures for.

As far as the display is concerned, the story is much the same as the Apricot F1 (that is, 640 × 200 pixels in four colours). You can either plug in ACT's RGB colour monitor or a cheap composite monochrome monitor.

The review machine was supplied with one of the colour units. These units really are very nice. Considering they are colour monitors they are very compact, and are quite in proportion with the rest of the system. The power and brightness controls are on the right-hand side of the monitor box. The only minor problem is that the monitor needs its own 240-volt power supply, so you will need two plugs to get the colour system going.

The screen is a Sony Trinitron unit. I have always liked these units in televisions, and the results in the monitor were also generally good, although in black and white mode the lettering on the screen is slightly fuzzy. The tube is anti-glare coated — I even used it sitting in the sun in my garden.

The F10 keyboard uses the same infra-red system as the F1. Instead of being connected to the main unit by a wire, the F10 uses an infra-red light beam to transmit the keyboard data to the main unit. The data is encoded in



There is no metal shield between the monitor and the system box

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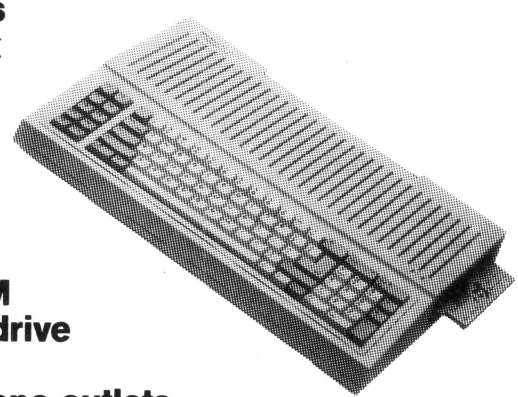
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such a way that there is little likelihood of it being corrupted — it will either get there or it won't.

The main advantage of this approach is that you don't become tangled up with a keyboard cable; the main problem is that the only useful place for the keyboard is on the desk next to the main unit. If you try to use it on your lap, the light beam will probably be broken by the edge of the table and the keyboard won't work. To avoid this, Barson supplies fibre optic cable which you can use to connect the keyboard and the main unit.

As well as containing the keys, the keyboard also holds a battery-operated clock. Each time you boot up the system, you are asked to press the DATE/TIME key. This transmits the date and the time from the keyboard to the system unit to update the date and time held by DOS.

The keyboard unit is rather small, and although it is quite wide it isn't too deep. The front of the casing has a kind of abbreviated palm rest, and the back houses two buttons which make two legs spring down with alarming ferocity to alter the typing angle of the unit. Underneath is a hatch which covers the battery compartment holding four penlight batteries for the clock and the infra-red unit.

When I Benchtested the original Apricot F1, I wasn't at all happy with the keyboard. It uses a membrane rather than individual key switches, and I didn't like its feel. The problem was exacerbated by the keys themselves, which reminded me of Scrabble tiles rather than computer keys.

I am glad to say that ACT has now gone some way to rectifying the problem. Although it is still a membrane keyboard, the keys have been redesigned so that it now looks and feels much more like a traditional keyboard.

The keys are laid out in the same order as the F1; the main qwerty typing area takes up most of the left-hand side of the unit. To its right are the editing keys, then the numeric keypad, and then the 10 function keys arranged in two vertical banks of five.

This makes a total of 92 keys — it is hard to see how a single extra key could have been fitted in the available space. This is the most crowded keyboard I have ever seen. It's a bit like the IBM keyboard: no room for a space between the functional areas — just cram them in together.

In addition to the normal typing keys, there are four extra buttons which run along the top of the keyboard casing above the typing keys. From left to right these are marked RESET, REPEAT RATE, SET TIME and KEYBOARD LOCK.

Not surprisingly, the RESET button soft-resets the machine. The REPEAT RATE key varies the speed at which the keys auto-repeat. The SET TIME button allows you to reset the clock using a display on the 25th line of the display, and the KEYBOARD LOCK button disables the keyboard.

In common with the rest of the Apricot range, the function keys double as a calculator. If you press the calc button (SHIFT F4), you can do calculations on the 25th line of the screen using the numeric keypad. You can then send the result to the cursor position by using the send button (F5).

All in all, the F10 keyboard is a vast improvement over the F1 unit. The keys feel and sound nicer, the only trouble being that you can hear the springs inside the keys as you hit them. The only disappointment is that this unit is just being supplied with the F2 and the F10: the F1 has to make do with the old keyboard. I can't see any logical reason why this should be.

As well as the keyboard, the Apricot F10 also has a mouse included in the price. When I Benchtested the F1, I wasn't very happy with the mouse either. At the time, it had the excuse of being a pre-production unit so no firm conclusions could be reached. This time the F10 was supplied with a production mouse, and I was hoping it would be better. It wasn't.

The first problem with the ACT mouse is that it is designed either to be rolled around the desk like a normal mouse, or held in one hand while the other hand moves the trackball. If you try to use it like a normal mouse, the light pipe is a must as the angle of the light beam is wrong (the ACT mouse uses the same infra-red system as the keyboard). If you use it as a trackball in your hand, you will probably still need the light pipe because your hand isn't aligned with the light beam.

As if this isn't enough, I had terrible trouble controlling the cursor with the mouse. Sometimes I could move the trackball, but the cursor wouldn't move.

This has happened on every ACT mouse I have tried — I can only conclude that the rollers inside the unit slip on the main ball and so don't register the movement.

Generally, if I want to use a mouse with an ACT machine, I plug a Microsoft mouse into the serial port. I had to put up with it on this occasion because someone has stolen my Microsoft mouse.

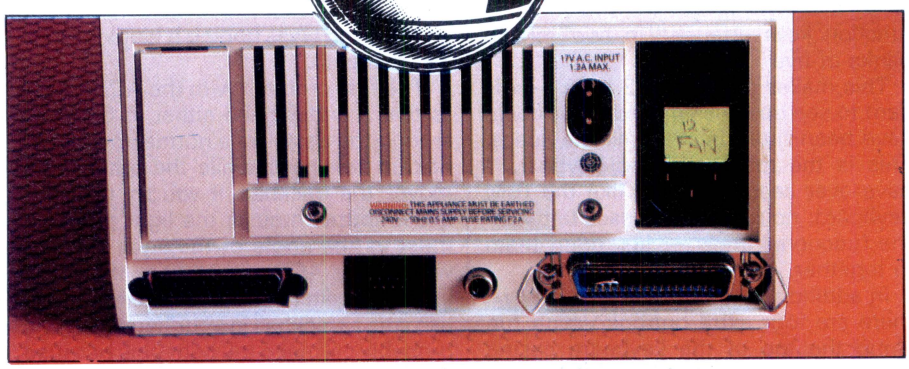
System software

Like the other Apricots, the F10 runs MS-DOS version 2.11 as standard. The main irrelation concerns the different versions of the BIOS which different machines run. Here, ACT seems to be in something of a mess.

Not long ago, I tried to install Lotus Symphony on an Apricot Xi. It transpired that although the version of the operating system was OK, I had the wrong version of the BIOS. The only way out was to format the hard disk and install the new BIOS.

This is an example of a problem with a product which was specifically designed for the Apricot Xi; things can get really hairy when you try to work out which software will work on which machine. As





The back features a two-pin monochrome monitor socket

far as the BIOS is concerned, ACT says it is working on a generic BIOS for the entire range.

Another point which is causing extreme confusion is the choice of friendly front ends for its machine. Here's the story . . .

Long, long ago when the Apricot PC was first launched, ACT decided that it would be a nice idea if it had a friendly front end to the operating system to make it easier to use. The company invented a system called The Manager which was quite basic and purely textual, and used a system of 'ladders' to allow you to select an option and carry it out. The Manager worked in its own limited fashion, although most people just deleted it.

ACT then decided that what it really needed was a graphics-based friendly system with colour, pictures, mice and icons, so it sank an awful lot of time, effort and money into producing a package called Activity. This was launched with the Apricot F1 and was bundled with the F1 and the Portable, although not with the Apricot PC. Activity was a good package. It worked within the limitations of the F1 and the Portable, and provided a nice, friendly, colourful environment in which to work. Then Digital Research released GEM . . .

GEM is designed to make a wide range of machines, from Ataris to IBM PCs to Apricots, look and behave like the Apple Macintosh. I can see why a few people at ACT were more than a little upset with GEM. ACT had just put a great deal of effort into creating a friendly interface, just to have one of its systems software suppliers release an even friendlier interface. But in spite of this, ACT included GEM with some of its machines. Then Microsoft released Windows . . .

Windows has been around, in theory, for so long now that most people can't remember when it started. Now, finally, Microsoft has released a positively-the-last-version of Windows. Windows isn't as friendly as GEM, but is more useful in that it allows multi-tasking on standard MS-DOS systems. Well, ACT just had to have that . . .

The outcome of all this is that the review F10 was supplied with Digital Research's GEM. GEM stands for 'Graphics Environment Manager.' It sits between the nasty, unfriendly operating system and the user, and provides what is hopefully a nice, friendly, easy-to-understand user interface. One of the great advantages of GEM is that it runs on a wide range of micros. To date, I've seen it on IBM PCs and compatibles, an Atari 520ST, various Apricots and a Philips.

When you first boot the Apricot F10, it boots the operating system, loads all the bits and pieces needed by GEM, then loads GEM itself. GEM on the F10 looks very much like GEM on any other system. The first thing loaded is the GEM desk-top, which has a pull-down menu bar running along the top with commands headed DESK, FILE, VIEW and OPTIONS.

Down the right-hand side of the screen are three icons, marked Hard Disk, Floppy Disk and Trash. Most of the remainder of the screen is occupied by a large window which displays the contents of the current directory. Files are represented by icons according to their type. If a program has been installed in GEM, a picture is displayed in the icon to represent the type of program it is.

Windows in GEM can be moved and sized in exactly the same way as on the Macintosh. You can use the mouse to drag windows around, size them and scroll information inside them.

The main difference between GEM on the Apricot F10 and, say, the IBM PC is that GEM runs in colour on the F10. Four colours are used — blue, yellow, red and black. The overall effect is very pretty, but I'm not sure about some of the colour combinations when an application is opened, for example.

My main criticism of GEM on the F10 is that the F10 doesn't have quite enough raw power to run GEM properly. Graphics user interfaces such as GEM take a lot of calculation speed to produce a display that can size and update graphics windows fast enough not to be noticeable.

It is not without reason that the Apple Macintosh uses an 8MHz Motorola 68000 processor just to drive a monochrome screen. The Apricot F10 only has a 4.7MHz Intel 8086 to look after a full-colour screen, so GEM on the F10 can be very slow when it has to resize or update multiple windows.

This was especially noticeable when comparing the speeds of GEM on a Compaq Portable with a monochrome screen, and an Apricot. Both machines have similar processors working at similar speeds, but the GEM display on the Compaq was much faster simply because it didn't have to update all the colour graphics planes.

In terms of usability, ACT would have been better off retaining Activity for the whole F range — at least that worked fast. This of course ignores the other advantage of GEM, which is that friendly applications programs can be written for the GEM environment.

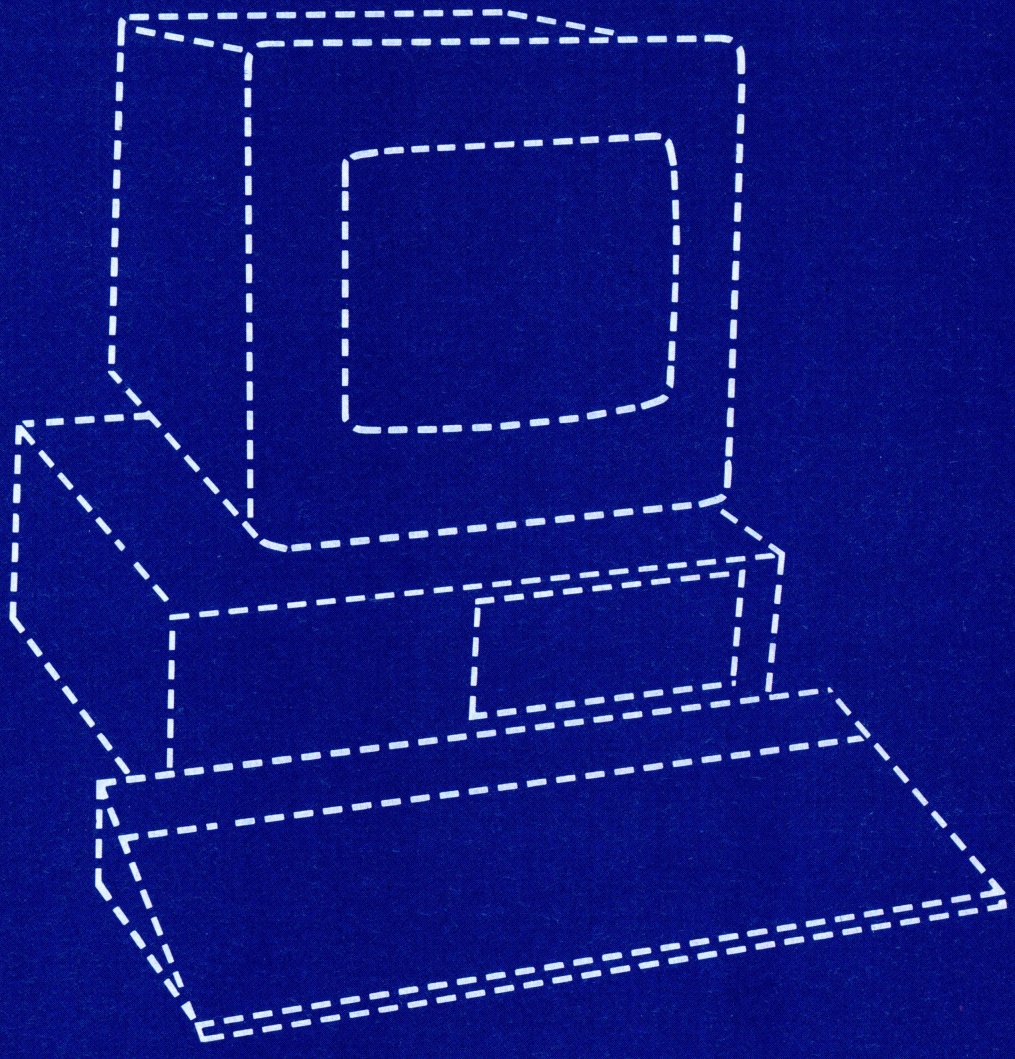
Applications software

Apart from having GEM bundled with it, the F10 also includes two applications programs specifically designed to run in the GEM environment: these are GEM Draw and GEM Write. The review machine was supplied with pre-production versions of both, as well as an early version of GEM Paint.

GEM Write is in fact a GEM-ised version of Lifetree's popular Volkswriter Deluxe word processor, and it looks very nice indeed. All the commands are contained in a pull-down menu which run along the top of the screen. The document is displayed in a window which can be sized, moved or scrolled at will, using the mouse. Different text styles can be displayed onscreen, although the pre-production review version didn't allow different fonts or point sizes.

One interesting feature of GEM Write is that you can include GEM Draw pictures in the document. This is done by specifying the filename of the drawing at the point in the document where it is to be placed; the drawing is then displayed onscreen in the text. The only drawback is that when you scroll through the text, it can take some time to re-draw the picture. Consequently, GEM Write contains an option to turn off the graphics, in which case only the filename is displayed.

Volkswriter Deluxe is a well-liked word processor for the IBM PC, and in its GEM



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guise looks to be a very good word processor indeed — definitely better than what is usually bundled with a machine.

GEM Draw was written by Digital Research and is usually included as part of the GEM package. In this guise, it can take advantage of the four colours available on the F10. I must admit that I've always found GEM Draw rather difficult to use. It is more like MacDraw than MacPaint, and stores its pictures as a series of drawing commands rather than a bit image, which makes it better for design work than free-hand drawing.

Having said that, the colour implementation on the Apricot is very nice. The window outline is in blue, with the main drawing areas in black and the grid lines in yellow. Very pretty.

GEM Paint is more like MacPaint, and is much better for doodling and freehand drawings. GEM Paint won't be bundled with the F10, you'll have to go out and buy it.

One of the good things about the Activity package is that you can play with system fonts and keyboards via the utilities included in the package. ACT is currently rewriting these utilities to work in the GEM environment, but unfortunately they weren't ready in time for this review.

With GEM, you aren't restricted to applications programs specially written for the environment. Any program that will run on the basic system will run under GEM, so what software will run on the F10 with or without GEM? As is common with Apricot these days, the answer isn't simple. Theoretically all the Apricots, whether PCs, Fs or Portables are compatible, but this is only true to a certain extent.

'Well-behaved' programs which use operating systems calls properly should run across the range: I tried a generic copy of SuperCalc and it ran quite happily. However, some programs (usually the popular ones) aren't well-behaved. Instead of using MS-DOS calls, they access the hardware directly, and this is where problems occur. The only real way to check if an Apricot program will run on the F10 is to reference the software price list, then try the program.

Some popular programs have device drivers which can be slotted into the main program to make it work with different screen configurations, and so on. Certain popular Apricot programs do this, so making them run on the F10 should simply be a question of altering the drivers to suit the F10's colour screen and keyboard. But here we run into a marketing problem.

ACT already has programs such as Lotus 1-2-3 and Open Access running on the F10. I tried running my Apricot Xi version of Lotus Symphony. Not surprisingly, it didn't run because I didn't have an F10 colour screen driver.

When I asked if it was intended to produce an F10 version of Symphony, it said no. The reason is not technical — in order to run, Symphony needs 512k of RAM and a hard disk, both of which the F10 has. The reason is one of market differentiation. Symphony currently runs on the high-end Apricot Xi models, which cost more. ACT is trying to position the 512k and 1 Mbyte Apricot Xis as

Disk Benchmarks

	Apricot F10	Apricot Xi	IBM PC/XT
0) Program load	1	16	19
1) Sequential write	6	6	5
2) Sequential read	8	7	19
3) Random write	13	11	15
4) Random read	9	7	3
5) Sequential multi-open and write	16	26	22
6) Sequential multi-open and read	2	1	8
7) Random multi-open and write	8	27	27
8) Random multi-open and read	3	2	8
9) Random read in random file	3	4	3
10) Random write in random file	6	9	3
11) Random front-end swap	47	50	76
12) Close up holed file	20	20	31
13) Multi-kill	6	6	15
Total	148	192	254

Technical specifications

Processor:	4.7MHz Intel 8086
ROM:	32k
RAM:	512k
Keyboard:	92-key membrane
Display:	Composite and RGB, 640 x 200 pixels, four colours
Size:	42cms x 22cms x 21cms
I/O:	RS232, Centronics, one expansion slot
O/S;	MS-DOS version 2.11, GEM
Bundled software:	GEM Write, GEM Draw, GW-Basic, IBM emulator

In Perspective

Trying to work out what ACT is up to these days is becoming increasingly difficult. In software terms, the only thing the machines in ACT's range have in common at the moment is the operating system, and that is open to question. Applications software is not completely compatible across the range, and the choice of at least three friendly front ends requires some thought.

Popular IBM wisdom (although not always practice) has it that the one thing you do is try to keep software and hardware compatible across the range. ACT seems to be going for a policy of market differentiation for its machines, which has little technical basis and sometimes occurs at the cost of software compatibility.

Therefore, the F1 and F1e are meant to be seen as the entry-level units, the F2 and F10 as the mainstay units, the Xi machines at the top, and the twin-floppy Apricot PC out in the cold. The idea is to achieve upward software compatibility through the range, but this can't happen at anything other than the generic level while GEM is in volume and Windows is at the top.

Benchmarks

BM1	1.8
BM2	5.7
BM3	11.8
BM4	12.3
BM5	13.7
BM6	25.4
BM7	39.5
BM8	38.3
Average	18.56

All timings in seconds. For a full listing of the Benchmark programs, see 'End Zone'.

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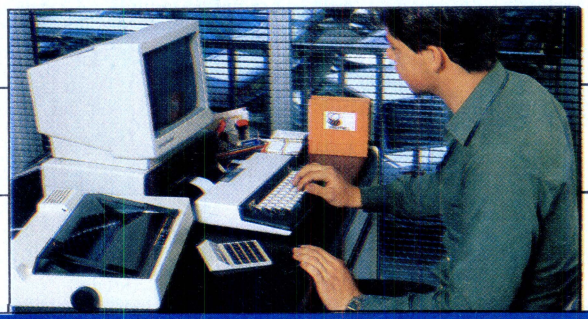
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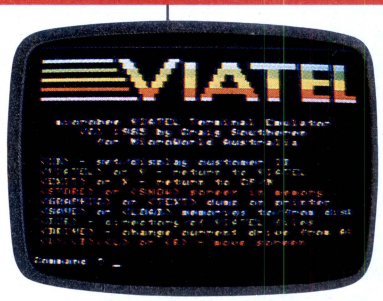
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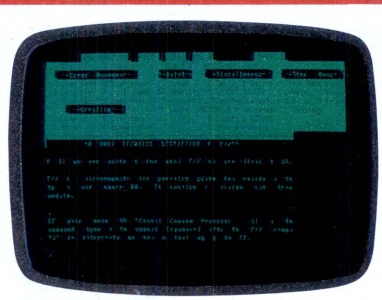
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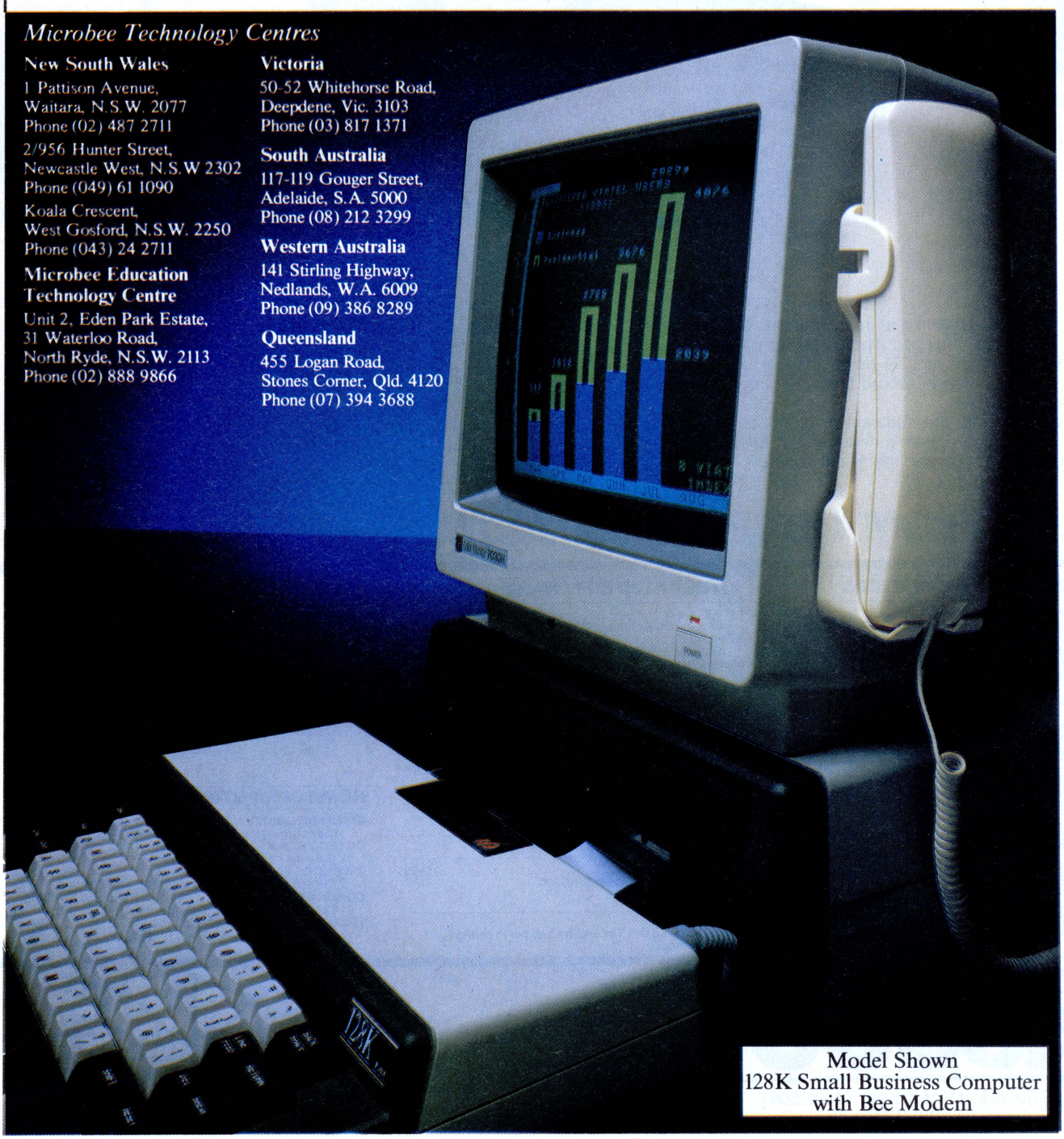
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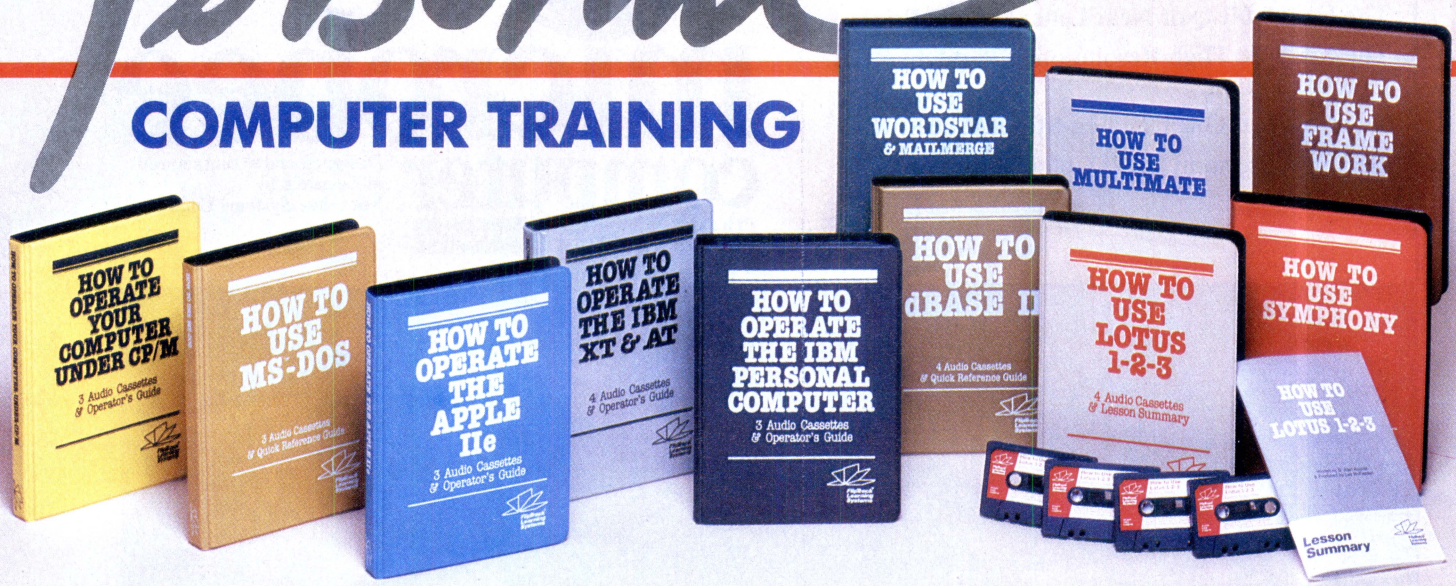
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high-performance machines, and the F10 as a cheaper high-memory machine. Symphony and Windows are seen as high-performance products which will only be sold on the high-performance machines.

In reality, there is no difference in processing power between the Xi and the F10, and as I stated earlier, the F10 probably has higher disk access performance than the Xis. ACT is adopting a standard marketing ploy — we all know there is no difference between Kellog's corn flakes and the supermarket's own brand, yet we continue to pay the extra.

Documentation

As is so often the case with Benchtests, we had the machine before the documentation was ready so none was supplied. I'm sure it will be up to the company's usual high standard.

Prices

The Apricot F10 will sell for just under $6,000 including sales tax (at press time a final price had not been established). This includes one 720k microfloppy, a 10Mbyte hard disk, 512k of RAM, a keyboard, a mouse, GEM, GEM Write and GEM Draw, but not the monitor.

The mono monitor is expected to sell for $500 and the colour unit for $700.

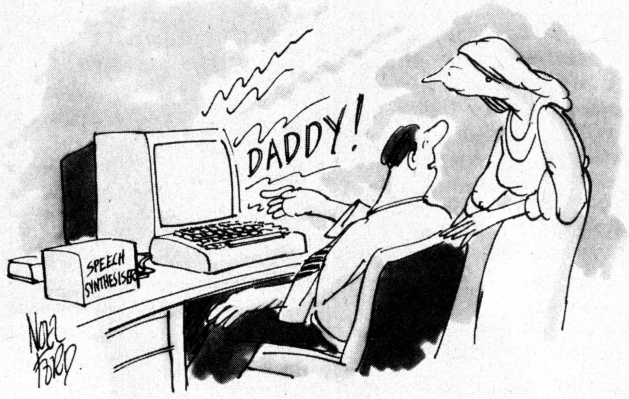
Conclusion

The Apricot F10 is a better machine than it looks. It does everything the old Apricot Xi10 does and more, and yet the sleek black Xi10 still looks much more purposeful than the F10 could ever hope to. This may seem a trifling point, but it's a fact.

In hardware terms the F10 certainly wins — it has the same hard disk, the same 512k of RAM, the advantage of a friendly full-colour display, and it's cheaper. The keyboard is a vast improvement over the unit on the F1.

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Apple Hard Disk 20

Apple's Mac has been under attack for its lack of expansion potential, but, finally, the company has come up with an answer in the shape of the Hard Disk 20. Peter Bright checks it out.

One of the criticisms most commonly levelled against the Apple Mac is its lack of high-speed, high-capacity disk storage. The Mac comes with just one 400k floppy disk drive, and to make the machine usable an optional external floppy drive is needed. Even with the twin drives, the Mac soon runs out of storage space if you are using complex applications such as Jazz and Helix.

The obvious answer to the lack of disk space is to add a hard disk, but Apple has been extremely slow to offer one. Third-party hardware companies have been quick to plug the gap with a wide variety of different hard disk configurations. Now, finally, Apple has launched its own 20Mbyte hard disk to be known as the Hard Disk 20.

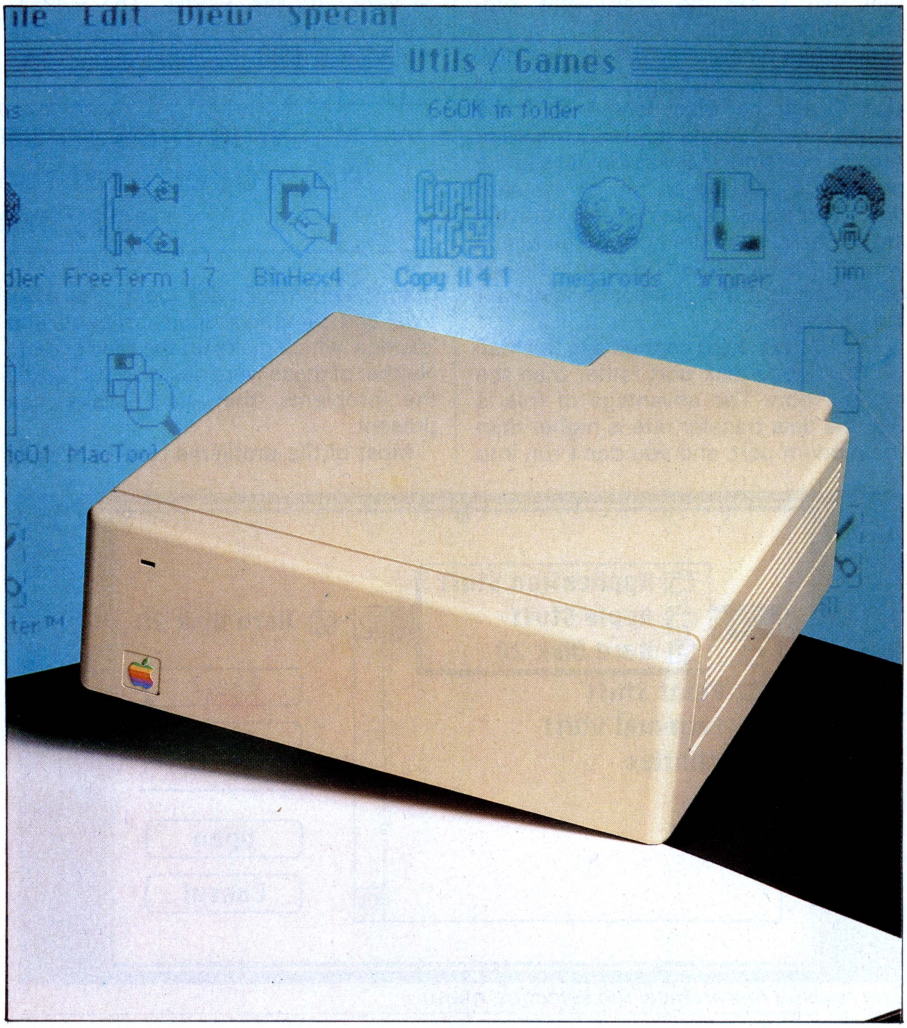
Hardware

One of the main problems of adding hardware to the Mac is that it is a 'closed architecture' machine. Most popular business micros, such as the IBM PC and the old Apple II, are supplied with expansion slots which allow you to plug extra electronics into the main PCB.

The advantage of this approach is that it makes it very easy to add hard disks, graphics cards, modems and the like to the basic system. The disadvantage is that in order to fit the cards, the user needs to have some degree of skill or send the machine back to his dealer.

The philosophy of the Mac is that it should be used by naive users. It was reasoned that since users never take the back off their televisions, it shouldn't be necessary to open the Mac. Therefore, not only does the Mac not have any expansion slots, but removing the back cover actually invalidates the warranty.

The lack of expansion potential has meant that different hard disk manufacturers have adopted different ways of adding their products to the Mac. The vast majority of external hard disks either plug into the printer port or the modem port on the back of the machine; the main disadvantage of this approach being that the data transfer rate, although fast, is not up to usual hard disk speeds. Besides taking up one of the scarce ports, an external hard disk adds an extra box to the Mac which you have



to put somewhere. Some live under the Mac, some by its side, and some at a distance from the machine.

Only the HyperDrive is actually designed to be contained within the Mac's casing. This is mounted on the main chassis inside the Mac, and is also unique in that instead of connecting to an external port, the HyperDrive has its own controller PCB which clips directly onto the back of the Mac's main Motorola 68000 processor. This gives it direct access to the processor and overcomes the data transfer speed problems of external hard disks.

There have been persistent rumours that Apple will market the HyperDrive as its own product, but for the moment at least the company has decided to go with a more conservative external hard disk in the shape of the Hard Disk 20.

The Hard Disk 20 comes in a three-inch-high box which is designed to sit underneath the Mac. The US-built review unit was pre-production, as witnessed by the fact that the disk access LED on the front panel didn't work and the Apple badge had fallen off; the casing plastics didn't match those on the Mac, so I assume they were pre-production as well.

Although mounting the hard disk underneath the Mac may look neat, it also raises the Mac screen by three inches which I found hard to work with. Also, to my mind, the Mac looked slightly precarious perched on top of the hard disk. I was much happier with the unit living on the desk to the right of the Mac. I would have been even happier to have it on the left, but the connection lead isn't long enough.

The Hard Disk 20 connects to the Mac via the floppy disk port rather than the modem port. The advantage of this is that the data transfer rate is higher than the modem port, and you don't run into trouble with programs such as MacTerminal which look for the modem port when they start up.

An additional advantage of the Hard Disk 20 is that a floppy disk port extension is provided, so that you can daisy-chain an external floppy disk drive or another Hard Disk 20 onto the back of the unit.

As well as containing a 20Mbyte 3.5in hard disk, the Hard Disk 20 box also contains a power supply unit, a fan, and controller circuitry. The combined noise of the fan and the hard disk can be intrusive in quiet offices, but is no worse than other systems I've used. The main hassle is having to plug in and switch on the Hard Disk 20 separately from the Mac.

System software

As if having to cope with the problems of physically attaching a hard disk to the Mac weren't enough, hard disk suppliers also have to face the problems posed by the design of the Macintosh system software.

The system software functions on the Mac are provided by two programs: the 'System' and the 'Finder'. The System contains operating system resources which are used by applications programs, and the Finder looks after disk files and windows, icons, menus and 'dialogs' which make up the Mac screen. Neither of these were designed to handle the problems that hard disks can present.

Most of the problems revolve around the fact that you can store a lot of files on a hard disk. The original Mac Finder was designed for floppy disks, which meant that there was an inbuilt low physical limit to the number of files that could be stored on a disk. Early versions of the Finder (1.1 and 1.1g) couldn't handle more than 128 files on one disk, and got very slow when the limit was approached. The latest version (4.1) of the Finder isn't limited to 128 files per disk and is faster at handling large numbers of files, but it still isn't ideal for hard disk use.

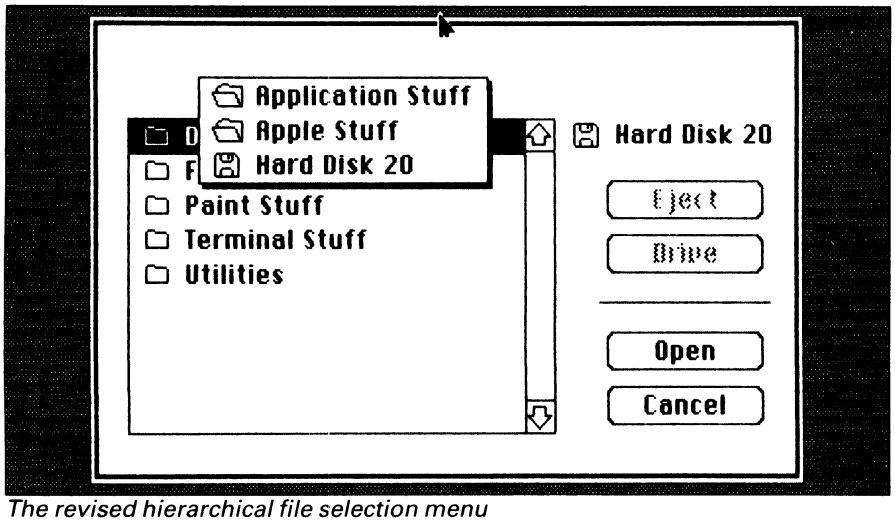
The main problem is that every time you want to load a file into an applications program using the 'Open...' command and every time you 'Quit' from a program, the Finder looks for details about every single file on the disk before proceeding. This is OK when you are using a floppy disk with only a few files on it, but with a hard disk you can have thousands of files so you might end up waiting a very long time for the Finder to do its thing.

Without exception, third-party hard disk suppliers have attempted to get around this problem by using disk 'volumes'. Instead of presenting the hard disk to the operating system as one large disk, it is presented as a number of smaller logical disks. In effect, the Finder is tricked into thinking that it is looking at a number of different small disks instead of one large one. Because each of these different volumes is treated separately by the Finder, it will only look for files on the selected volume rather than over the whole disk. This means that the Finder has to look at fewer files and therefore works faster.

'... it is nice to see Apple doing the job properly rather than opting for the easy way out...'

The main problem is that only a few volumes can be active at any one time so you have to 'mount' and 'dismount' volumes according to what you want to do. This means you have to exercise some care in grouping files together to ensure that when you mount a volume, all the required files are present. This tends to go against the general idea that the Mac should be easy to use.

Another problem with some third party hard disk systems is that you have to arbitrarily set the size of a volume in advance and you can't easily change its size. If, for example, you had two 800k volumes, one of which was nearly empty and one of which was full, it wouldn't be possible to give some of the spare space



The revised hierarchical file selection menu

to the full volume. This criticism doesn't apply to all third-party hard disk systems; the HyperDrive, for example, has a dynamic disk space allocation system which means that volumes can grow as they fill up.

Even the best hard disk partitioning system still isn't the best way to handle hard disks on the Mac. What is really needed is a hierarchical filing system.

Most popular business micro operating systems such as PC-DOS, MS-DOS and Unix use hierarchical systems. These allow you to have different disk directories which represent different groups of files but which link together to cover the whole disk. The directories are usually linked together in an inverted tree structure. In this way, the master 'Root' directory is at the top with sub-directories, which in turn have sub-directories of their own. You can easily move from one directory to another and examine different groups of files, breaking all the files on the disk into manageable chunks while retaining the ability to move from group to group at will.

The Mac Finder looks as if it has a hierarchical filing system. When you open a disk window you can create 'Folders' and move groups of files into these folders and sub-folders. However, this system of folders has only been an illusion to avoid the screen getting cluttered with file icons. In reality, all the file information is stored in one directory. Until now...

Instead of following third-party manufacturers with a hard disk partitioning system, Apple has re-designed the System and Finder so that the Mac now has a hierarchical filing system.

The Hard Disk 20 is supplied with new versions of the System, Finder and a special Hard Disk 20 driver. When you initially switch on the Mac, you have to insert a start-up disk in the internal disk drive. This boots the hard disk and then ejects. When the system is booting up, the usual 'Welcome to Macintosh' screen also displays a hard disk boot-up message. The review hard disk was supplied with very early pre-production software which displayed its version number as '0.26'. As most release versions start at '1.0', it's obvious that the software has some considerable way to go.

The review hard disk was also supplied with a pre-production updated version of the new hierarchical Finder (version 4.49). This looks just like Finder 4.1 except that it now supports miniature file icons so that you can display more files on one screen.

Using the new system, the Finder will only look at files in the currently open folder. This means that you could have 2500 files on the disk and three in the open folder, and the Finder would only look at the three in the open folder.

If you are in the Finder desk-top you move around the folders in just the same way as you do on the old Finder — just keep double-clicking folder icons until you get to the required place. The only difference is that opening folders under the old Finder was instantaneous because it already knew all about the files contained in the folders. Under the new Finder, there can be a delay while it goes off and looks for the relevant information about the folder to be opened.

Opening a file or changing a folder from within an application program is a good example of the benefits of the Apple's design philosophy, using 'Resource Files' as the building blocks for applications programs. For example, when you select 'Open...' from MacWrite to load a file, instead of displaying its own 'Open File' window and then going off and fetching the file itself, MacWrite simply calls a standard system utility which displays the standard file selection window, and wanders off to get the file on MacWrite's behalf.

When Apple wanted to allow applications programs to handle the new hierarchical file structure, all it had to do was rewrite the file selection resource, in the System, to take care of the new structure. The applications programs didn't have to be touched and were none the wiser. That's the theory anyway...

Now, when you select Open... or Save from an application program you are greeted by a re-designed file selection window. As well as specifying the file name, a new section has been added which displays the names of the available sub-directories and files. You can move down through the sub-directories by double-clicking the folder name. You can move back up by selecting the root directory name or by clicking the name of the parent directory.

One nice feature of the filing system is that files remember where their parents are and can call them, even if they are in a different directory. For example, if you have a MacWrite document in one directory and MacWrite itself in another, MacWrite will still load if you double-click the document icon.

Interestingly, the hierarchical system is only available on the hard disk; all floppy disks are automatically treated as one directory, even if you have folders on the floppy.

Apple says that the new Finder has been designed so that response time is maximised, even when there are several files in one folder. Obviously it pays to have comparatively few files in any one folder, but just to be difficult I wrote a little Basic program which created 500 files and put them all in one folder.

When I left Microsoft Basic, it took the poor old Finder no less than five minutes and 46 seconds to work out what was going on and re-build the desk-top. However, once it had done that and got its act together, it took 19 seconds to open the folder from the desk-top, and subsequent quits to the desk-top from Basic took a very respectable 35 seconds.

The Finder is obviously a lot cleverer than it used to be. For a more usual folder containing just five files, it took just over one second to open the folder from the desk-top and 17 seconds to re-build the desk-top when quitting Microsoft Basic.

In terms of general access speed, the Hard Disk 20 is roughly two and a half times faster than a floppy disk. It took 32.2 seconds to load MacWrite 4.5 from floppy disk and just 12.6 seconds to load it from the Hard Disk 20.

My only major worry with the new hierarchical filing system was that quite a few programs that I tried to run crashed under the new system. Popular programs such as Jazz, MacWrite, MacPaint, MacDraw and Factfinder all ran fine, but quite a few of my public domain utilities crashed. PageMaker would run, but wouldn't read documents created under the old system. Obviously some allowances need to be made for the review system as it had early pre-production system software.

Conclusion

In hardware terms, the Apple Hard Disk 20 isn't anything special; there are plenty of other external hard disks around which do the same job. It's the system software which makes this product different.

Hard disk based Macs really do need a hierarchical filing system, and it is nice to see Apple doing the job properly rather than opting for the easy way out and using disk volumes. My only worry is that a significant percentage of my Mac software won't run under the new filing system.

At the time of writing, Apple wasn't sure if this was due to bugs in the pre-release system software or because of a basic design problem. I can only hope that it was the former.

The Hard Disk 20 will retail for around $2,995.

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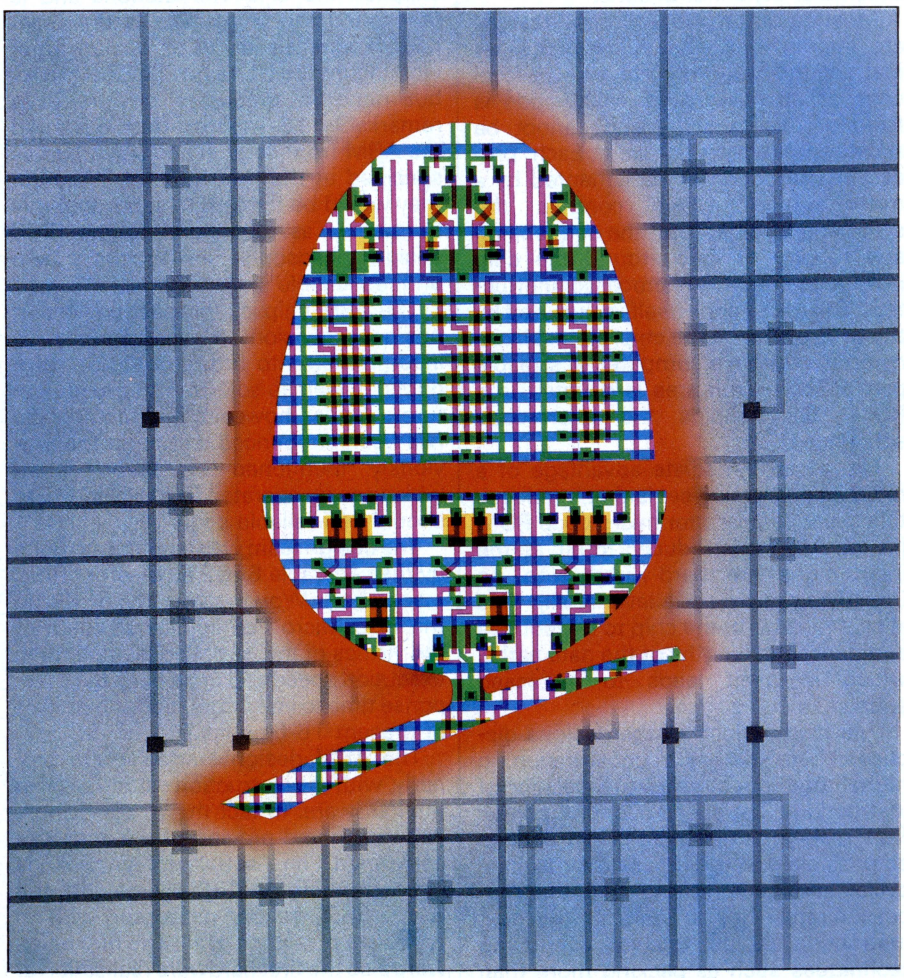
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RISCy business

The Reduced Instruction Set Processor (RISC) era has begun, albeit quietly, and working examples are now appearing on the market. Dick Pountain examines three such processors.



What exactly is a RISC, and why is it a good thing? A reduced instruction set processor, as the name suggests, is one which can execute only a small number of different instructions, compared to the prevailing standards of the day. In computing (as indeed in most walks of life) everything is a trade-off. A RISC processor trades off the number of instructions available to the programmer for speed; RISC processors can execute many times faster than their more complex brethren. When implemented as microprocessors in silicon, RISC designs also save precious space on the chip; smaller chips can be designed and debugged more quickly and cost less to fabricate.

The usual trade-off is code size. By having fewer instructions and fancy addressing modes, RISCs often require more bytes of code to do the same job. As memory continues to plummet in price, many people will come to find this an eminently sensible trade-off. And as I shall explain when discussing two other RISC systems (the Inmos Transputer and a machine based on the Forth language), the trade-off isn't even inevitable.

As early as 1975, IBM began a research project on the 801 minicomputer which incorporated RISC ideas and is rumoured (remember this is IBM) to have been capable of 10 MIPS (million instructions per second), four times the speed of its 370 mainframe. The 801 research was spurred by studies of conventional computer architectures which suggested that the average processor spends most of its life executing a handful of simple instructions, mainly load, store, branch, add and subtract.

In the early 80's, student projects at Stanford and Berkeley universities in California led to designs for reduced instruction set chips which achieved performances that surprised the industry as well as their creators. For instance, the second Berkeley chip, RISC II, with an 8MHz clock runs integer arithmetic C programs faster than a 12MHz 68000 does.

Despite these promising pointers, the computer industry has until now continued along its traditional path, which is to produce a new generation processor based on the old generation with more instructions added.

This drive for more and more instructions is not governed by any theoretical rationale. The original microprocessor instruction sets were designed in an *ad hoc* fashion by hardware engineers rather than programmers. They were in part copied from existing minicomputer designs such as Digital Equipment's PDP-11 and the IBM 360, and in part were decided by the pure practicalities of what could be done with the technology of the day (remember that all those chips represented the state of the art of their time).

The RISC approach

A RISC processor is stripped down, like a racing car, for speed, speed and more speed. More speed lets us use more

civilised tools to get the job done more quickly, more securely, and more reliably.

There is no single recipe for RISC processor design; the only thing which connects the three different approaches described in this article is that they all involve processors which can execute only a small number of instructions (from 40 to 70), and they can be implemented in a small amount of Silicon (tens, rather than hundreds, of thousands of devices). From that point they diverge completely, with stack-based versus register-based architectures, threaded versus block structured code, high-level versus assembler style instructions.

Most current microprocessor designs are 'micro-coded': that is, the processor instructions are written in a lower-level code called micro-code. Micro-code is fixed at design stage and cannot be accessed by programmers. Each processor instruction is implemented by a micro-program which controls the switching of gates, and the sequencing and routing of data around the chip needed to execute the processor instruction. The micro-code itself is executed by the control unit on the chip, almost like a computer within a computer. A sizeable part of the silicon area is devoted to a ROM which holds the micro-code sequences.

The most immediate advantage of a reduced instruction set is that it reduces this space required for micro-code ROM (in the ARM it is reduced to nil, as the instructions are hard-wired with no underlying micro-code level at all). This allows the size of the chip to be reduced and hence the lengths of the data paths, which in itself leads to increased speed.

One factor which all the designs discussed here share is a concentration on high throughput by efficient pipelining of instructions. The speed of a RISC comes from making as many of the instructions as possible execute in a single machine cycle, and guaranteeing that the processor rarely has to wait for the next instruction to be fetched. By using techniques such as packing more than one instruction into a word, and overlapping in time the instruction fetch, decoding and operand manipulation, the processor is kept working as fast as the silicon will allow all the time.

The so-called 'Von Neumann bottleneck' (that is, the limited speed with which a processor can access its memory), is attacked by every trick in the book, and occasionally by rewriting the book. One approach, exemplified in the Berkeley RISC, is to use the silicon space freed by the small instruction set to have lots of registers (up to 64) so that more operations can be performed without memory access. The Forth machine on the other hand uses stacks, implemented in ultra-high speed RAM, to achieve the same effect.

The ARM

The recently announced ARM (Acorn RISC Machine) chip, from the troubled manufacturer of the BBC micro, was a very well-kept secret indeed. A design team was set to work in the heady days before the company's financial near-collapse of 1985, in collaboration with the US firm VLSI Technology Inc which supplied the CAD workstations and is fabricating the chips. The Acorn team had experience of VLSI design from working on the ULAs for the BBC Micro, but none in processor design. In a remarkable 18 months they designed the ARM from scratch and it worked as specified at the first attempt, although they would be the first to admit that this triumph is as much due to the RISC design philosophy as to their own unquestionable skills.

The ARM chip is a product of Acorn's business division: it will certainly be incorporated into future computer products as well as sold to other manufacturers. So far, however, nothing specific has been announced, although the previously mentioned evaluation board which can be operated from a BBC Micro should be available soon.

The design team was inspired as much by the venerable 6502 as by other RISC researchers. Working with the 6502 on the BBC Micro had convinced them of the virtues of this simple design, both in execution speed and in its unrivalled response time to interrupts (better than that of present 16-bit chips).

The ARM design started, quite properly, with the instruction set rather than the hardware. In fact the whole design, debugging and proving of the chip was performed on software simulations (some running on BBC Micros with the 3MHz 6502 second processor) with no hardware prototype at all. The first chips were also the first hardware realisation of the project!

The ARM is closer to the Berkeley model of RISC than the other two systems discussed here. It uses 25 registers and a highly pipelined architecture to achieve a performance of 3 MIPS from a small (7mm square) chip. It contains 25,000 transistors. For comparison, the Motorola 68020 is 9mm square, contains 192,000 transistors and achieves about 2.5 MIPS. Clocked at the equivalent of 5MHz, ARM runs the *APC* Basic Benchmarks almost exactly 10 times faster than the IBM AT, and comfortably faster than the fastest machine in February's list. Fabricated in a fairly conservative three-micron CMOS technology, it will be very much cheaper to manufacture than the 68000 series, and uses so little power that it doesn't become even detectably warm in use.

ARM has 32-bit registers and data bus, plus a 26-bit address bus which enables it to address 64Mbytes of memory on byte boundaries. There are 25 registers in all, only 16 of which are normally available to the programmer (some extra ones become available during interrupts). The program counter is kept in register 15, and holds the status flags in its first six bits, there being no separate flags register.

All the instructions are 32-bit words (aligned on word boundaries), divided into several fields, and can be fetched in one cycle. All operations are performed on 32-bit quantities, the load and store instructions being smart enough to extract bytes and zero extend them to 32-bits when required.

There are 44 basic instruction codes, which can be categorised into five types: load/store single registers, load/store multiple registers, arithmetic and logical, branch, and software interrupts. No multiply or divide instructions are supported.

All instructions are conditional: that is, they include a test which has to be true for them to be executed. The first four bits of each opcode are used to select one of 16 possible conditions. The purpose of this is to reduce the number of branches required in a program, as branches reduce the efficiency of pipelining. When a branch is taken, the next (already fetched and decoded) instructions have to be thrown away, causing a break or 'bubble' in the pipeline.

There are only two addressing modes, base-relative and PC-relative. These are made highly flexible by permitting a second register, shifted if required by an on-chip barrel shifter, to be used as the offset. The result of the offset operation may be optionally rewritten to the base register and combined with the use of negative offsets; which gives the equivalent of the 68000's pre and post auto-decrement and increment modes. The barrel shifter is also used for arithmetic and logic operations, and (without the programmer's involvement) to align data words and to extract fields from instructions.

Branches use a 24-bit offset which allows branching anywhere in memory. There are no separate long and short jumps, and no reason to want them as they would save neither space nor time. Setting an optional link bit in the branch

instructions copies register 15, the program counter, into register 14 so that jumps and subroutine call/returns are catered for by the same basic instruction.

All the ARM instructions can be executed in one clock tick, except for the load/store multiple register instructions which require one tick per register. These latter instructions provide a fast way of saving the processor state, and allow very efficient context switching for procedure calls in high-level languages and for interrupt servicing. To enable the ARM to be used in virtual memory systems, all the instructions are restartable when the Memory Manager orders an abort.

As an example of the way these simple instructions can be exploited, a number in a register could be multiplied by 17 by adding it to itself shifted left four times, in a single clock tick.

The control of data flow through this pathway is not performed by a single control unit as in conventional processors, but through a number of separate functional units. The instruction decoder, for instance, is a programmable logic array with the instructions all hardwired; there is no micro-code ROM, as bits in the actual instruction word provide most of the control information. Condition sequencer and instruction skip units allow a fetched, decoded instruction to be skipped if its condition fails, without breaking the pipeline of following instructions.

An instruction may be fetched from memory while its predecessor is being decoded and its predecessor is still finishing execution in the ALU. This state of affairs persists as long as register-to-register operations are being performed consecutively without branching, and it maximises the throughput of the processor. (All the arithmetic and logic instructions are register-to-register). The ARM's maximum processor-to-memory bandwidth (the rate at which data can be transferred) has been measured as 18MHz, compared to 4MHz for the IBM AT, 2-4MHz for the Macintosh and 1.2MHz for the IBM PC. ARM has been designed to extract the most performance out of the cheap DRAMs currently used in personal computers, but could show even better performance with fast static memory parts.

The Inmos Transputer

The T414 Transputer, now coming off the fabrication lines after a delay due to process problems, is not usually thought of as a RISC machine. The Transputer is a radical design which can be used to construct parallel processing systems; it's a 'programmable component' rather than a central processing unit. Systems built from large numbers of Transputers will be used for applications such as graphics, digital signal processing and control systems, which require extremely high computing performance. A recently announced project aims to build a super-computer from Transputers.

In order to facilitate the building of parallel processing networks, the Transputer contains a complete computer on a single chip. Each T414 chip has a processor, 2k of memory and four serial communications links on the same piece of silicon. The on-chip RAM (the next model, T424, will have 4k) enables each Transputer to perform local processing, as well as addressing extended off-chip memory if required. The four high-speed serial links enable the different Transputers in a network to communicate with one another at 10 Mbits/second. The performance of a single chip is the range from five to 10 MIPS, depending upon the program material being executed.

The T414 is a 32-bit device with 32-bit registers and a 32-bit address bus capable of addressing four gigabytes of off-chip memory. The name Transputer, strictly speaking, refers to a family of designs, with different word sizes, numbers of links and built-in functions. Later, Inmos intends to produce 16-bit models (which save on silicon space and package pins), and devices with dedicated disk or graphics controllers on-chip.

Unlike the ARM, the Transputer is forced to use leading edge process technology. Simply fitting the components onto one chip requires packing densities not before attempted in commercial processors, and Inmos is using a sub two-micron CMOS process to achieve it: its experience in building high-performance RAM parts has been of valuable assistance. It is partly as a consequence of this critical space shortage that the processor part of the Transputer has been designed as a RISC (although the designers are committed to it for 'philosophical' reasons too). Although the Transputer is a large chip with many devices on it, only 25 per cent of this space is available for the processor part.

The Transputer displays a very different RISC architecture from that used in the ARM. Instead of a lot of registers, it has virtually none. To be more precise, it has only six registers, and three of these

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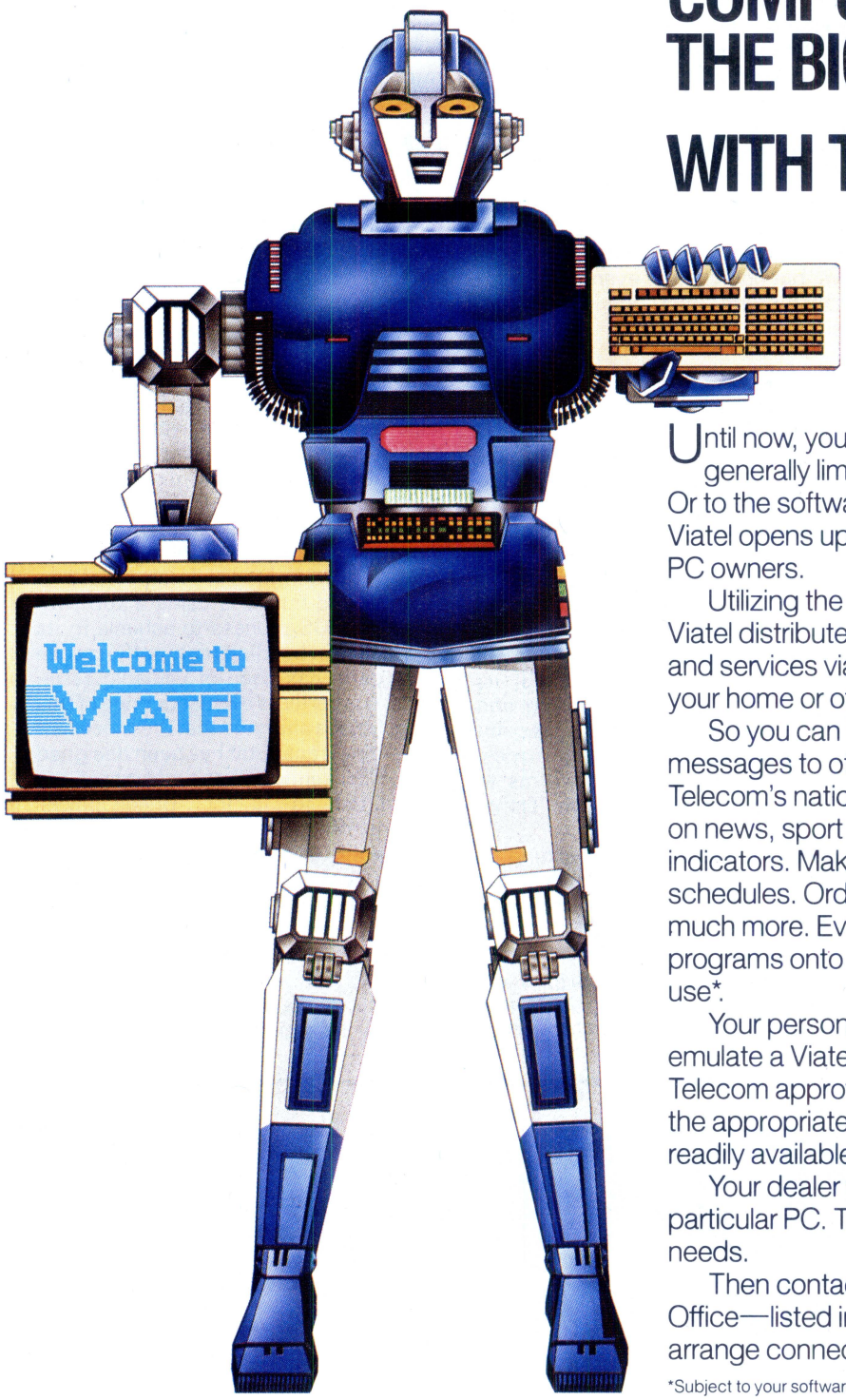
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are used as an expression evaluation stack. The other three are called the Workspace Pointer, the Instruction Pointer (that is, program counter) and the Operand Register, and none of them is used to hold data. In place of data registers, the Transputer employs its on-chip RAM to hold operands; the Workspace Pointer points to the area of RAM which is currently being used as the register set.

This feature was determined by the need for the Transputer to execute multiple concurrent processes. Switching contexts, when one process is suspended and another is started, can be achieved by switching the contents of the Workspace Pointer to point to the new process's data area, and it is very efficient as few registers have to be saved. The on-chip static RAM is ultra-fast, as it does not suffer the delays normally encountered in driving the pins to get signals off one chip and onto another. It can cycle as fast as the processor (20MHz) so the overall effect is as if the processor had 500 32-bit registers, although of course they can hold either code or data.

The Transputer instruction set is designed to directly support the execution of a particular high-level language called Occam. Occam is a new language and the first to fully incorporate the concept of concurrent operations. It's a block-structured language which superficially resembles Pascal or C. It would be bending the truth, but only very slightly, to say that the Transputer directly executes Occam code. Occam statements often compile into one, and always into very few Transputer instructions. For example, the Occam assignment statement:

```
x := 1
```

compiles into the two instructions:

```
load constant 1
store local x
```

each of which executes in a single cycle.

The actual Transputer instruction set comprises around 60 instructions, which makes it indisputably a RISC machine. However, the Transputer is intended to be programmed only in Occam, never explicitly in machine code: Occam is its 'assembly language'. The machine instructions are micro-coded rather than hard-wired like those on the ARM, the space taken up by ROM being compensated for by the small number of CPU registers needed.

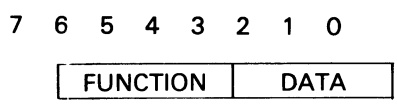
There are no special addressing modes. The majority of instructions are zero address, expecting to find their operands on the evaluation stack. The rest are one-address instructions which treat the whole of memory, including the on-chip RAM, as a continuous block. The first 16 locations in local (on-chip) memory are special cases which are addressed by single-byte instructions (for example, 'store local' previously mentioned). Array indexing and record addressing via pointers are performed by powerful single instructions rather than addressing modes. 32-bit multiply and divide instructions are provided.

Like ARM, the T414 Transputer uses a straight and uniform 32-bit data path which runs through all the registers and control blocks. It also pre-fetches instructions, but the pipelining is not quite so extended as in ARM due to the frequent process switches required when executing concurrent programs.

A very clever scheme of instruction encoding overcomes one of the disadvantages of RISC designs, namely the size of their machine code. All Transputer operation codes are one byte long (this also has the immediate benefit that on a 32-bit T414, four instructions are fetched at a time).

As eight bits are not enough to encode all the possible op-code/operand combinations, longer instructions may be built up by stringing together sequences. After analysing typical programs, a frequency encoding scheme has been devised whereby the most commonly used instructions are only one byte long, and the least commonly used ones are the longest. This leads to a code density which is higher than that of first-generation microprocessors, and much better than new processors like the 68000. For example, the two aforementioned instructions, load constant 1 and store local x, are both single-byte codes.

The scheme works as follows. Each byte-long op-code contains two four-bit fields, holding the function code and a data value:



Four bits can only encode 16 functions, and 13 of these codes are used for the 13 most frequently needed instructions, including the arithmetic and logical operations, comparisons, and local load and stores. The other three function codes are used for the 'prefix' instructions, which say that the following operand consists of more than one byte, and the 'operate' instruction which does the same for instruction codes.

Prefixed instructions are built up in

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four-bit chunks in the Operand register by successive loading and shifting left. For example, the constant 897 hex would be loaded by:

	Operand register	Stack
prefix #8	8	
prefix #9	89	
load constant #7	->	897

which occupies three bytes and takes three cycles. This is not as time-inefficient as a naive first glance might suggest. Firstly, experience shows that the vast majority of constants used in programs are small integers like 0 and 1 (which would take one byte and one cycle). Secondly, the simplified instructions are so fast that you're still winning anyway. A roughly equivalent Z80 instruction such as LD HL,#897 takes 10 cycles. As for it being verbose to program, let the Occam compiler worry about that.

A powerful consequence of this scheme is that any instruction can take an operand of any size up to the word size of the processor, and more importantly, the code becomes independent of the processor word size. The same code will execute on a 16-bit and a 32-bit Transputer.

In summary, although the Transputer is more than a RISC, the RISC philosophy was crucial in enabling its more ambitious features to be realised within the limits (just) of existing process technology.

Metaforth MF16LP

Metaforth is a start-up company founded by Dr Alan Winfield and Dr Rod Goodman. Alan Winfield is well known in the Forth community for writing one of the best tutorial books on the language, and for implementing Forth systems. Being an electronic engineer by training, Alan Winfield was not satisfied for long with purely software solutions, and set about designing a RISC computer to directly execute Forth code. The result, the MF16LP, is now starting manufacture.

Forth is at first sight an oddity among computer languages. It's both compiled and interpreted, it uses an explicit stack for arithmetic, and it compiles threaded code which consists of lists of pointers rather than machine instructions. This curious structure makes immediate sense, though, when you stop regarding Forth as a high-level language and look upon it as the extendable instruction set of a hitherto non-existent 'stack machine'. Existing Forth systems mimic this machine by implementing its instructions as subroutines written in the machine code of a host processor such as the Z80 or 68000.

Due to the overhead imposed by threaded code, and because the architectures of most microprocessors don't fit very well with its virtual machine, Forth is not as efficient as it could be. Although Forth is many times faster than other interpreted interactive language systems like Basic and Logo, it is typically five to 10 times slower than a language like C, which compiles directly into the host processor's machine code. Certain microprocessors such as the Motorola 6809 and the TI 9900 execute Forth much more efficiently than the Z80 or 6502 do, as their architectures 'fit' the Forth virtual machine slightly better.

The Metaforth machine is a direct hardware realisation of the Forth virtual machine. It's a RISC processor which uses two dedicated hardware stacks instead of registers, and whose instruction set consists of the Forth primitive words, such as DUP, SWAP and DROP, from which other words are defined. It executes Forth much better than any conventional computer does, but due to the extreme simplicity of Forth's underlying structure, it has turned out to be a quite extraordinarily fast computer architecture in absolute terms. The present version, which is still implemented in discrete logic rather than as a chip is capable of six MIPS. A VLSI implementation, combined with optimisations that Metaforth has already discovered, promises to push this up well beyond 10 MIPS.

The MF16 consists of a single-board computer (on a double Euro-card) built using Advanced Schottky TTL devices. The parameter and return stacks each consist of 2k of static RAM, which needs to have a 35-nanosecond (ns) access time as the machine's cycle time is only 50ns. Main memory doesn't need to be quite so fast, which would be an expensive proposition, but still needs to be 55-75ns if it is not to slow down the processor.

It's amusing to see the reaction of engineers on first seeing the board, as their first question is always 'Where's the processor?'. Of course there is no microprocessor on the board, which looks for all the world like a RAM card. The whole processor requires about 20,000 transistors, which would make it a very small chip. A VLSI implementation is currently under design and will, like the ARM, be fabricated in the US.

The MF16 at present uses the customary 16-bit wide stacks with a 24-bit address bus. Consequently long address

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calculations must be done using double numbers; the VLSI version will go to full 32-bit stacks to avoid this.

The instruction set consists of a set of Forth primitives (chosen so that both the 79 and 83 standards can be accommodated) which are micro-coded. Part of the micro-code store is writeable: in other words, it is possible to add new machine instructions, and Metaforth intends to use this facility to customise the machine for special applications such as graphics and signal processing.

Extensive analysis has identified a set of 39 instructions which is sufficient to support a full Forth-79 or 83 system, but for efficiency reasons several other non-essential instructions are included to give a set of about 50 instructions. The great majority of these instructions can be executed in one instruction cycle.

The first prototype machine treated its instructions like conventional machine codes. A Forth assembler translated programs into streams of in-line op-codes, and the threaded nature of Forth had to be realised by CALL and RETURN instructions. However, Winfield discovered an ingenious scheme to implement threading directly into the hardware, with a zero-time overhead.

In very broad terms, the machine is split into two halves, one responsible for instruction fetch and the other for execution, each having its own stack. These halves can operate in parallel, so that the next threaded instruction can be 'unravelled' and fetched while the previous one is still using the parameter stack. This is the equivalent of the ARM's pipeline, and combined with a unique dataflow ALU architecture contributes most of the speed.

The RISCy future

RISC processors have reached the point of commercial acceptance. IBM continues to work on RISC designs (it now has the 801 on a chip), and Hewlett-Packard is also deeply involved as are smaller companies.

For example, Pyramid is selling a fast Unix system which uses a custom RISC processor and Novix Corporation has produced a Forth chip designed by Chuck Moore, with similar capabilities to that of the Metaforth machine.

The lessons of RISC are that conventional processor designs have become counter-productively complex; that processor design is a job which requires the collaboration of software as well as hardware engineers; and that high-level languages can best be supported by simpler rather than more complex designs.

(Editor's note: The RISC evaluation board for the BBC Micro, as described in this feature, is expected to be available from Barson Computers in January. It is claimed this will be the fastest microprocessor ever built. Readers wanting more details should call Barson Computers on (03) 419 0300.

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Another American soap opera emerges as Steve Jobs organises his post-Apple business. David Ahl delivers the news from the States.

Much-improved Framework

Framework II from Ashton-Tate has been significantly improved over the original product. Three major changes have been made in the area of memory management. Firstly, Framework II has an optional virtual memory driver. This feature allows a hard disk to serve as an extension of RAM, permitting the creation of virtually unlimited-size files. Secondly, it supports the Intel/Microsoft expanded memory specification, which means it can directly address up to 8Mbytes of RAM. And thirdly, the package uses a 'sparse matrix' technique for compressing spreadsheet files into less space.

In the area of communications, Framework II has completely integrated commands instead of the external Mycroft Labs MITE program that was provided with the original Framework.

Utility programs were offered with the original Framework for importing Lotus, DIF and WordStar files. Framework II is considerably more versatile, particularly with respect to converting ASCII text into numeric data that can be used by the spreadsheet module.

In exporting files, the original Framework could write only ASCII text files and dBase comma-delimited files. Framework II can produce files in IBM DisplayWrite, WordStar, and MultiMate formats also.

The word processing module now contains an 80,000 word spelling checker, offers discretionary hyphenation and non-breaking space characters, and displays pagination on demand.

Two interactive tutorials — beginners' and advanced — are now included with the program. The package comes on eight disks and requires 384k of memory. All modules installed on a hard disk will occupy about 1Mbyte. Framework II sells for $US695.

Q&A, naturally

Symantec's new file manager, Q&A, has two user interfaces — one like the pfs: range and one like natural language. The natural language interface, called the Intelligent Assistant, lets the user ask complicated queries of the database in English sentences. Moreover, the user can expand or modify an enquiry without having to start all over again.

Q&A appears to be an innovative and well thought-out product. Its ability to use existing pfs: files is a big plus. The company is composed of seasoned professionals, and although retailers are not exactly looking for more software to put on their shelves, Q&A ought to have a better than even chance of making it big.

Just the job?

The headlines read like a high-tech soap opera.

3 June 1985: Apple Reduces Jobs' Duties in Overhaul Designed to Trim Costs, Bolster Stability

2 Aug: Apple Chairman Jobs Is Selling Eighth of Stake in Computer Firm

17 Sep: Apple's Jobs Plans New Computer Firm, Hires Five from Concern He Co-Founded

19 Sep: Apple Mulls Position After Jobs Quits

20 Sep: Jobs' Team Building a Lisa-like Micro

25 Sep: Jobs Asserts Apple Abandoned Efforts to Settle Dispute Over His New Venture

Underlying the news stories is the notion that Steve Jobs is an American business hero of the order of Thomas Edison, John D Rockefeller and Lee Iacocca — an inventive genius, a master marketeer, a charismatic manager, and an astute financier — all rolled into one. Whatever he touches will turn to gold — Apple seems to think so (now that he has been forced out) and news reporters seem to think so (it's nice to have heroes).

Frankly, I think the jury (the market) is out and will be out for some time to come, but that doesn't stop us from looking back and I do not see Jobs' name in lights. Let's look at the myth versus the reality.

Jobs the inventor: Steve Wozniak invented the Apple II, the longest-lived design in personal computers; Jobs had nothing to do with it. Jobs influenced the design of the Lisa/Mac; 'influenced' does not equal 'designed'.

Jobs the marketeer: the real management direction for Apple in its staggering growth period was provided by AC 'Mike' Markkula and Mike Scott, not Jobs. Years later, Jobs brought in John Sculley in recognition that Apple needed leadership in marketing.

Jobs the manager: 'Morale hit a new low during the company's annual meeting, when Macintosh division employees got front row seats to hear the zealous Mr Jobs describe new Macintosh products. The Apple II division watched via closed-circuit television from a nearby auditorium.' — *The Wall Street Journal.* Typical of Jobs.

Can Jobs' new Lisa for the education market make it? Sure! Colleges would love a cheap Vax or high capability Mac, but for Jobs' company to be a success a great many pieces will have to fall into place. Some of them will *because of* Jobs, but more will have to in *spite of* Jobs.

Random bits

As expected, IBM has formally announced that it will merge the sales forces that sell to large and small customers. The reorganisation will be along geographical lines: 12 regional sales offices will be eliminated ... Cash-strapped retailers say that IBM's pre-Christmas rebates of six to eight per cent on XT and AT models are not sufficient to increase already bulging inventories. The wholesale price of the PCjr has also been reduced by another $US174, which means that the street price should be in the $US300-400 range — quite a bargain if the computer meets your needs ... Checkmate Technology of Tempe, Arizona has introduced a MultiRam CX card for the Apple II which contains a 16-bit 65C816 CPU and additional memory (up to 640k). A companion operating system, MAX-OS, from Micro Magic has multi-tasking and multi-user capabilities that allow creation of a Unix-like environment. The card with software costs $US329 ... Citizen has introduced a 35cps daisywheel printer with an 8k buffer that is compatible with the Diablo 630, NEC 3550, and Qume Sprint 11. The price is just $1,200 ... Lotus admitted in September that Symphony 1.1, which it began to ship last July, has a serious defect that can cause users to lose significant amounts of data. About 25,000 copies of version 1.1 have been delivered to customers ... Having failed to win a significant market share with its QX line of computers, Epson has announced a me-too line of IBM PC-compatible machines ... Sperry Corp has expanded its PC-compatible line with a Mitsubishi-made Intel 80286-based machine to compete with the PC/AT ... Mindset Computer Corp, maker of a machine that opened to rave reviews last fall, has filed for protection under Chapter 11 ... Rising from the dust is Franklin Computer Corp, with new financing and a new Apple-compatible computer, the Ace 2000 ... To help alleviate cash flow problems at Morrow Computer, Zenith has agreed to finance some of Morrow's inventory used in the manufacture of the Zenith Z-171 portable computer purchased from Morrow ... Ever wonder what became of all those ex-Atari executives? Five of them, including former president Don Kingsborough, are selling high-tech animated story-telling toys such as Teddy Ruxpin, a bear who blinks and moves his nose and mouth realistically as he tells stories or sings.

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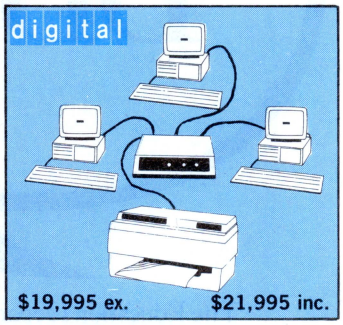
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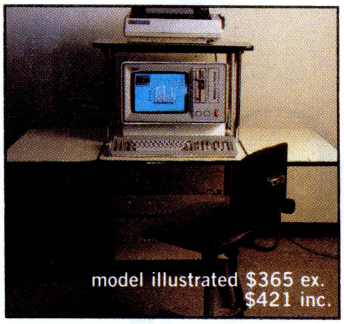
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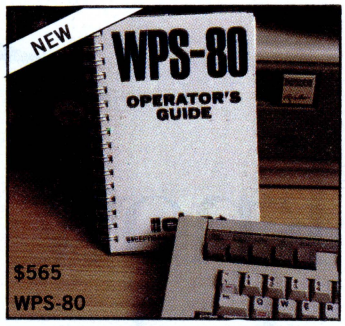
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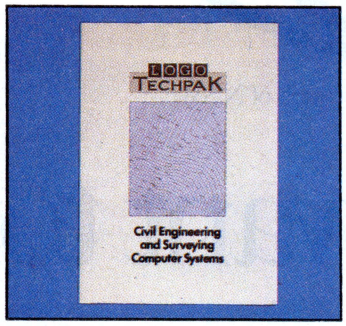
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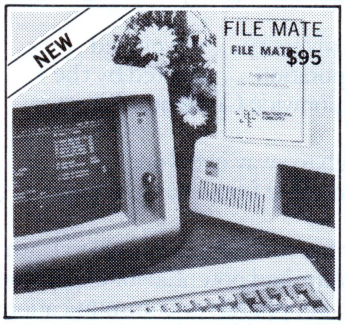
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structures of Pascal. Its file and string handling surpasses that of both, but the language really excels in its wealth of structured programming facilities. If the purpose of structured programming is to make coding readable, then Comal even scores over Pascal. While it is not used commercially it does allow the teacher to use accepted problem-solving techniques, such as top-down and stepwise refinement. Consequently, having mastered Comal, learning other languages becomes relatively painless. As it is an interpreted language (like Basic), it is ideal for the rapid solution of small to medium scale problems. It has one other similarity with Basic — poor data structuring facilities. Only integers, reals, characters and arrays (up to eight dimensions) are supported by it.

Case study

To illustrate the strengths and weaknesses of Basic, Comal and Pascal, I'll explain how they each go about solving a very common problem in computing — that of sorting a list of numbers into ascending order.

The technique used is that of the 'ripple sort'. Given a list of numbers, you compare the first and second, second and third, third and fourth, and so on, swapping the numbers when necessary. When you have done this for the entire list, the largest number will have rippled to the top of the list. If you now forget about this last number (as it's the largest number and at the end of the list, it is now sorted) and perform a similar process on the rest of the list, the second largest number should ripple to the top of the remaining list (which is actually the second top position). We now move the top of the list down one again (forgetting about the top two numbers which are now sorted) and repeat the process until the top of the list becomes the first number. At this point, all the numbers must be sorted. The process is best described algorithmically (Fig 1).

As can be seen from the Basic equivalent of the algorithm (Fig 2), Basic does not reflect the nature of the underlying problem. In particular, if the reader did not know the purpose of the code, then the actual program statements would not provide many clues.

The coding is largely incomprehensible, looking more like a collection of

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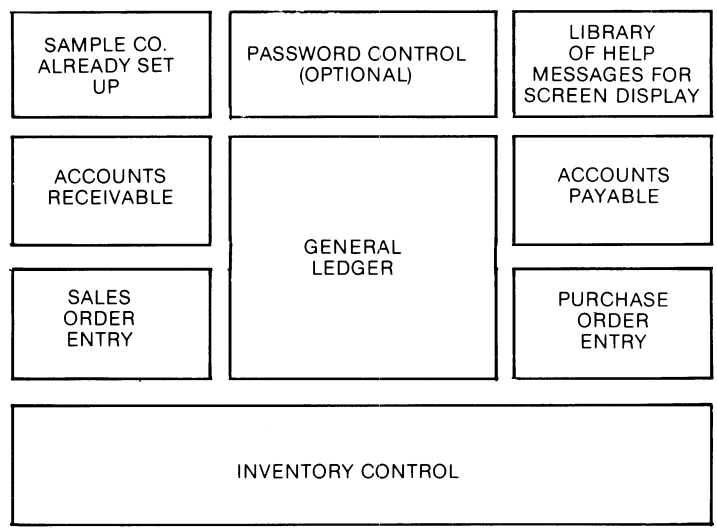
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```
repeat
start at second number
        repeat
                if previous number > current number then swap numbers
                move onto next number

        until list finished
reduce list by one number (the one just sorted)
until end of list becomes the first number
```

Fig 1 Algorithm for ripple sort

```
 900 REM SORTS ARRAY "K" WITH "EL" ELEMENTS
1000 LET N=EL
1010 LET C=2
1020 IF K(C-1)<=K(C) THEN GOTO 1060
1030 LET T=K(C)
1040 LET K(C)=K(C-1)
1050 LET K(C-1)=T
1060 LET C=C+1
1070 IF C<=N THEN GOTO 1020
1080 LET N=N-1
1090 IF N>=2 THEN GOTO 1010
1100 RETURN
```

Fig 2 Basic program

```
 900 // Requires no introduction - self-documenting code
1000 PROC sort(REF array(),no_elements) CLOSED
1010   top_of_list := no_elements
1020   REPEAT
1030     current_element := 2
1040     REPEAT
1050       IF array(current_element - 1) > array(current_element) THEN
1060         temp := array(current_element)
1070         array(current_element) := array(current_element - 1)
1080         array(current_element - 1) := temp
1090       END IF
1100       current_element := current_element + 1
```

cont...

```
1110      UNTIL current_element > top_of_list
1120      top_of_list := top_of_list - 1
1130    UNTIL top_of_list = 1
1140 END PROC sort
```

Fig 3 Comal program

```
procedure Sort(var list:vector;NoElements:integer);
{ 'vector' is of type array[..] of integer }
var
   TopOfList,CurrentElement,Temp:integer;
begin
   TopOfList:=NoElements;
   repeat
      CurrentElement:=2;
      repeat
         if list[CurrentElement-1]>list[CurrentElement] then
         begin
            Temp:=list[CurrentElement];
            list[CurrentElement]:=list[CurrentElement-1];
            list[CurrentElement-1]:=Temp
         end;
         CurrentElement:=CurrentElement+1;
      until CurrentElement>TopOfList;
      TopOfList:=TopOfList-1;
   until TopOfList=1
end;
```

Fig 4 Pascal program

mathematical equations than the solution to the simple problem of sorting numbers into order.

This is in striking contrast to the Comal coding (Fig 3). This program is very similar to the algorithm, being easily readable and therefore comparitively simple to follow. Descriptive variable names and the use of control structures mean that when a problem is reduced to algorithmic form, the encoding into Comal is straightforward.

The program was entered entirely in lower-case and without any indentation. It is a feature of Comal itself that causes programs to be presented in the format illustrated (Fig 3).

Pascal, like Comal, is highly suited to problem-solving and this is reflected in the coding (Fig 4). The layout in this case was achieved manually.

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While both the Comal and Pascal programs are slightly longer than the Basic version, the extra coding pays rich dividends when it comes to the subsequent maintenance of the software. By comparing the Comal and Pascal programs, readers should see what I mean about Comal being more suited to rapid problem-solving, as many of the nuances of Pascal (such as the declaration of all variables and the selective (and critical) usage of the semicolon) are not necessary.

Block-structured Comal

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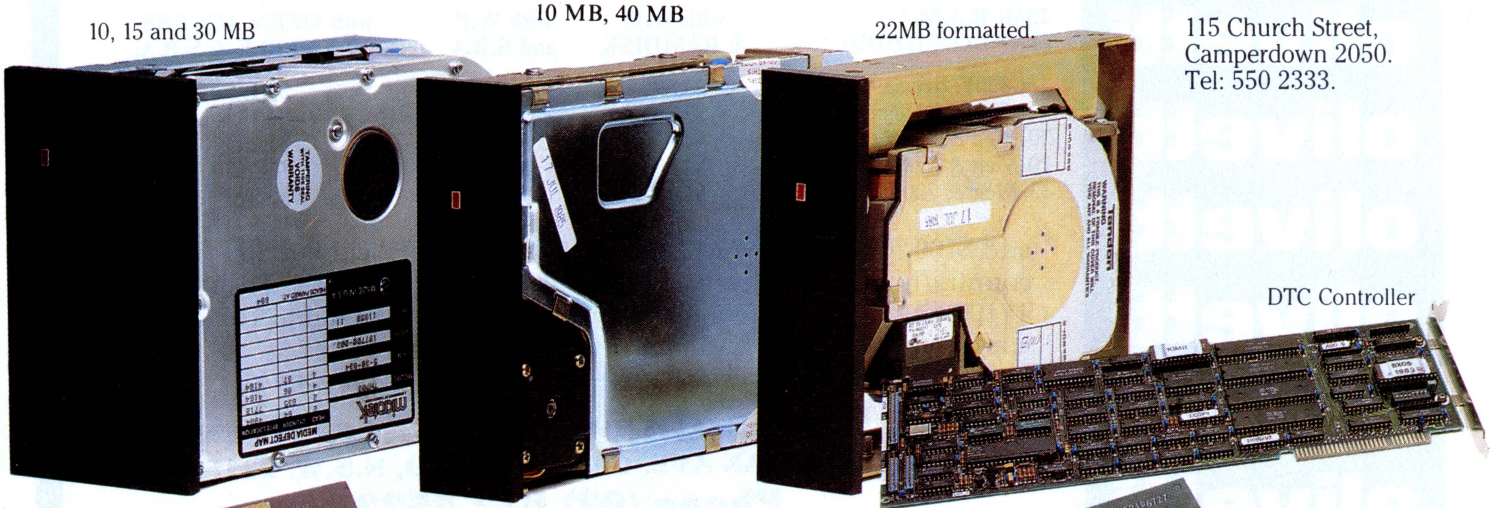


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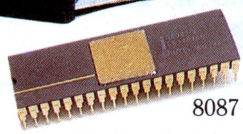
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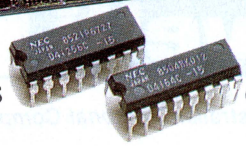
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scores over Basic for another equally important reason — it is a block-structured language. The routine is completely transparent to the rest of the program until it is called.

For example, in Comal, to sort an array called 'list' with 200 elements you would write:

EXEC sort(list1 (),200)

The same routine could be used to sort an array called 'list2' with 50 elements by writing:

EXEC sort(list2(),50)

As the variables contained in the sort procedure are only active when it is called, programmers need not worry about using the same variable names in other parts of their program. When the procedure is left, the space occupied by the variables within it is recovered for use by the rest of the program. Large problems may be divided into a number of discrete blocks that teams of programmers may work on independently, without worrying about clashing with the coding created by others. Alternatively, useful libraries of routines (like this sort procedure) may be stored and merged with existing coding without worrying about how it will interface with the rest of the program. This is why Comal satisfies the vocational objective, as this is how programming is done commercially.

While all the above points apply equally well to Pascal, none of them are applicable to the Basic coding. The subroutine would require rewriting if you were to sort an array other than K, or if you altered the number of elements. If any of the variables used in the sort subroutine were used elsewhere in the program, then their integrity could not be guaranteed. This would make it impossible for teams of programmers to work independently on a problem as each would have to know what the other was doing.

Conclusion

Comal is undoubtedly superior to Basic for learning programming, and can be squeezed into a tight computing syllabus. It provides education with a unique opportunity of rationalising its programming provision by introducing a structured approach to computer-based problem-solving.

This integrated approach would involve the use of appropriate programming languages throughout the education process: for example, Logo in primary education, Comal in secondary, and Pascal in further or higher education. If such an approach was adopted then skills acquired at one level would be transferable to the next. END

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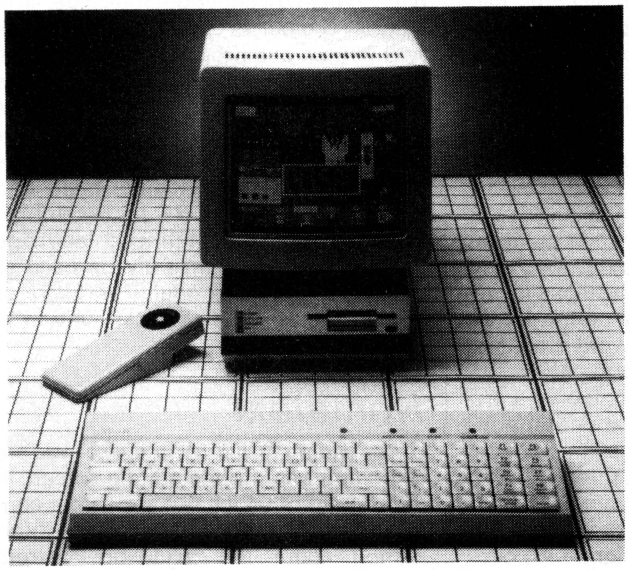
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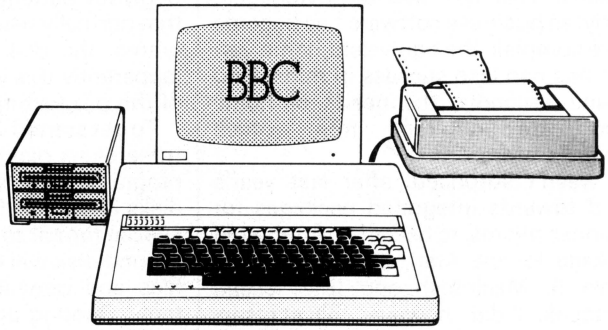
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Homepak

Integrated software (word processor, database and communications), the like of which is common for business micros, is now available for home users in the shape of Homepak from Batteries Included. Nick Walker assesses its capabilities.

Serious software for home computers has, in recent years, followed trends set by its more powerful business micro cousins. This has two disadvantages: firstly, as business software has become more complex, the equivalent home version has had less success in mimicking it; and secondly, the needs of home users are different from office business users.

I wasn't surprised, after last year's trend towards integrated packages for business micros, to hear of an integrated package for the Atari, Commodore 64, Apple II, Macintosh and IBM, called Homepak. I did, however, have reservations about its capabilities when running on a home computer, and, given the complexity of integrated packages on business computers, I also doubted the usefulness of such a package for the average home micro user.

Homepak consists of three elements: a word processor, Hometext; a database, Homefind; and a communications package, Hometerm. All three programs come on one single disk and, interestingly for Batteries Included, a company that normally uses dongles on all its programs, the disk is not copy-protected (apparently this is at the express wishes of the programmer).

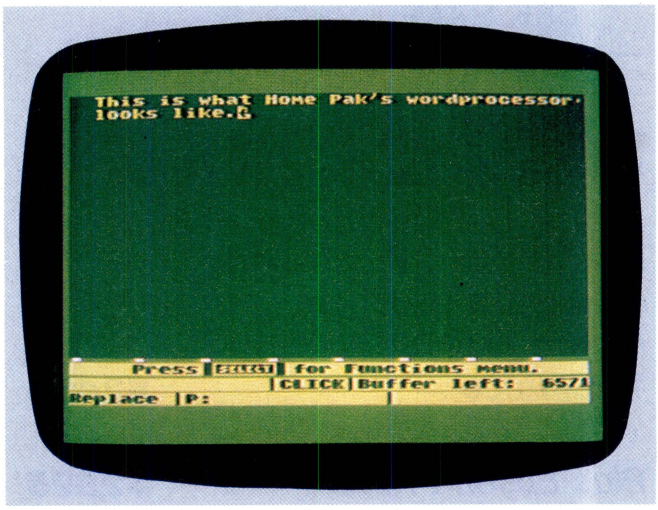
To get started with Homepak you need three blank disks, one for a copy of the programs and two for data. Two data disks are needed as the database uses a special format to allow fast retrieval; the second disk will contain word processor files and downloads from online systems. Booting up your copy of the program results in the main menu offering the three programs. It is immediately obvious upon seeing this screen that the programmer, Russ Wetmore, has his roots in writing games programs. The three options are in different colours, with a different note played as you select each option. Above the options is a title bar and below a copyright message, all in suitably colourful graphics. Homepak was written in a programming language called Action!, a Pascal and C-like language available on cartridge for Atari micros. It's unusual these days for software for a home micro to be developed on the machine itself, and when it is, it's usually in assembler. Action! is the only high-level language I'm aware of that can truly be used to develop commercial-quality software or get results as good as those written in assembler.

Hometext

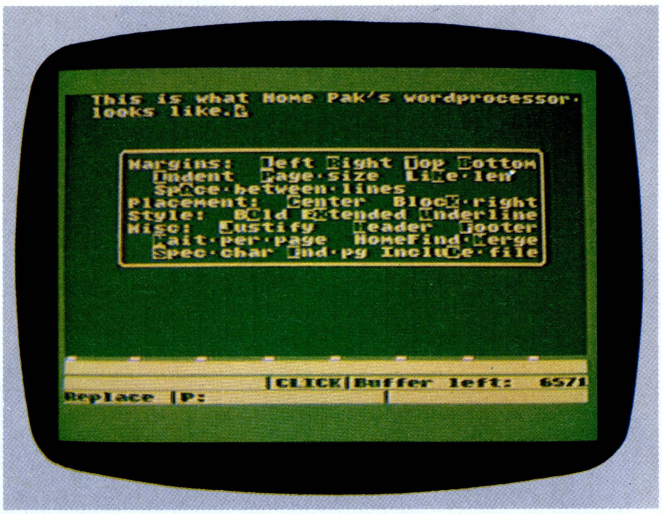
Upon loading the word processor you are taken straight into the editing screen, at the bottom of which is a status bar consisting of six areas which provide information about the following: current filename of text; key click on/off; amount of memory left for document;



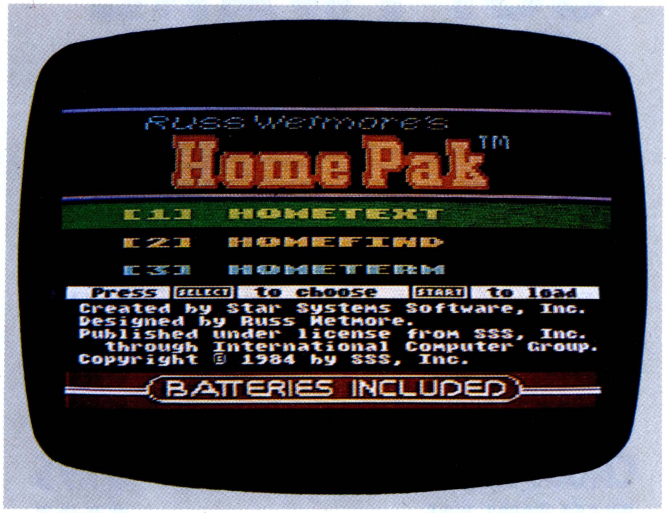
The word processor function menu



The word processor screen looks like this



Windowing on the word processor



The Homepak opening menu

replace or insert text; current output device; and merge filename. Above this is a single line giving information relevant to the operation you are performing at any time.

The most restrictive feature of Hometext is that it is RAM-based. On the Atari, this means the grand total of 6350 bytes free for documents. To some extent this is compensated for by the excellent facilities for chaining documents and, given the program's friendliness, it doesn't prove to be a major restriction. Text entered while in this screen will be displayed in the upper portion of the screen and will word-wrap.

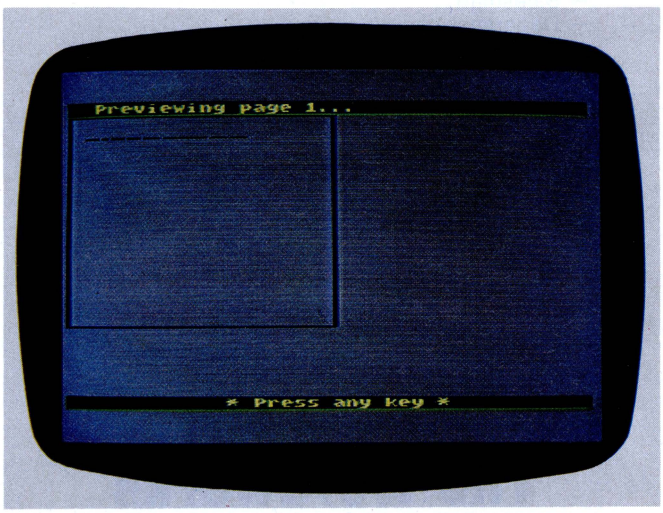
Movement around text has been influenced by WordStar, being achieved by pressing the CONTROL key followed by an alphabetic key. The position of the alphabetic key on the keyboard gives an indication of which way the movement will be. It's possible to move to the top and bottom of a document; move to the top, bottom and middle of a text screen; and scroll a screen of text backwards and forwards. In addition, the cursor control DELETE and INSERT keys work in the usual manner. You can toggle between replace/insert mode using the inverse key (Commodore key on the Commodore). The colour of the border changes to signify which mode you're in — definitely the touch of a games programmer.

The three console keys START, OPTION and SELECT (function keys on the Commodore) will bring up three menus. Loosely speaking, START is used for block manipulation commands, OPTION for printer-related options and SELECT for everything else.

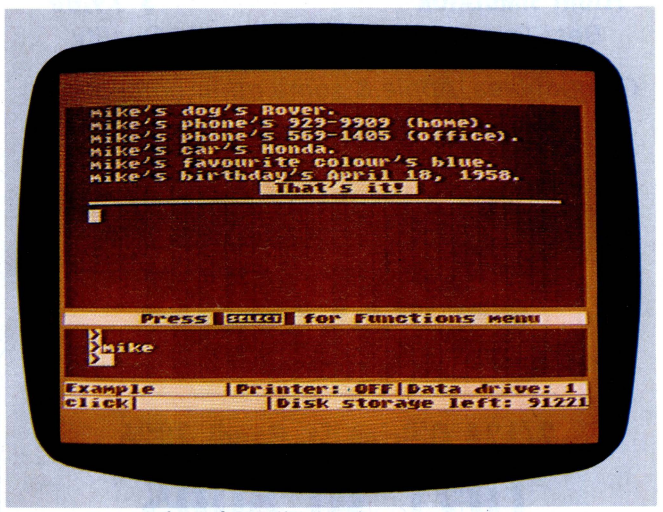
The block manipulation menu comes up as a window on top of the text and offers four options: move text, delete text, copy text and find string. The first three options allow you to define a block of up to 960 characters and then perform the required operation; the fourth option will find any string and replace it with another. With all the operations the status line provides information to guide you if you need it, and windows over the text appear for such things as error messages. Again, the influence of games programming shows, and in general is very well used. For example, while performing a search-and-replace, a bell is sounded each time a word is found, giving an audible confirmation of the number of words replaced.

The printer menu also appears as a window above the text, but unfortunately it has too many options to discuss each in great detail. As well as the usual operations provided with all word processors, there are operations you'd normally associate with professional word processors, such as headers, footers and different types of justification. It's also from this menu that you place markers to signify the merging of information from a file created by the database (mail-merging, to use the technical jargon).

Unlike the others, the third menu is a



The print review screen



An example of the friendly database

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full screen in itself. From here, you access miscellaneous housekeeping activities such as loading from disk, saving to disk, obtaining directories and starting a mail-merge run. One of the most impressive and useful features of Hometext is accessed from this menu — the print preview feature. Home computer word processors usually have a problem due to the limited line length needed to work with a television (usually 40 characters), so you can't get a feel for how the final document will look when printed out at 80 columns. Print preview graphically illustrates what your page of text will look like when printed, using dotted lines to replicate each line of text and highlighting any special features (extended and bold-face words or characters are shown in blue, underlined words have a green line beneath them, normal words or characters are printed in black). Due to the amount of memory needed for this operation, documents larger than about two pages have to be saved to disk and the filename specified to the print preview option.

One common criticism of user-friendly menu-driven software is that when you are familiar with the commands, the menus become redundant and slow down your progress. Hometext has a particularly nice way of overcoming this: if you keep the console key pressed down and follow it with the required function letter, the menu window doesn't appear — a good way of tailoring the amount of help to the skill of the user.

The Homepak disk contains a number of special files with a .SET extension, called configuration files; one for each program on the disk. These are records of the current screen colours, brightness and text brightness, margins, key click sound and other features specific to each Homepak program. For Hometext this also includes default tab settings, shift-lock and three printer control codes.

You can change these features to suit your own use and save the changes back onto the program disk by an option from the general menu. When you next load the program, the new settings will be loaded automatically, giving some degree of customisation.

Homefind

The general concept of a database is of a number of records, each consisting of a rigid framework of entry lines called 'fields' which, when they have been established, usually remain fixed in size and cannot be changed. If you approach Homefind with this established idea of what a database should be, you'll struggle. But you approach it with the attitude that all you want to do is type in the relationship between items of information and at a later data retrieve that information, you'll find Homefind a superbly simple database which is ideally suited to the kind of use you might apply a home database to.

Homefind is a natural language database or, more accurately, a natural language information manager — you enter information in the way that it naturally comes to you. For example, if you are entering phone numbers you'd type 'Rob Smith's phone number's 734 6517; if you then want to retrieve this information you'd type 'What's Rob Smith's phone number?'. All you have to learn is the simple format used to enter data and you have a remarkably powerful database, considering how easy it is to use.

The main screen for entering and retrieving information is as similar to Hometext as possible, considering that this is a database and not a word processor. The general operation is the same (that is, console keys for menus, and so on) making it very easy to use. The screen is composed of four areas: the largest area at the top of the screen is where information from the database is presented to you. Below this is a single line giving prompts and information in a similar way to Hometext, plus four lines which display your entries and enquiries. At the bottom of the screen is a status line with five areas displaying the following information: the name of the database disk; printer on/off; the data drive number; key click on/off; and the amount of disk storage left for information.

The initial screen will prompt you to insert a data disk or create a new one. Each database is contained on one disk and one disk only, which can't be used for any other purpose as the data is stored in a special format to allow fast access when retrieving information. To continue with our example, if the database hasn't previously been told about Rob Smith or phone numbers, typing in 'Rob Smith's phone number's 734 6517' will result in the response 'Rob Smith's news to me! New Subject Y/N?' and a similar response for the phone number. Answering 'Y' to each response will add the information to the database, and from now on the database will accept information about Rob Smith without questioning his name, and will accept phone numbers without querying what they are.

The apostrophes are absolutely essential as they break any entry into subject, tag and objects, in that order. In our example the subject is Rob Smith, the tag is phone number and the object is 734 6517. From this, Homefind creates one index for each, and you can ask for information on any one. Entries are not restricted to one line so addresses, and so on, can be shown as usual but still represent just one object. For example: you could type:

Rob Smith's address's
25 Linden Road,
Bondi, NSW 2026

using the down arrow to signify a new line.

When you have entered sufficient information, you will want to retrieve it. Typing 'Who's Rob Smith?' will result in the database telling you all it knows about Rob Smith — his phone number, his address and anything else you may have entered. If you type 'What's Rob Smith?' or even just 'Rob Smith', you'll get the same response. You can make requests referring to tag's or object's, for example typing 'Phone Number's' would list all the phone numbers you've typed in. If you ask for something that's not on the database, your request will be turned into a question which, if you answer, will then be added.

The database will make all the logical deductions that it can. If you type 'Rob Smith's nickname's Bobby', you could then ask 'What's Bobby's address' and the database would understand. It's surprising how much the database can learn from you typing in what seems to be unrelated information: as part of this review I entered my software collection into a database, and was frequently amazed by its correct answers to vague questions.

Homefind doesn't provide a fancy report generator like most programs — a simple printer on/off toggle is all you get. It is clever enough to only print what's relevant and print it in an understandable way, which will probably be sufficient for most uses. If you really want a report, some fiddly manipulation in conjunction with Hometext can be made to generate it.

Pressing SELECT (F5 on the Commodore) will bring up a menu of housekeeping functions in the same way as Hometext. From here you can change the data disk, generate a new data disk, clean up information on a disk, make back-up disks, and perform other assorted functions.

Due to the special disk format used by Homefind, a special function is provided to create normal DOS files for use with Hometext's mail-merge option. A search request peruses your data and forms the response in memory, which can then be saved as a normal DOS file. Files from other databases and word processors (including Hometext) can be used, providing they are edited into the correct format.

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DANFA1



Hometerm

If I thought Hometext and Homefind were comprehensive packages, they are outshone by Hometerm. Hometerm has just about every feature that a terminal program should have, including some that you don't appreciate until you need them and find that Hometerm contains them.

Hometerm supports 300/1200 baud operation, has ASCII and ATASCII translation modes (and the equivalent Commodore translation), will upload and download via a very comprehensive implementation of the XModem Christensen protocol, and uses dumb loading for capturing text.

After loading Hometerm from the main menu you'll go directly into the terminal screen. Three screens make up the Hometerm package, the other two being menus obtained by two of the console keys (function keys on the Commodore). The terminal screen initially looks exactly the same as the word processing screen, with a large area for text, a single line for prompts, and a status bar containing the following information: a timer measuring how long you've been online; the amount of memory remaining; baud rate; duplex setting; filename (if any); and the ATASCII or ASCII mode. I especially like the inclusion of a timer, a feature normally only found on more expensive comms packages and useful for commercial systems which charge for their services.

Pressing SELECT (F5 for the Commodore) will take you to the function menu. There are so many features available with Hometerm that not all are shown in this menu: for some of the more obscure ones you have to consult the Homepak manual. Needless to say, Hometerm offers the usual facilities, but I'll concentrate on the aspects that make it stand out from the rest.

First is a macro facility (a macro in communications terms is a series of commands that can be sent with a simple keystroke). Using this it is possible to automate your signing-on procedure or any sequence of commands you commonly use, thus saving time and very often money. Hometerm has 10 user-definable macros available at any one time, and you can have as many sets of macros on disk as you wish. Other systems provide this facility, but what sets Hometerm apart is that the commands are 'smart' macros. They send characters, pause and wait for a response from the host, then continue to send characters. Macros can be chained in any order you require, which means, for example, that you can put the phone numbers of different bulletin boards in macros 1, 2 and 3 and then put a sequence which works on all bulletin boards of a certain type in macro 4. Whichever phone number you choose, you can chain macro 4 and use the whole sequence. Other advanced controls of macros include options to include delay rates or automatically to open and close the capture buffers, all from within one of these smart macros.

If this seems rather complex, it's important to realise that you can ignore the intricacies of these features and just use the defaults. They allow you to load the program and be online with the absolute minimum of effort. However, where other 'user-friendly' programs are soon outgrown by their users, this one keeps up every step of the way. If you need more features than Hometerm provides, then it's time to buy a micro running expensive specialist communications software.

Two features of Hometerm that are worthy of mention are word-wrap and windowing. Word-wrap can be toggled on and off, and when on will work in the same way as word-wrap on a word processor. If you log on to a system that was really designed to be used by 80-column displays, you can switch on word-wrap and avoid splitting screens in the middle.

Windowing really comes into its own when using the interactive chat, or CB facilities, of a large system. When a dozen people are talking at the same time, the words can be flying so fast that it's difficult to tell if the sentence you're about to send is correct. The windowing facility allows you to build your sentence in a separate window, edit it as required, and only when you press RETURN is it sent.

Text captured from Hometerm can be saved as a file which can be read and edited by Hometext. At any point you can switch the output so that it not only goes to the screen, but also to a designated file. The ability to switch this on and off while online means your file can contain only the relevant pieces and not all the paraphernalia usually associated with online systems such as logging-on information.

Hometerm, like the word processor and database, also has a .SET file which allows you to configure the defaults to your own preferences.

Prices

As this review was going to press, the distributorship of Batteries Included changed hands from Imagineering to Entertainment and Computer Products, (ECP) in Sydney. Simultaneous with this changeover, was a reduction in price for Homepak.

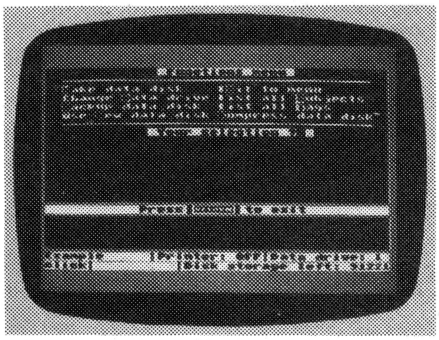
Versions for the Commodore 64, Atari, Apple II and IBM will cost $69.95; and the Macintosh version will cost $89.95.

Conclusion

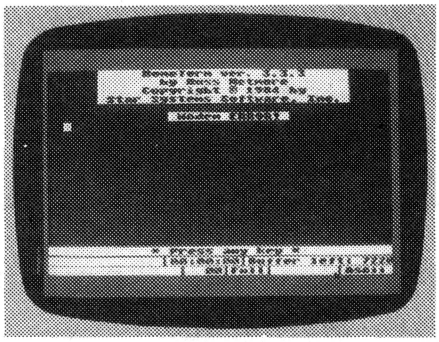
For $69.95 you get an excellent word processor, an unusually friendly yet fairly powerful database, and the best terminal program I've seen for a home micro. Each one of these programs is worth $69.95 by itself — together they represent what can only be described as a bargain. My only criticism is the small amount of memory available to the word processor, but even that is insignificant when you consider its ease of use.

I applaud the programmer's decision to make the program unprotected, and hope that at this price users will buy it in preference to obtaining an illicit copy. If you own a Commodore 64, Atari or Apple micro, Homepak deserves to be part of your software library.

END



The database function menu



The online terminal screen



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Like all man made implements computers and peripherals fail. The most common problems users encounter are disk drive alignment problems, keyboard failure and print head break-downs.

Improvements in the fabrication techniques of chips have resulted in improved reliability and longer service life. However, the trend towards multi-layered printed circuit boards has introduced a fragility to logic and system boards that has made servicing them dicy if not impossible. This has led to manufacturers introducing a board exchange policy.

Usually, a computer fault is simple to diagnose. If it's a mechanical failure in the disk drive or keyboard a service technician will find it quickly. If the power supply is blown, nothing happens when you switch on. If it's a burnt out chip a diagnostic program should tell the technician which chip has failed. It then takes several seconds to replace the faulty chip and re-run the diagnostic program to test the system.

Intermittent faults are the worst, they can be impossible to track down and even harder to have repaired properly. There is nothing more frustrating than having a computer technician look at you quizzically and tell you that your sick computer is performing perfectly, with the implied assertion that you are a twit and whatever is going wrong is user error. Technicians are seldom patient enough to search for a dry solder or cracked cable, or subject the mother board to a hot/cold test to look for a fracture in the printed circuit board. When that happens you have to stick to your guns and insist that they find and repair the fault, after all that's what you're paying them to do.

Service on warranty

When a machine breaks down and is still covered by warranty, it is the customer's responsibility to take the machine to the nearest authorised service agent, usually a retail shop selling that system.

IBM, Apple, Commodore and Tandy dealers are responsible for customer service, even if the computer was not purchased from that store. They should check the machine, find the faulty module and swap it, sending you on your way with minimum delay. The faulty module is sent on to the manufacturer who replaces it. The new part goes into the dealers' spare parts kit. At least that's what should happen.

If the dealer doesn't have the spare part in stock, or the shop assistant lacks the training to be able to diagnose the fault, the machine should be sent to the manufacturer for service. Both Commodore and Apple claim to have a one week turn around time for systems sent in for service, but personal experience has taught me that turn around time is usually two to three weeks, and longer during peak periods like just after Christmas.

"Apple will always repair any Apple product found defective," said Inga Fliedsted, of Apple Australia. "But we cannot be responsible for defects or failures caused by unauthorised modifications or additions of third party products. Multi-layered printed circuit boards and surface mounted devices can be permanently damaged by amateur attempts at modification. Hand soldering processes used to accomplish non-Apple upgrades to the 128k Macintosh jeopardise the integrity of the Macintosh system. In such cases, Apple may find any component affected unacceptable for return or exchange, and Apple's warranty will be void. For the same reason a modified product may not be eligible for Apple Care or our carry-in service program."

So if you have an Apple system that has been modified, don't send it to Apple. You should return to the shop that did the modification and have it replace the faulty component.

IBM refuses to sell spare parts to third party repair organisations. To have an IBM repaired you have to send it to an IBM dealer or IBM authorised service centre, where IBM trained technicians are on hand to isolate the system's faults, replace the faulty modules and get your system opertional with a minimum of fuss.

All IBM dealers are supposed to keep a full range of spare parts and employ an IBM trained technician. IBM is very sensitive about its reputation, the 'trust IBM' syndrome, and dealers who don't maintain standards could theoretically jeopardise their dealership, especially if sales aren't going too well.

Asian manufactured PC clones and Apple compatible systems, have a very poor reputation for reliability and the dealers who sell them have often been criticised for failing to support their systems once the sale has been made. Dick Smith Electronics is an exception to this rule and has a good reputation for servicing the systems it sells.

Most of the service companies I spoke to refuse to handle clones because the volume of units sold in Australia is too small to attract the kind of business they need to justify holding spare parts and



technical documentation. Without these necessities the owners of Asian systems are largely on their own.

Service Contracts

Chapters 9 through seventeen finished. The publisher screaming. The heroine drugged, naked, tied with barbed wire to the hood of a Falcon GTHO, about to be attacked by the whole Commanchero gang when . . .
ZAP, the power supply blows, the screen goes blank.

DEC pioneered the service contract back in the late 1960s. It offered DEC 8-s users a 30 day maintenance service, where the DEC 8-s user would unrack his computer every 30 days, load it into a cab send it to DEC. DEC would send back a fully serviced replacement machine in the same cab. The user would plug in the replacement and would, hopefully, be right for another 30 days. If there were a breakdown, it would be handled the same way.

This pioneering concept was replaced by an exchange board policy with the advent of DEC's minicomputer and dedicated word processors.

"We have a service contract for our 5 year old Decmate 1 and DS 310 word processors," said Tracy Gordon, WP operator at McGraw-Hill. "When something goes wrong, a technician will come out within 48 hours. He'll bring a set of standard spares with him, but if he needs something unusual he'll ring the office for the part to be sent over by courier.

"The technician can usually fix the word processor in one go, but if it's something big, like a drive needs replacing, it can take two days to fix.

"These word processors break down at lease once every two to three months. They would cost a fortune to fix if it weren't for the service contract. I don't know what the service contract costs but I would imagine that it costs more per month than lease payments on new word processors. It would probably make sense to replace them, but we keep on keeping on."

Sparked by intense rivalry between manufacturers and the general downturn in sales, Apple is offering a free extension to its 90 day warranty period. Called Apple Care, this service contract covers all parts and labor for 12 months from the date of purchase. However Apple Care does not cover breakage, neglect, misuse, non-authorised repair, accident, modification (without written approval), improper environment, unusual physical or electrical stress, lightning, static electricity, flood, fire or 'act of God'. If, after taking this bewildering list of exclusions into account, Apple owners are still convinced that the Apple Care package offers value for money, they can purchase a further 12 month warranty extension for $156 for a Macintosh or $162 for an Apple IIe with monitor and drives. Apple Care for a Lisa costs the princely sum of $600 per annum.

IBM has a 90 day warranty, and after that period service contracts are available from IBM or a number of approved service centres. A service contract for a basic 256k XT will cost approximately $900, while a 12 month contract for a PC will cost in the vicinity of $700.

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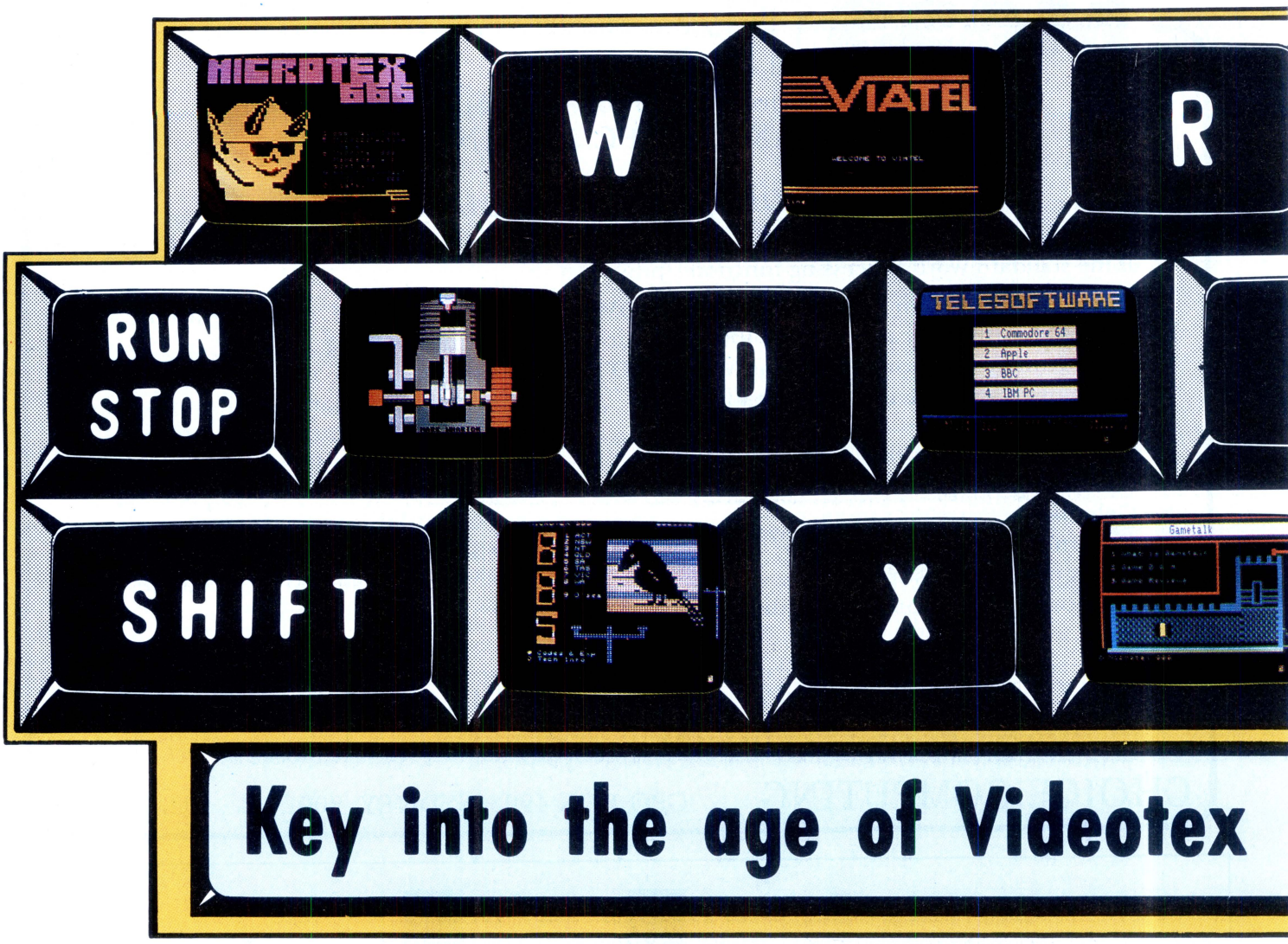
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User Group Board — a comprehensive listing of Australian computer user groups. All user groups are invited to use this section as a notice board to publicize meeting dates, location, agenda and joining details, and to get the club known generally.

Magazine — as a project of Computer Publications (publisher of 'Australian Personal Computer' & 'Personal Computer Games'), Microtex 666 provides *APC* and *PCG* programs and a way of subscribing to each. There will soon be facility for ordering back issues as well as an up-to-date news section sourced from *APC, PCG* and the new weekly, *'Computing Australia'*.

Microcomputing News — provides information on forthcoming exhibitions, conferences and seminars around Australia.

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CB 2051

report on Fox computers, Sonya Humphries of the ABC's Investigators programme has had 22 letters from the public complaining about promised service and backup for systems they have bought.

"Clearly it's a problem," Sonya Humphries, said. "People are getting ripped off. I am sorry for them."

Lothar Zilian of Rotadyne Plastics is a typical example of a customer left in the lurch.

"We bought two Hyperion Portable computers and Lotus 1-2-3 from ComputerLand, Ryde," Zilian said. "We only had the machines for several days when we started having problems. Drive A wouldn't load on one machine. We tried to send the machine back to ComputerLand Ryde for a warranty repair but they told us to send the machine to somebody called Ackerman. He kept the machine for a couple of days then sent it back to us saying nothing was wrong with it. Meanwhile the other Hyperion had become unusable. 'P' and a 'Y' symbol kept appearing on the screen no matter which key you pressed and all data was lost. Four hours of work on Lotus went west. The second machine went to ComputerLand. They tested the machine and said it was OK and that it was the program disk that was faulty. By now the first machine had broken down again and so we sent it back with the program disk. This machine was tested and drive A replaced. They checked the Lotus program disk and said it was OK.

"When both machines broke down again we really did our block. Both machines were returned to ComputerLand and were replaced with two new machines. These new machines never worked properly and ComputerLand could never fix the intermittent problems these machines had.

"After this we gave up, returned the Hyperions to ComputerLand and got a trade in on two IBM PCs.

Lothar Zilian's problem was that no one in this sorry saga was prepared to pay for the cost of the warranty repairs. ComputerLand maintained that the cost should be charged to Hyperion's Australian agent, but that company was in trouble because Hyperion in Canada had gone into liquidation and wouldn't refund the cost of repairs made under warranty. Rather than bite the bullet, the Australian agent wouldn't talk to anyone and so the case of the sick Hyperions dragged on and on.

Law of the jungle

Mr Zilian was lucky in that he could focus his discontent on the dealer who sold him the goods, and force the dealer to give him a trade in on replacement systems. Others haven't been so lucky. The last 18 months have seen a high mortality rate among computer stores, especially the smaller independent suburban outfits which have gone to the wall. When you need a fast efficient repair service — and the computer shop which sold you the machine has become a greengrocer and is selling bananas and coconuts as well as Apples and Apricots — where do you go to get your system fixed?

If the machine is still under warranty, then any dealership that sells similar machines has the responsibility to honor your warranty and will repair the machine for you, but there are some provisos. Both Apple and IBM disclaim responsibility for third party products installed in the system and any modifications made to the system. If there is a defect or failure caused by an unauthorised modification, then the dealer may deem that your machine is unacceptable for return or exchange regardless of warranty. Then your only alternative is to take the machine to a service company that will fix third party products and modified systems. The charge will be up to $80 an hour.

The law of the jungle is alive and well: whenever a company leaves users without support, others step in to provide whatever service the public needs. There are several reputable service companies around that have a long history of servicing business machines and large computers of various sorts and have now stepped in to fix sick micros. There is also a generation of clever technicians who received their training in the service departments of the major vendors, and who have taken the plunge and opened their own repair businesses.

Who's who in the jungle

STC is a national operation with repair centres in all capital cities including Port Moresby in Papua New Guinea.

It started fixing third party computers in the early 1970s when it became Australian agent for a British minicomputer manufacturer, General Automation. STC has a fleet of radio controlled vans and claims an average response time of 2.8 hours. It offers three types of service: on site service, return to base, or casual time and materials. Both onsite service and return to base service are subject to a service contract.

"You will need to keep your machine operating at maximum efficiency," Julie Groves of STC said. "It is therefore essential to be covered by a comprehensive service plan. At STC we can tailor a complete maintenance service program to ensure the proper functioning of your computers at all times. Our comprehensive on site service plan covers parts and labour with regular servicing that can catch any fault that might become a major problem. This plan gives you unlimited remedial calls with priority response. All costs are covered in an annual contract payable quarterly, so you can plan your budget and not be faced with big unexpected repair bills.

"The return to base plan includes the same benefits but the customer is responsible for delivery and pick up, including freight costs. All other costs are covered in our contract fee.

"The casual plan is the same as the return to base plan but the customer is charged on a time plus materials basis, and the customer is responsible for delivery to one of STC's service centres."

STC services IBM, Sirius, Onyx, Panasonic, Mitsubishi Minicomputers, Durango, Apricot, ITT Extra, Courier, Qume, Brother, Epson, Microline, NEC, Centronics and Citoh equipment.

STC is very coy about quoting the costs of its service contracts, especially for publication in a magazine. So call for a quotation.

Hills Computer Service is a national operator with bases in all capital cities and Newcastle. And, yes, Hills Computer Service is part of Hills Telefix, but no, Hills television repairmen aren't the people who fix computers. Hills have seven computer technicians operating throughout the Sydney metropolitan area, and although it doesn't have radio controlled cars Hills claims an average response on the same day for calls placed before midday. Calls placed after then are responded to the following morning.

Hills fixes many brands of micros and printers. The "fix it list" includes IBM PC, Apple (not Macintosh), Commodore, Dick Smith's range, Hitachi, Kapro, Osborne, Pantek, Sharp, National, Columbia, Epson, Citoh, Brother printers and typewriters, most monitors and hard disks.

Hill's has two kinds of service contracts: on sight and return to base. An on site contract for a standard IBM PC costs $380 per annum while the return to base contract for the same system will cost $285. Other examples are an Apple IIe or IIc contract, on site $140-$120, return to base $100 per annum. Hill's casual rate is $80 per hour plus parts.

Control Data was set up in 1960s and is now the largest third party maintenance organisation in Australia. It has a large centre in North Sydney with fifteen

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MEMO TO: BOB KNOWLES,

TONY WARR,

FROM: DENIS GALLAGHER,

SUBJECT: ADVERTISING - DECEMBER

After talking about our advertising plans for AUSTRALIAN PERSONAL COMPUTER for the month of December last night I think we all agree that we did'nt have sufficient time to properly prepare copy and do a professional job.

I'm sure that we dont want to miss the opportunity to get to the readers especially in the Christmas lead up period - and anyway we just have to tell all those buyers out there that:-

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3) To have a happy and safe Christmas!

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Denis Gallagher

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The QL stands for Quantum Leap. Not the most modest claim ever made recently.

But the Sinclair QL has, in the words of the usually less than generous international



press, "...a specification that obliterates contemporary price performance standards."

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Naturally it fits perfectly with standardised printers and other peripherals.

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Behind all this enthusiasm is one simple fact, the Sinclair QL can be yours for just $799.

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It has 128K of memory expandable to 640K, so it grows as your needs grow.

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And because no computer is complete without software, we've included the four most popular home computer programmes – word processing, spreadsheet, database management and graphics – free.

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computer technicians on call, and has offices in all Australian capital cities.

3M Australia — primarily known for its tape and disk products — also provides service on Epson printers, National Panasonic computers, Tallgrass hard disks and OKI-Microline printers. The usual range of service contracts is available, plus the option of pay-as-required maintenance. In addition 3M offers a toll-free hotline for all equipment it services.

Scarlan Computer services is typical of the swag of smaller repair companies started by technicians who have gone into business for themselves.

Armen Gregorian was a ComputerLand technician who started his own company in June 1983. The business has been growing slowly and has just moved into new premises in Drummoyne. Armen now employs three technicians, five sub-contractors and a secretary. His company specialises in Apples and IBMs but is willing to service all makes and models, provided he can get spare parts and documentation. He will also fix printers, floppy drives and popular makes of hard disks.

"People come to us instead of going to computer retailers because we move quickly and are less expensive," Gregorian said. "People like to know what went wrong with their computer, we can tell them because we fix boards when possible instead of automatically replacing them. If it's a fault with the household or office wiring, dirt, or static electricity buildup that's causing the problem, we can tell them because everybody that works for me is a trained technician who knows their way round the innards of a system and can discuss problems with customers."

Scarlan also runs a consulting service for those interested in buying second-hand equipment.

"It's a good idea to bring second-hand equipment in to us for a check up before buying it, if you want to make sure you're getting a good buy. The cost of servicing faulty equipment quickly adds up."

Scarlan offers a service contract for a basic Apple II+ with two drives and an Imagewriter system for $250 per annum. A Macintosh service contract will cost $550. Alternatively, Scarlan will repair systems on an ad hoc basis.

END

Maintenance/repair companies

New South Wales:

3M Australia Pty Ltd
7 Franklyn St, Glebe
(02) 498 9394

Control Data Australia Pty Ltd
221 Miller St, North Sydney, 2060
(02) 923 9000

Computer Maintenance of Australia Pty Ltd
61 Alleyne St, Chatswood, 2067
(02) 406 4744

Datronics Corporation Ltd
376-380 Lane Cove Rd,
North Ryde, 2113
(02) 88 7933

Hills Computer Service
148 Miller Rd, Villawood, 2163
(02) 645 2355

Scarlan Computer Services
Suite 1, 150-158 Victoria Rd,
Drummoyne, 2047
(02) 81 5311 (02) 81 5513

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(09) 327 9511

Datronics Corporation Ltd
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(09) 364 7077

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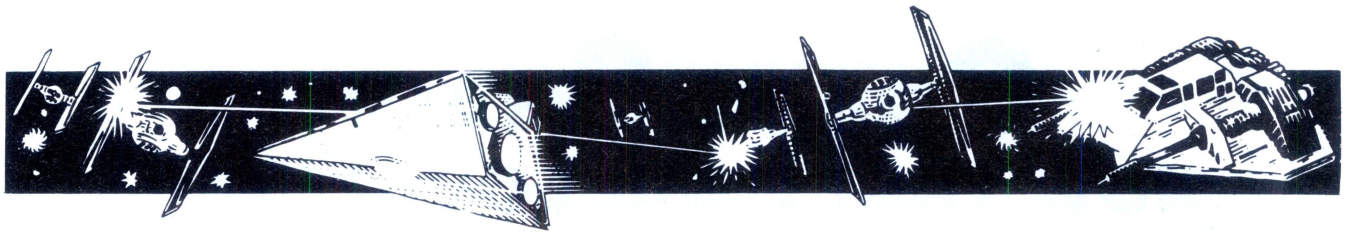
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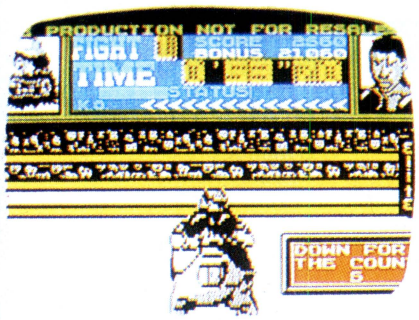
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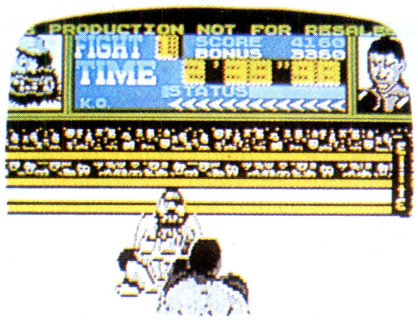
Authorised Apple Dealer

While Stocks Last



With padded gloves and silky shorts, Stephen Applebaum enters the ring to challenge Frank Bruno and suffers mental problems while bouncing on a spring. Just some of the scenarios featured in this month's top games selection for the Commodore 64/128 and Spectrum.





Below the belt

GAME: Frank Bruno's Boxing
MACHINE: Commodore 64, Spectrum
SUPPLIER: Computermate
PRICE: $29.95

Slightly bruised after last month's excursion to the land of the rising sun, I now find myself thrown into a boxing ring, apparently as a challenger for the world title in Frank Bruno's Boxing.

If you've played Punch Out in the arcades, you'll have some idea of what Frank Bruno's Boxing is all about. For those who haven't, it's a game where you control a wire-frame boxer as he fights several computer-controlled fighters, each of which has a very different interpretation of the Queensberry Rules — in other words, they cheat.

Soon after the program has loaded from cassette, a prompt appears asking for the player's initials; that done, the fight can begin. Before you can throw any punches, you have to wait for your antagonist to go through his ritual warm-up. As he goes through his pre-fight callisthenics, you have a chance to see his speciality. In the case of the first boxer, Canadian Crusher, that means a bear hug; on the other hand, Fling Long Chop, the second challenger, wouldn't look out of place in Way Of The Exploding Fist with his fast kicking and lightning movements. There are seven pugilists who have to be faced before the world champion can be taken on.

The graphics used throughout Frank Bruno's Boxing are of a far higher standard than any I have seen in similar games on the Spectrum. During a fight, the player is given a view of the action from behind Bruno's back; this shows Bruno, his opponent, and the crowd outside the ring. Above the main display is a box containing two bars representing the strength of the two boxers. Each time a fighter receives a blow, the bar diminishes, while the opposite happens when he lands one, so the way to knock out a boxer is to bludgeon him until his strength falls to zero.

Frank Bruno's Boxing is as big as the man himself and twice as hard. It'll take a long time for anyone to reach the world champion, and even longer to beat him.

If you want a game that's going to pose a challenge for more than just a few plays, get hold of this one: you won't be disappointed.

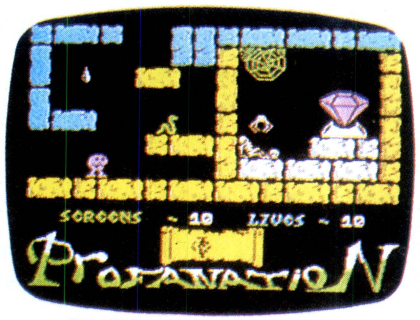
Temple of doom

GAME: Abu Simbel (Profanation)
MACHINE: Spectrum 48k
SUPPLIER: Top-of-the-Chart
PRICE: $29.95

Gremlin Graphics has produced some excellent programs recently and to reflect this, I have included two in this month's Screenplay. First off is the strangely-named Abu Simbel (Profanation).

Somewhat deceptively, the game's cassette inlay sports an Indiana Jones type figure leaping over a grotesquely large spider. In reality, the character featured in Profanation is closer to Q*Bert than Harrison Ford, and hardly comparable to a human in any respect — except, perhaps, for the fact that it has two legs. That aside, Abu Simbel is a high-quality ladders and levels game,and an extremely difficult one to boot.





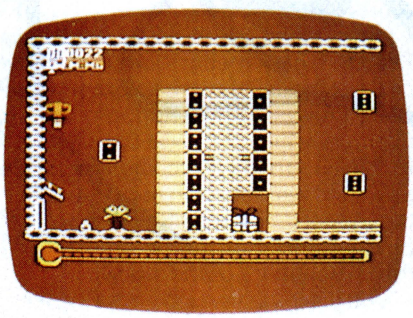
Quite simply, the idea is to enter the

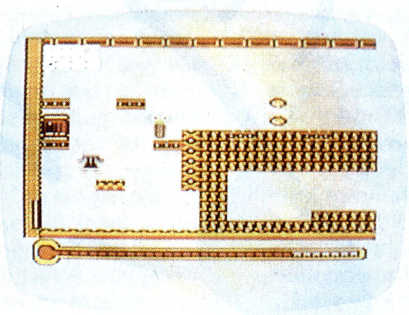
temple of Abu Simbel, built 3000 years ago by Rameses II, and find the treasure hidden within. Prior to your expedition, no one had attempted to explore the temple, put off by the curse placed on it by its creator. It would have been better if you too had heeded the stories, as far from being superstitious nonsense they are all true, and you soon find yourself in a lot of trouble. The only way to break the spell cast by Rameses II is to reach the temple's mortuary chamber and discover its secrets.

Searching the temple takes a great deal of time and concentration, and certainly isn't for anyone who gives up easily: for example, it took me well over 45 minutes to get through the first screen.

The instructions supplied with Abu Simbel are rather sparse, so I'm not sure how many rooms there are to explore. I managed to get through five of them, each of which was garish in its decor and very detailed. Wandering around some of the chambers are well-animated snakes, spiders and bats, all of which are fatal to the touch. Even being splashed by water dripping from the ceiling proves calamitous. As you find yourself bumping into these a great deal, Dinamic, the Spanish company that programmed Abu Simbel, has been kind enough to give you 10 lives to play with. However, if your game skills are as wanting as mine, you'll probably find that not even these are enough.

Abu Simbel (Profanation) is not particularly original but is well-programmed, and a lot of work has obviously gone into the graphics.





Mental Problems

GAME: Thing on a Spring
MACHINE: Commodore 64
SUPPLIER: Melbourne House
PRICE: $24.95

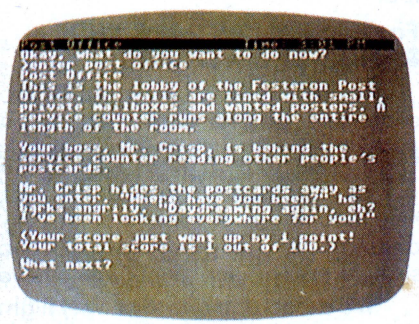
Thing on a Spring is the second of the two games reviewed from Gremlin Graphics, and is by far my favourite. In some respects it is similar to Profanation as once again you have to jump around different levels, exploring lots of trap-laden rooms. However, unlike the former, Thing on a Spring contains several mental problems which give it greater lasting appeal.

Instead of Pharoah's curses and poison spiders, Thing on a Spring contains an evil, megalomaniac goblin who is wreaking havoc on the world from his underground lair. Unless he can be stopped, the planet will be sucked dry of all its wealth and treasures and held to ransom by the subterranean monster.

Apparently, the only one who can save us is Thing on a Spring, a cute little character who bounces around the screen like Zebedee on speed. Before he can kill the goblin, our hero must find nine pieces of a jigsaw which, when assembled, will yield a clue as to how he can be destroyed. While searching the goblin's underground installation, Thing often comes into contact with some of the monster's followers; these dastardly creatures have the fatal habit of rusting Thing's spring to the point of disintegration. Although luckily someone has left cans of oil lying around, so all is not lost.

In play, Thing on a Spring is one of the most amusing and essentially frustrating games I have reviewed in a long time. As well as bouncing around the various platforms of the goblin's factory, there are elevators and moving floors to be negotiated.

It took me a long time to realise that I couldn't use the elevators without first finding a special parcel containing a gadget to allow me to do so. There's a lot more of that kind of thing in this slightly offbeat game.



Not what it seems

GAME: Wishbringer
MACHINE: Commodore 64, Apple
SUPPLIER: Imagineering
PRICE: $59.95 (C-64), $69.95 (Apple).

This is yet another release from the master of the adventure game, Infocom. As usual, this is a text-only adventure with masses of detailed description and lush prose. The game's packaging is also up to the usual standard and includes the game disk, an official postal map of the small, sleepy town of Festeron, a special-delivery letter for the proprietor of Ye Olde Magick Shoppe, a local history release of the Legend of Wishbringer and a mysterious glowing stone. As this is an introductory level Infocom adventure, there is a lot of general information on the company's adventures.

The basic scenario is that you are a daydreaming postal clerk for the local Post Office. Your boss, Mr Crisp (or Corky to the librarian Miss Voss) is a cranky, nasty man who asks you to deliver the special-delivery letter to the Magick Shoppe and hurry up about it. This presents the game's first difficulty, as you need to work out how to pass the uncommunicative gravedigger in the murky and mysterious graveyard full of tombstones and old bones.

Alternatively, you could try to pass the extremely mean, vicious and hungry poodle in the street. When this is done, things start to happen, and you eventually find your way through to the Magick Shoppe where you are greeted by an old woman. She asks you to read the letter to her (which you should *not* have opened until this point — it adds to the atmosphere of the story).

You discover that all is not as it seems in the sleeply little town, and set off to discover the Evil One who has kidnapped the old woman's cat. Who knows what darkness may bring, and why does Festeron look so different in the twilight and the fog? You will have to play the game to find out.

Just remember that all small, quiet towns aren't what they seem — nor is everyone exactly who you imagine them to be. Think of Norman Bates at the sleepy Bates Motel. END



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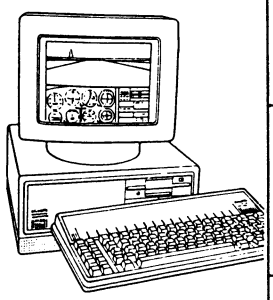
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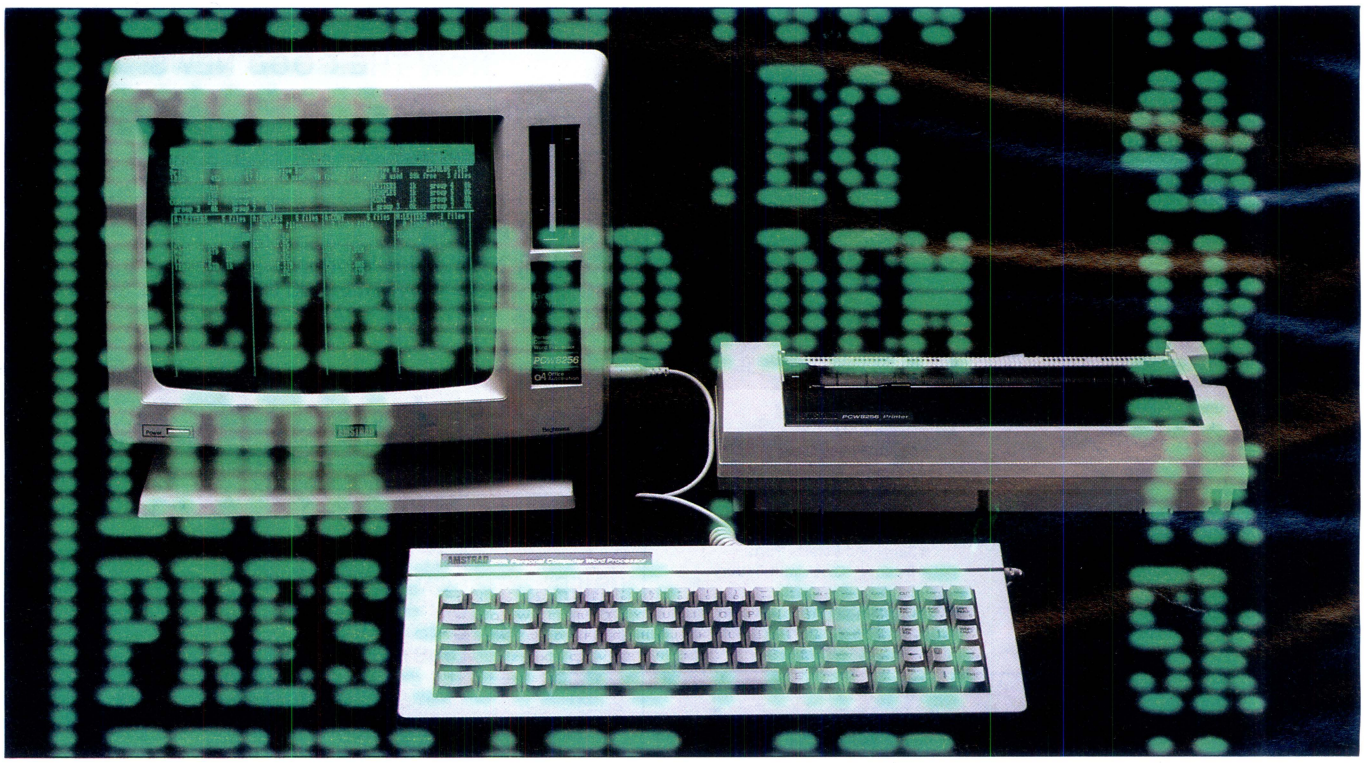
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Amstrad PCW 8256

Amstrad's period of prolific manufacturing continues with the PCW 8256, a good-quality, great-value word processing system that includes a printer in its $1,500 price tag. Is there sufficient support in the 'serious' market to do it justice? Peter Bright conveys his impressions.



Amstrad has always had a reputation for producing cheap, good-value consumer electronics, ranging from music centres through TVs to videos. In the last year or so it has also developed a good reputation with its 464, 664 and latterly 6128 home micros.

Now, with its new machine, it seems to have taken its good-value image to new heights — a word processor with CP/M, a disk drive, 256k of RAM, a monitor, Basic, Logo *and* a printer for under $1,500.

Hardware

The name PCW stands for Personal Computer Word processor. It is made up of three separate units — the main system box, a keyboard and a printer. All three units will be supplied in one large cardboard box much like a domestic TV. Even in the business market, the idea of including a printer in the price of the unit is unusual, and at this price level it is unheard of.

The main system unit houses the monitor, the disk drive and all the electronics, including the power supply. It looks very like a portable television, and I wouldn't be at all surprised if the casings started out as an Amstrad portable TV. It also sits on what looks like a tilt/swivel stand except that the review model didn't tilt or swivel.

Most of the front of the main unit is taken up by the monitor screen. To its right are spaces for either one or two disk drives mounted vertically. The usual configuration is for the machine to be supplied with one disk drive in the top slot, with the bottom slot containing the PCW badge.

The back of the machine is quite bare: all it houses are power-in, a special Amstrad printer interface, and an edge connector onto the main PCB. There is also a 24-volt power-out socket to drive the printer.

The edge connector exists primarily because Amstrad will be offering an RS232/Centronics parallel printer module which will plug into the edge connector and slot into a recess on the back



The PCW's separate keyboard is a change of style for Amstrad

panel of the main unit.

The final interface on the main system unit is a DIN socket on the side panel for the keyboard lead.

You get inside the PCW in the same way that you would get inside a television — remove the screws and take off the back panel. Most of the internal space is taken up by the monitor tube and high-voltage electronics. The digital section consists of just one surprisingly small PCB. My initial reaction to this PCB was how small it is and how few components it uses. It has been totally redesigned, and uses significantly fewer components than either the 464 or the 664.

The main PCB contains a total of 17 chips. Of these, eight are 256 kbit RAM chips and another five are TTL drivers for the printer interface; this leaves just four chips to do the serious processing. These consist of a 4MHz Zilog Z80 processor, an 8041 printer controller chip, an NEC 7658 disk controller, and a large dedicated gate array. In addition there are sockets for another eight RAM chips, although Amstrad says that it has no intention to fill them.

Although the Z80 processor can usually only access 64k of RAM, the PCW makes full use of its 256k by bank-switching sections of RAM. This is usually handled by the CP/M Plus operating system.

You may have noticed that the above list doesn't include any ROM chips. This is due to the PCW being without any ROM as such — everything is loaded off disk. In order to do this you obviously need some kind of disk bootstrap loader, so Amstrad has used the 256 bytes of mask ROM available on the 8041 printer controller to squeeze one in.

The gate array is interesting in that it is mounted above a hole cut in the middle of the PCB, with its legs spanning the gaps on all sides between it and the main board. The result looks odd but is apparently easy to align for manufacture.

The low component count coupled with the fact that the PCW is manufactured in the Far East and then shipped over, means that the system is probably cheaper to produce than the 464.

The system has been designed to work with either one or two disk drives. Initially, Amstrad will be shipping each unit with one 3in 170k disk drive; an extra drive can be fitted at a later date if required. Amstrad also plans to sell a 1Mbyte (720k formatted) double-sided, double-tracking 3in disk as an extra to fit into the spare disk space. This should be available later this year.

As I have stated, it is unusual for a computer manufacturer to include a printer in the price of the machine. Amstrad hopes that one of the PCW's main selling points will be its word processing capabilities, so it follows that a printer is a good idea.

The printer casing matches the appearance of the rest of the system, and looks like a fairly standard 80-column dot-matrix unit. In fact, true to Amstrad's style, the printer is as basic as it can be while remaining capable of doing its job.

Most printers contain a processor and ROM to hold the character fonts, as well as control electronics for a Centronics printer interface. Amstrad buys in the basic printer mechanism without any control electronics at all; all printer control is done by the printer controller in the main system unit. This extends right down to telling the pins on the print head when to strike, which means that the only electronics necessary for the printer itself are a few TTL drivers to interface it to the main unit. The printer interface is non-standard and achieved via a short length of ribbon cable.

The advantage is that it makes the printer cheaper to produce. This economy even extends to ditching the Online, Line-feed and Form-feed buttons that are usually found on printers; these functions are accessed under software control from the main unit.

In use, the printer is very good considering it's free. It can handle both friction-fed and sheet-continuous stationery. The tractor feed unit clips onto the top of the printer and is driven via a gear from the roller. A nice feature is that if you are using single-sheet paper, the printer will automatically roll the paper so that it is aligned at top-of-form as soon as you pull out the bail bar; this saves you having to rotate the roller by hand. Our office typewriter does this, but I've never seen a computer printer do it.

Two type qualities are offered: draft which is fast; and high-quality which is slow but very good in terms of type quality. This obviously isn't up to daisywheel standards, but I wouldn't be ashamed of it. The printer can also reproduce graphics from the screen, either by using the built-in graphics dump routine or by using the GSX drivers supplied. The pin patterns for the letters are all stored on disk, so theoretically you should be able to create your own typestyles. However, unfortunately they are stored in a compacted form and aren't too easy to get at.

As previously mentioned, all printer control is achieved via software from the main unit. If you are in the word processor, you can control all the printer's functions from there; but if you are in CP/M or a generic applications program, you can use the key on the keyboard marked 'PTR'. When you hit this key, a printer control menu is displayed on the last line of the main display. Using the '+' and '—' keys, you can set and unset on/off line, top-of-form, line-feed and form-feed, toggle high-quality/draft print, toggle on or off the paper-out detector and reset the printer. These functions are very easy to use when you remember that you have to control the printer from the keyboard rather than by pressing buttons on the printer.

Overall, I was impressed with the printer. It is slightly slower than modern dot-matrix printers, but the quality can be good and it's free.

Unlike previous Amstrad machines, there is no choice of display with the PCW — a monochrome green screen is what you get. No colour is available.

The display is built into the main sys-

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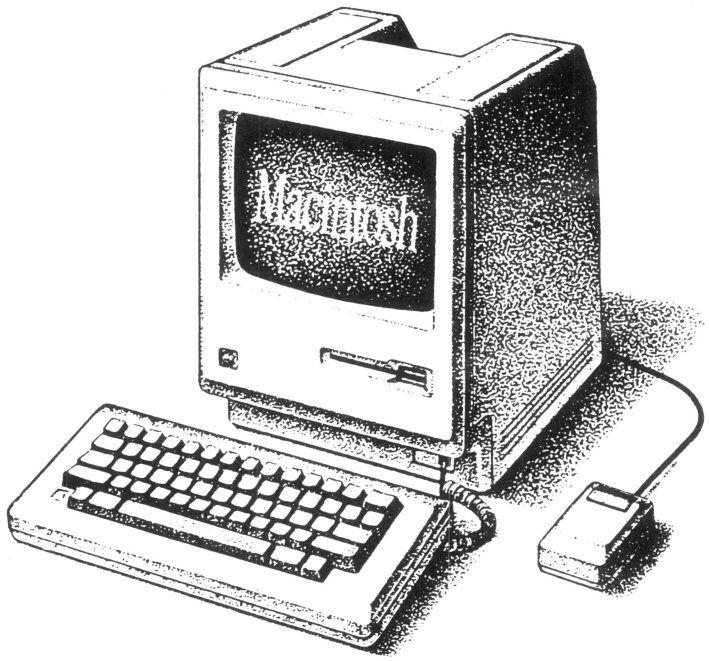
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The disk drives: a 720k disk drive is available as an optional extra

tem box; in fact, it *is* the main system box. At 14 inches the display tube is larger than average, but like other Amstrad systems it is based on television technology. This means that the display quality isn't up to pukka monitor standards, but is still quite good. I had no trouble using the screen on the review machine, although a lack of shielding on the pre-production unit did cause some display surge. My main worry was that the tube had no anti-glare coating, and consequently could be hard to read when facing a window.

As it uses a large 14in tube, Amstrad can fit more characters on the screen than usual. Most systems have 80-column by 25-line displays; the PCW has 90 columns by 32 lines, which gives 50 per cent more characters onscreen than usual. This extra size can be useful: in the word processor, for example, you can extend the number of words displayable onscreen.

Some CP/M programs can also be configured to take advantage of this extra room — I saw a version of SuperCalc 2 which managed to display more cells onscreen than it normally did. For CP/M programs which can't use the larger display, Amstrad supplies an 80x25 screen driver. The system is also supplied with Digital Research GSX graphics interface software, and can display graphics at a resolution of 720 x 256 pixels.

The display is OK rather than wonderful. It isn't as good as a standard monitor, but it's better than a 464 monochrome display. The larger size can be a real benefit for spreadsheets or word processing.

The PCW is a departure for Amstrad in that its previous machines have included the keyboard in the main casing; the PCW comes complete with a separate keyboard connected to the main system by a long length of cable and a DIN plug.

The keyboard unit has its own processor which scans the keys and sends the codes down the serial link.

If the keyboard were a house, it would be condemned for overcrowding: a total of 82 keys are fitted into the very small unit. It's easier than usual to hit the wrong key until you become accustomed to the layout.

Many of the keys are dedicated to the word processor. This gives the whole unit a strange appearance by computer standards, but it makes the keyboard a lot easier to use. The main qwerty typing section takes up most of the space to the left and centre of the unit; to its right are four function keys marked f1 to f4, and shifted to give f5 to f8. To the right of the function keys are the cursor/numeric/word processing keys. Many of these keys have more than one function, but none has more than two — the keyboard is so cramped, there is no space between the different functional areas.

Due to many of the keyboard legends being customised for the word processor, they may not make immediate sense under CP/M. Two examples of this are the control key which is marked ALT, and the escape key which is marked EXIT and which has been moved from its traditional top-left position to the right of the space bar.

One feature which I did like was the SHIFT LOCK key. Firstly, this key has a LED built in so that you can tell when it's engaged. Secondly, unlike most computer keyboards, the PCW's is disengaged either by hitting it again or by hitting one of the SHIFT keys — just like a typewriter.

Some compensation for the confusing legends under CP/M is that the keyboard is 'soft', so you can set a key to return any character code. Under CP/M, you can set up different keyboard definitions and store them on disk, then call them in with a suitable applications program. This is useful, as it makes it easier to set up special keys such as cursor control and editing so that they work with normal CP/M programs.

It is also useful because the system has an extended international character set which gives over 200 characters; these are usually accessed via the EXTRA key. Some of these characters are quite useful: for example, the symbol to raise a number to a power isn't on the normal keyboard legends — it is accessed by hitting EXTRA-U. Some users might want to redefine key sequences such as this.

The overall feel of the keyboard is very light, although the key action felt good enough. The main problem, as I have said, is that the keys are so close together you can easily hit the wrong key by mistake, but my mistake rate fell as I became familiar with the unit.

System software

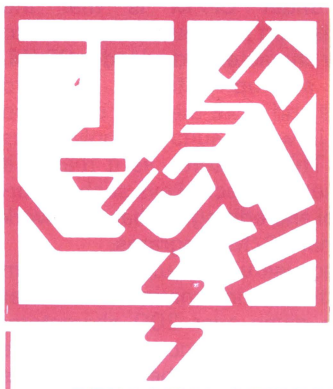
The PCW's main operating system is Digital Research's CP/M Plus (or version 3, as it is sometimes called). The only exception to this is the word processor, which doesn't use CP/M but goes straight to the hardware. The word processor does, however, use CP/M file structures, so word processor data is available under CP/M and *vice versa*.

CP/M Plus was specially developed for the new breed of Z80 8-bit machines which use more than 64k of RAM, and is much nicer and more powerful than its more popular brother, CP/M 2.2. The main advantage of CP/M Plus is that it can handle bank-switching of RAM. The Z80 processor can only directly access 64k of RAM; to handle more memory than this, you have to switch different areas of RAM into the Z80's line of vision.

Having said that, CP/M Plus on the Amstrad doesn't directly access all the available RAM. Of the total 256k, 116k is set aside as a RAM disk; as far as the operating system is concerned, this is just a very fast disk designated drive M. Of the remaining RAM, 61k is given to the transient program area (TPA), and the rest is occupied by the basic input output system (BIOS), the basic disk operating system (BDOS), the console command processor (CCP) and the disk hash tables.

Having the BIOS, BDOS and CCP in RAM is useful in that it allows you to load

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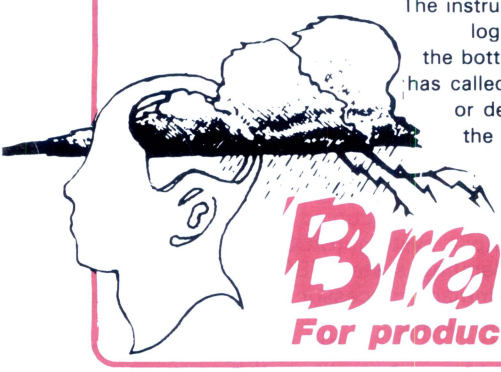
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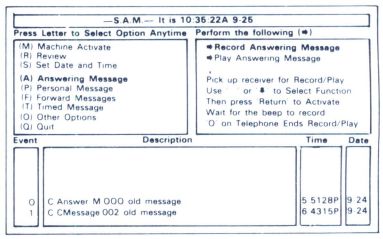
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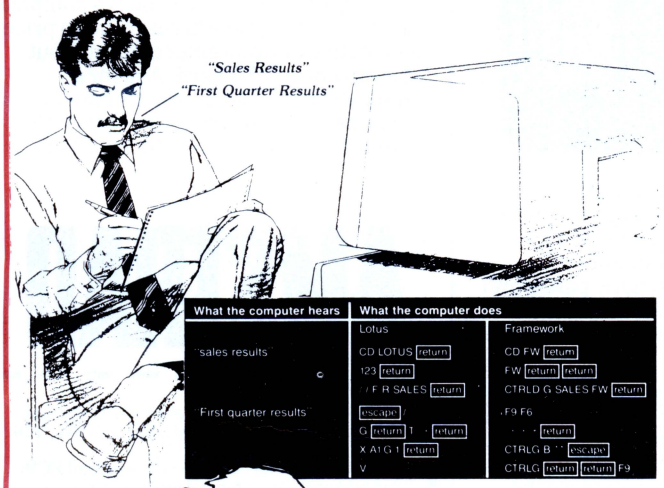
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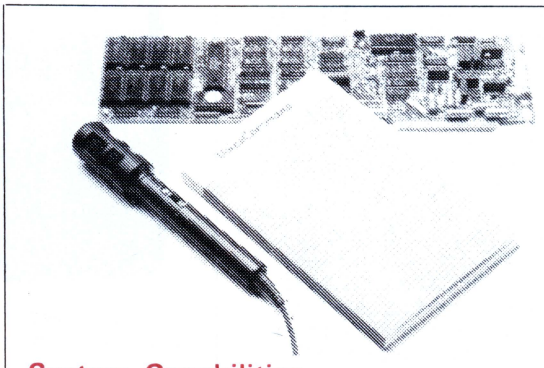
Voice commands, spoken into a standard microphone, activate the computer just as if they were entered on the keyboard. Voice and keyboard commands may be used at the same time, allowing you full control of all aspects of each program.

Easy To Install

VoiceCommand enables speech recognition capabilities to be added to any application without requiring changes to the application.
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Microphone — The microphone is installed by plugging the connection cable into the VoiceCommand board.

Easy to Train

It is easy to train your computer to understand the spoken word. Three to four repetitions of the spoken vocabulary constructed for each application produce a workable set of reference patterns.
It is easy to learn to use VoiceCommand because there is no complex command code. Non-technical users may define their own vocabulary.



System Capabilities

- 32,000 word vocabulary
- 500 word instant-recognition segments
- Standard microphone jack
- Compatible with MS/DOS and PC/DOS software
- Discrete utterance recognition
- Four levels of control for various types of speakers and/or microphone sensitivities
- Multiple Users

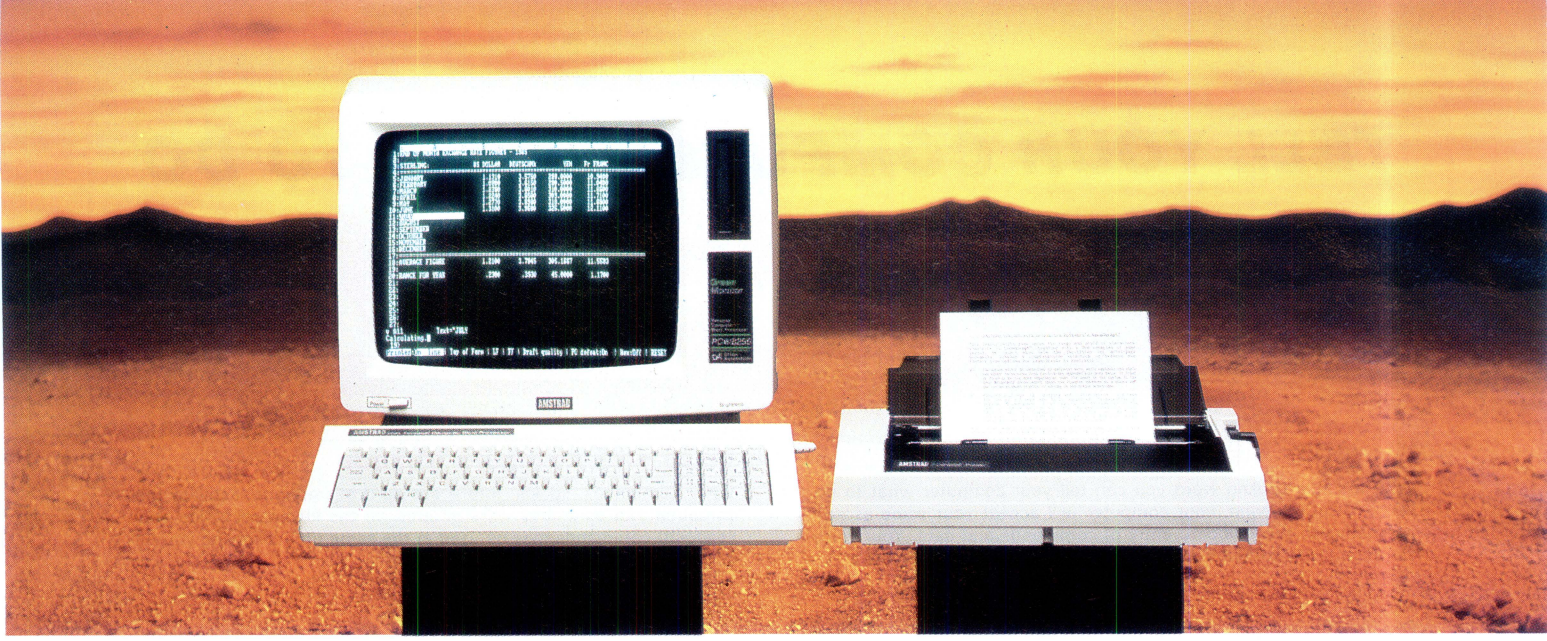


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Amstrad PCW 8256

Sets new horizons in personal computing and word processing.

Everything about the new Amstrad PCW 8256 has been designed to simplify and speed up personal and business computing and word processing.

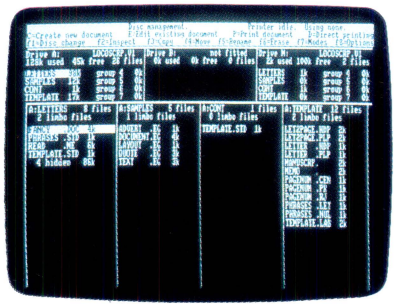
The screen has 40% more usable display area than even an IBM PC.† The keyboard has keys specifically dedicated to word processing functions. The computer is fully programmable to make CP/M* software such as spreadsheets, databases and communications easier than ever to use. The printer has a self-loading mechanism for single sheet use and a tractor mechanism for continuous feed stationery. And the convenient 3″ discs are supplied in tough, protective cases to withstand business wear and tear.

A complete business package for under $1500

The Amstrad PCW 8256 is a complete business package which includes:

- High resolution green screen monitor.
- Built in disc drive.
- 82 key keyboard.
- 256K RAM Computer.
- LocoScript wordprocessing built in.
- Fully integrated printer with numerous high speed draft and letter quality options.
- CP/M Plus* with GSX and Dr LOGO.
- Additional microprocessors for keyboard and printer control.
- Mallard BASIC with Jetsam.
- Expansion capability.

*Registered Trade Mark of Digital Research
†IBM PC is a registered Trade Mark of IBM Inc.



The built-in LocoScript word processing software is amongst the most powerful available and includes such features as pagination, simultaneous editing and printing, automatic paragraph realignment, automatic document editing and reforming and simple cut & paste editing.

The CP/M Plus* operating system gives you access to over 8,000 commercial applications programs, and with the Basic, Dr LOGO and GSX Graphics Extension programs supplied, you can explore the full capabilities of microcomputing and even experiment with writing your own programs.

You can prepare sales forecasts. Perform "what if" calculations on budgets and cashflow projections. Sort database records. Teach yourself to type. Or use Amsoft's fully integrated ABC accounts system to keep track of invoices, stock and debtors (requires additional disc drive unit).

The printer provides a choice of letter or draft quality, with built-in features such as pitch, italics, bold face, underline, super and sub script. And, with its optional serial interface, the whole system becomes a versatile and very cost effective "intelligent" terminal on mainframe installations, either by direct connection or via a modem.

The Amstrad PCW 8256 is a complete business package at a breakthrough price, distributed and guaranteed throughout Australia by AWA-Thorn. Ask for a demonstration at leading computer shops and department stores today, or post the coupon below for further information.

AMSTRAD

TPB/679

Post to: AWA-Thorn Consumer Products Pty. Ltd.
348 Victoria Road, Rydalmere, NSW 2116.

Please forward information on the Amstrad PCW 8256 personal computer and word processor.

Name: _____

Address: _____

_____

_____ Postcode: _____

AWA-THORN
Broadening your horizons

the system disk just once — subsequent disks don't require these routines to be present as they are in RAM.

The 61k TPA is the area of RAM which is actually available to an applications program. At first sight it might seem that 61k out of 256k isn't that good, but in fact it is more than enough to run all the popular CP/M applications programs.

Installing PCW CP/M applications programs has been made as simple as possible. One of the usual problems is working out the screen control codes in order that the program will work with your display. The PCW gets around this by putting a DEC VT52 terminal emulator between the applications program and the screen hardware, so as far as the application is concerned, it is talking to a DEC terminal.

The same thing has been done with the printer. Instead of running direct to the hardware, the printer is shielded by an Epson emulator, so you set the application to think that it is talking to an Epson matrix printer. This is all very neat.

In use, the PCW implementation of CP/M Plus is very nice indeed. The only slight low point is when you first boot up. I mentioned in the Hardware section that the bootstrap loader on this machine has been squeezed into 256 bytes of mask ROM in the printer controller. As it is such a tight squeeze, there is no room for any fancy boot-up screens or any error messages.

When the machine is first switched on, the screen lights up. When you insert a system disk, the machine displays horizontal lines down the screen while the system is booting. If there is an error, the screen will flash or the system will bleep. You can force a re-try by hitting the space bar.

When CP/M is booted, it looks around the hardware to see what is there and what isn't, and adjusts itself accordingly. If you have the option serial/parallel card plugged into the back, CP/M will set itself up so that you can access it using the usual device names. The same is true if you have a second disk drive fitted.

Disk drives are nicely handled on the PCW. Even if you only have one disk drive, CP/M is set up so that two virtual drives, A and B, are mapped onto the single physical drive so you can pretend to be copying from drive A to drive B. The system automatically tells you when to swap disks. The name of the current virtual drive is displayed in the bottom-right corner of the screen.

CP/M Plus has so many improvements over CP/M 2.2 it's difficult to list them. The most useful are that you no longer have the dreaded CP/M 2.2 BDOS ERROR ON A type error — you now get an MS-DOS style Retry, Abort or Ignore? error; and there is usually no need to hit CONTROL C to tell CP/M that you've changed a disk in a drive. These both make CP/M Plus much easier to use.

Other enhancements for CP/M Plus include date-stamping of files, password protection and an enhanced DIR command which tells you everything except how many kbytes you have free on disk. It also has a full online help facility which explains how the commands work. I loaded this onto the RAM disk for fast access when I was stuck.

Applications software

If you're going to sell a machine as a word processor, it's obviously a good idea to include word processing software. In the case of the PCW, this software is known as LocoScript. As the name suggests, it has been written by Locomotive Software which writes or converts all Amstrad's system software. LocoScript was written by Locomotive specially for the PCW, but it does intend to convert it for other systems soon.

Although the version which I saw was pre-production and had a few features missing, it is obvious that LocoScript is a very powerful word processor. One of its advantages over a generic word processor such as WordStar is that as it was written for the PCW, it can take full advantage of the hardware, different printer pitch settings, and so on.

The general user interface of the word processor is to use pull-down menus in conjunction with the function keys and the dedicated word processor keys on the keyboard. Initially I found the system intimidating, mainly because the display is cluttered and some features are hidden a few levels down. When I became accustomed to the way it works, I had few problems.

When you first boot up the word processor, you are greeted by the file control menu. This is the most confusing and cluttered display on the system as it has to display a great deal of information.

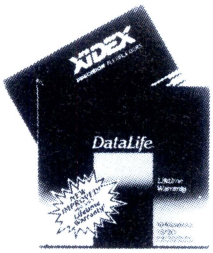
LocoScript stores its document files in one of eight 'groups'. Each group has a template associated with it, and each time you open a new document, data from the group template is copied into the new document. This can be useful if you generate a lot of standard letters: you could have one group called 'Letters' which puts your address at the top, another called 'Memos' which sets up the memo format, and so on. When you delete a file, it is moved to a holding area and is only physically deleted if the system needs the disk space, so you stand a good chance of being able to recover accidentally deleted files.

```
Keyboard is very crowded with no gaps between the different
functional groups.

Front of main unit - large screen, on/off button, one vertically
mounted 3 inch drive. Space for another below taken by PCW
badge.
PCB totally different from 464,664 and 6128 No ROM just 256 byte
bootstrap  masked on the printer controller chip.
```

Fig 1 Example of printout

Christmas extravaganza!



5¼" FLOPPY DISK SPECIALS!

XIDEX	1-9	10+
S/S D/D Cat C12401	$31.00	$29.00
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VERBATIM DATALIFE		
S/D D/D Cat. C12501	$27.95	$26.95
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3½" XIDEX DISKETTES!

Yes, that's right, we now have 'hard to get' 3½" diskettes!

Cat. C12600 S/S box of 10 **$65.95**
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DELUXE 5¼" DISK STORAGE UNIT

Features...
- Clear smoked plastic lid
- Diskette fan display system elevates the disks for easy identification and access.
- Lockable lid (2 keys supplied)
- High impact plastic base
- 45 diskette capacity

Cat. C16050 **$49.50**



5¼" DISK STORAGE

Efficient and practical. Protect your disks from being damaged or lost!

Features...
- Smoked plastic cover
- Lockable (2 keys supplied)
- High impact ABS plastic base.
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Cat. C16020 **$29.50**



MINI DISK STORAGE BOX

Holds up to 30 x 5¼" diskettes.

Cat. C16020 **$16.95**



COMPUTER CASSETTES

Quality 20 minute tapes.

Cat. D11141

1-9	10+	100+
$1.50	$1.40	$1.20



CICADA 300

- 300 baud
- Provides full 12V bipolar output signal
- Direct connect modem
- Full duplex operation

(Phone not included)

Cat. X19101 **NOW $179**



RITRON MULTI PURPOSE MODEM

Our New RITRON Multi Purpose Modem has arrived and has all the standards you require.
Just check the Ritron's features:

- CCITT V21 300 Buad Full duplex
- CCITT V23 1200/75
- Bell 103 300 Full duplex
- Bell 202 1200 Half duplex
- Auto answer, auto disconnect.

Telecom Approval No. C84/37/1134

$379

1200/75 BAUD RATE/BIT CONVERTER

For computers not capable of split baud rates. Buffers characters at 1200 and converts to 75 baud

Cat. X19105 **$99**



MODEM PHONE

Check the features and the value for money of this stylish new modem phone...
- Auto/Manual Answer, Manual Originate, Auto Disconnect.
- Speaker Phone with Built-in Amplifier for Detecting Busy Signal during communication.
- Carrier Detect Indication.
- 20 Memories (each with 18 Digits Capacity) for Auto-dialing.
- BELL 103 CCITT V21 Compatible.
- 300 BPS Full Duplex.
- Last Number Redial.
- Pushbutton Keyboard.
- Volume High or Low Control.
- "In-use" Dialing Indicator.

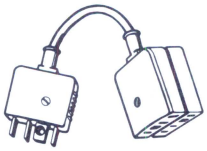
Cat. X19105 **only $174**
(Not Telecom approved)



TELEPHONE EXTENSION CABLE UNIT

Allows 15 metres of telephone extension cable to be neatly wound into a protable storage container. The reel sits on a squared off base and the reel has a handle to wind cable back on to it after use. No tangles - no mess! Ideal for the workshop, around the house, office, pool etc

Cat. Y16013 **$24.95**



TELECOMMUNICATION PLUG TO 2 SOCKETS.

Ideal for modem connections.

Cat. Y16014 **$12.95**

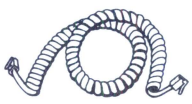


TELECOMMUNICATION EXTENSION LEADS

Cat. Y16010 5 metre **$12.50**
Cat. Y16012 10 metre **$14.95**

NEW PHONE PLUGS & SOCKETS

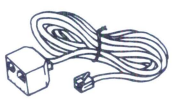
We hear on the grapevine that all future installation will use the U.S.A type of plug and sockets for communication lines.



TELEPHONE CURL CORD

- U.S. plug to U.S. plug
- Replacement hand set cord
- Length 4.5 metres
- Colours: cream, dark brown.

Cat. Y16022 **$7.95**



TELEPHONE EXTENSION CABLE

- U.S. plug to U.S. socket
- Length 10 metres
- Cream colour cable

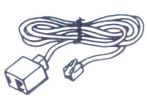
Cat. Y16024 **$8.95**



TELEPHONE ADAPTOR

- Australian plug to U.S. socket
- Length 10cm
- Cream colour cable

Cat. Y16026 **$6.95**



TELEPHONE EXTENSION CABLE

- U.S. plug to 2 U.S. sockets
- Length 10 metres
- Cream colour cable

Cat. Y16028 **$10.95**

RS232 GENDER CHANGERS

- Saves modifying or replacing non-mating RS232 cables by changing from male to female to male
- All 25 pins wired straight through



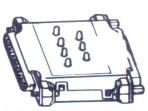
Male to Male

Cat. X15650 **$19.95**



Female to Female

Cat. X15652 **$19.95**

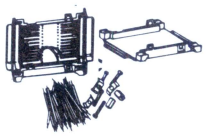


RS232 MINI TESTER

- Male to female connections
- All pin wired straight through
- Dual colour LED indicates activity and direction on 7 lines
- No batteries or power required

T.D. Transmit Data
D.S.R. Data Set Ready
R.D. Receive Data
C.D. Carrier Detect
R.T.S. Request to Send
D.T.R. Data Terminal Ready
C.T.S. Clear to Send

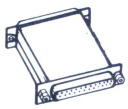
Cat. X15656 **$39.95**



RS232 MINI PATCH BOX

- Interface RS232 devices
- With male to female 25 pin inputs
- 25 leads with tinned end supplied
- Complete with instructions

Cat. X15654 **$25.95**



RS232C NULL MODEM ADAPTOR

- Male to female connections
- Pins 2 and 3 reversed
- All 25 pins connected

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COMPUTER LEADS

We have a wide range of computer leads available, all at very reasonable prices!

APPLE:
- Apple II, IIe, II+, with parallel interface card
- Dual 10 pin (20 contacts) connector to Centronics 36 pin plug
- Length 2.4 metres

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IBM
- IBM PC, XT, and look alikes with 25 pin "D" plug on computer end to Centronics 36 pin plug on printer end.
- Length 2.1 metres

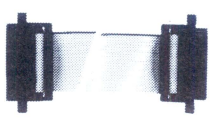
Cat. P19029 **$34.95**

TANDY
- For models II/12/16/16B/2000, with dual 17 pin female on computer end to Centronics 36 pin plug on printer end. (Equivalent to 26-1323)
- Length 2.4 metres

Cat. P19027 **$29.95**

- For models I/III/4/4P, with 34 pin edge connector on computer end to Centronics 36 pin plug on the printer end. (Equivalent to 26-1401)
- Length 2.4 metres

Cat. P19028 **$32.50**



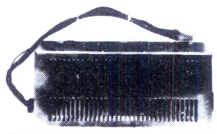
READY MADE CABLES

Serial to serial. 2 m

Cat. P19011 **$24.95**

Parallel centronics to centronics. 2m

Cat. P19013 **$29.95**



QUALITY SWITCH MODE POWER SUPPLY FOR APPLES

INPUT: AC. 240V
OUTPUT: DC. +5V. 5A +12V. 4A
DC. −5V. .5A −12V. .5A

Cat. X11095 **$139**



130W IBM COMPATIBLE SWITCH MODE POWER SUPPLY

DC output: +5/13A, -5V/0.5A
+12V/4.5A -12V/0.5A
AC input: 240V AC +−15% 1.5A
47Hz - 63Hz

Cat. X11096 **$239**



180 CPS PRINTER! KAITEC KAI 180 EX

Standard 80 column Dot Matrix Printer. High quality printing by NLQ mode. 3K Buffer. High-speed, low-energy consumption 9 wire dot head allows 180 characters per second.
Logic seeking printing or incremental printing with high response, stepping motor. Use of fan-fold, roll or cut-sheet paper is possible with adjustable sprocket pin feed and friction feed. Both fixed and proportional character pitches are available. Emphasized and double print modes are possible. 9 graphic modes are available. 8 language international character font internalized.

SPECIFICATIONS:
Printing Type: Impact Dot Matrix
Maximum Printing Range: 203mm
Print Types: ASCII 96 Others 7 language
Character Format: Character Mode Standard 9 x 9 dots
NLQ 18 x 20 dots Graphic Mode
Printer Modes: (a) Fixed pitch mode (b) Proportional pitch mode
Character Size: 2.42(H)x 1.99(W)
Printing Speed: 180 Character per sec. (pica)
Paper Feed Method: (a) Adjustable sprocket pin feed paper width 4-10 inch (pull through) (b) Friction feed paper width 4-8.5 inch
Interface: Parallel interface 8-bit parallel (Conforms to Centronics)

Cat. C20020 **Only $499**



BX RANGE OF PRINTERS!

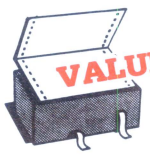
BX 100 ..... **$370**
BX 130 ..... **$440**
BX 130W (15") **$595**



PRINTER RIBBONS

CP80, BX80, DP80, BX100, MB100

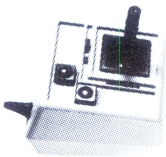
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Top quality at a very affordable price! Blank 11 x 9½", 2,000 sheet, quality 60 gsm bond paper.

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JOYSTICK FOR IBM

Features Selectable "Spring centering" or "free floating". Electrical trim adjustments on both axis. 360 degree cursor control

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APPLE JOYSTICKS

Ideal for games or word processing. Fits most 6502 "compatible" computers.

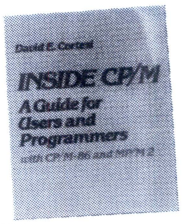
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COMPUROBOT

Simply key in a list of commands to the amazing Compurobot and watch him go about performing even your most complex manuevers - up to 48 steps! Forward, backward, left/right turn, left/right curve, robot noises, flashing lights and a multi speed gearbox!

Cat. **$49.50**



INSIDE CP/M

A Guide for users and programmers with CP/M-86 and MP/M2, by David Cortesi.
This book is both a guide and a reference manual for CP/M, an operating system for small computers. The book has two sections. The Tutorial presents the basics of the management, use, and programming of a small computer and CP/M. In the Reference, CP/M information is organised for quick access by programmers and users.

$41.95



THE 'C' PROGRAMMER'S HANDBOOK

This handbook is an introduction and a reference to the C programming language, both for beginning and experienced programmers. C is a general purpose language featuring economy of expression, and modern flow control and data structures. Concise structure and fast execution make C the ideal language for applications and system-level programming.

$27.50



DESK MOUNTED LAMP MAGNIFIER

This unit magnifies any object under a clear cool fluorescent light. The magnification is the maximum obtainable (lens 127mm diameter biconvex 4 Dioptres, focal length 254mm) consistent with minimum distortion and eyestrain and good off-angle viewing. It is NOT cheap, but then again it will definitely last a lifetime. It is built like a Rolls Royce! Spare fluoro tubes are available from electrical outlets. If you have trouble with fine PCB work or component identification but still want both hands free, this is for you.

TECHNICAL INFORMATION
Illumination: 22W Fluoroscent
Weight: 81.6Kg
Lateral Extension: 254mm
Vertical Extension: 254mm
Fixing: Heavy table base (grey) with two chrome plated flexible arms.

Cat. C92700 **$179**

Something for everyone!



MITSUBISHI DISK DRIVES

MF353 (3½" DRIVE)

Double sided, double density, 1 M/Byte unformatted, 80 track per side.

Cat. C11953 **$280**

MF351

3½" Standard size disk drive. Single sided, double density.

Cat. C11921 **$225**

M2896-63

Slimline 8" Disk Drive, Double sided Density No AC power required. 3ms track to track, 1.6 Mbytes unformatted, 77 track side 10s/su10 bit soft error rate.

Cat. C11916 **$550**

Case & Power Supply to suit

Cat. X11022 **$159**

M4854

Slimline 5¼" disk drive. Double sided, double density, 96 track/inch, 9621 bit/inch, 1.6Mbyte unformatted 3ms track to track access, 77 track/side.

Cat. C11904 **$350**

Case & Power Supply to suit.

Cat. X11011 **$109**

M4853

Slimline 5¼" disk drive, Double sided, double density, 1 Mbyte unformatted, 3ms track to track, 80 track/side, 5922 bits/inch.

Cat. C11903 **$260**

M4851

Slimline 5¼" disk drive. Double sided, double density 500K unformatted, 40 track/side. Steel band drive system.

Cat. C11901 **$199**

Case & Power Supply to suit

Cat. X11011 **$109**

M4855

Slimline 5¼" disk drive, double sided, double density, 96 track/inch. 2.0 Mbytes unformatted.

Cat. C11905 **$385**



ADD ON HARD DISK DRIVE FOR IBM

Includes disk controller card. Available and installed free only at our city store.

Cat. X20010

10 M Byte **$1,395**

20 M Byte **$1,550**



APPLE* COMPATIBLE SLIMLINE DISK DRIVE

Japanese Chinon mechanism

Normally $225 **This month $185**

(*Apple is a registered trade mark.)



KEYBOARD AND CASE

A stylistic low profile case to give your system the professional look it deserves. Comes with an attached encoded, parallel output keyboard and provisions for 2 x 5¼" slimline disk drives.

Cat. X11080 **NOW $199**



"IBM TYPE" COMPUTER CASING

Give your kit computer a totally professional appearance with one of these "IBM type" casings, includes room for 2 5¼ inch disk drives and connection ports. Dimensions 49x39x5cm.

Cat. X11090 **$119**



APPLE COMPATIBLE CARDS!

PRINTER CARD

"Grappler" style card allows hi-resolution screen dumps to your Epson compatible printers. Fully functioned for flexible flow of output.

Cat. X17029 **$89**

80 COLUMN CARD

Ideal for use with CP/M. Your computer becomes capable of upper and lower case, with a full width screen of 80 characters. If you want to run Wordstar, or any good wordprocessing software, get this card.

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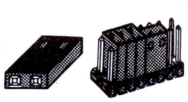
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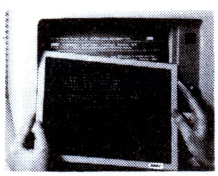


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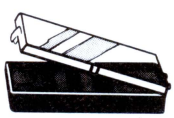
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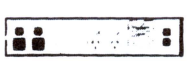
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- Ideal teacher or strong opponent.
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- 1,000 hours play with 3AA batteries.
- Optional mains adaptor available.
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- Player vs. player mode, thinks on opponents time, built in opening library.
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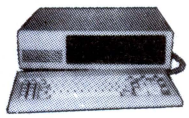
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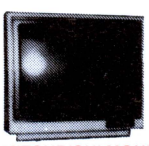
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About 100 different 5¼" disk formats are supported, including Kaypro, Osborne, Tandy and Microbee, but not Commodore or Apple.

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DISK No.

CP1 **GAMES.** Twelve menu-driven, compiled games, including an excellent one that prints bio-rhythm charts, a clever horse race, and a space trader programme for the wheelers and dealers.

CP2 **GAME.** A 191k version of Adventure, the classic game which can absorb your attention for days at a time. This is a 550 pt version with an expanded cave and smarter creatures.

CP3 **GAMES.** More fascinating games to absorb time you can't spare — such as a six level chess game, Othello, a well-written multi-level version of Pacman and an extensive Wumpus adventure game.

CP4 **GAMES.** Some outstanding games written in Mbasic, with source. Includes golf, a hunting game (like space invaders) called Duck where the ducks fight back, and a super adventure game where you can choose your personal strengths. Also contains a keyboard translator like Smartkey.

CP5 **GAMES.** Written in Turbo Pascal, with the source code provided so you can see how it's done.

CP6 **GAMES.** More games in Turbo Pascal, with source.

CP7 **GAMES.** A further five games in Turbo Pascal, with source.

CP21 **UTILITIES.** A whole heap of useful programmes to catalogue your files, arrange the directory display, make emergency alterations to the disk, allow printing and computing at same time, count words, print the screen, copy better, erase, unerase, delete, make batch commands, etc.

CP22 **ZCPR.** The famous replacement for CP/M with fancy tricks that will keep you from returning to CP/M. Has source coding so that it can be adapted to various computers. There's a 45k manual on disk.

CP23 **Z80 MACRO ASSEMBLER.** The syntax closely follows RMAC and MAC. A bargain at a fraction of their cost.

CP24 **Z80 ASSEMBLER.** This is a first class version of the Crowe assembler which has been upgraded. Uses standard Zilog mnemonics. There is also a programme which allows you to link multiple files at assembly time.

CP25 **Z80 DISASSEMBLER.** Includes DASM, an easier to use version of ZZSOURCE, and XLATE, a very good 8080 to Z80 translation routine. Source and documentation are included.

CP26 **DIAGNOSTIC AIDS.** Routines designed to test memory and exercise drives. Set up for Kaypro but source is included for adaptation to other machines. Each test is documented.

CP27 **UTILITIES.** Examples of structured programming in basic. Includes an excellent screen to printer dump, enhanced directory display and games such as HANGMAN, MATHS, and MASTERMIND. Compiled versions are on disk also.

CP28 **UTILITIES.** A super collection of some of the best uitilies available, such as NEWSWEEP, NULU (file library), SUPERZAP and VDO-KP (editor).

CP41 **WORD-PROCESSING UTILITIES** for improved editing and formatting. Aids pretty printing, shortening a file, multiple space outputs, add tabs, remove white space, etc. Written in C and source coding is provided.

CP42 **TYPING TUTOR.** A comprehensive typing tutor for all grades of typists. Has been customized for popular ADM3A terminal such as used by Kaypro and may need minor adjustment for other terminals. Source included.

CP61 **MX80 PRINTER GRAPHICS.** A comprehensive graphics package for those with Epson MX-80 printers and look alikes. Includes sample files.

CP81 **LANGUAGE — FORTH.** This is the famous F83, which adopts the latest Forth standard. Has built-in editor, compiler, etc.

CP82 **LANGUAGE — SMALL C COMPILER, VERSION 2.** Inexpensive way of learning to use C. A published handbook is widely available.

CP101 **COMMUNICATIONS. TURBO PASCAL BULLETIN BOARD.** A complete bulletin board package that has been highly praised by users.

CP102 **COMMUNICATIONS. MDM730.** A popular and widely used system. Easily adapted to different machines. Source code and extensive documentation is included.

CP121 **ACCOUNTING. PERSONAL CHEQUE BOOK AND FILE LIBRARY.** Two major programmes are contained on this disk —one to keep track of your cheque payments (in categories) — the other to group related files on your disks.

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M2 **GAMES.** Fifteen Pascal games with source code. There is also a musician programme so that you learn about music while you write songs and a programmer's calculator which shows the internal workings of stack, memory, and registers.

M3 **GAME. ADVENTURE.** You guessed it, the original classic written in C with source.

M21 **UTILITIES.** These are essential and include file maintenance superstars like SWEEP and WASH as well as library and squeeze/unsqueeze programmes. Lots of them.

M22 **UTILITIES WITH ASSEMBLER/DISASSEMBLER.** Has a ramdisk programme, print while you work spooler, wordstar converter, as well as assembler/disassembler.

M23 **UTILITIES.** Make life easier for yourself with programmes like Util, Z, Vtype, ST, Protect, Unprotect.

M41 **WORD PROCESSOR.** Considered at least as good as the commercial programmes. Contains PC-Write and Roff4, with manuals. For editing and formatting.

M81 **LANGUAGE. FORTH.** This is F83, the latest standard, with built-in editor, compiler, etc.

M101 **COMMUNICATIONS. MODEMS.** Two major communication programmes— QMODEM and KERMIT.

M102 **COMMUNICATIONS. SINGLE-USER BULLETIN BOARD.** Source included.

M103 **COMMUNICATIONS. MULTI-USER BULLETIN BOARD.** A very capable system.

M104 **COMMUNICATIONS. SOURCE FOR MULTI-USER BULLETIN BOARD.**

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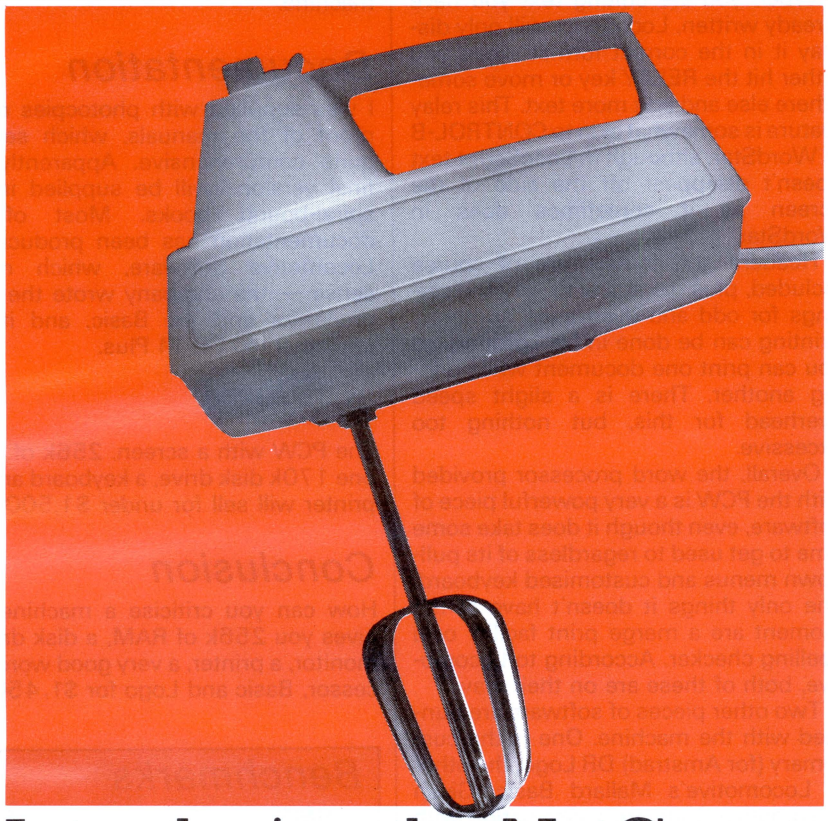
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a page break, for example.

Unlike some word processors, LocoScript wordwraps both up and down: most word processors can't move a word back once they have wrapped it into the line below. This feature is especially necessary for proportional spacing, where it is possible that a short word could have been fitted into the previous line.

When you are editing text you have already written, LocoScript will only display it in the correct format when you either hit the RELAY key or move somewhere else and edit more text. This relay feature is somewhat akin to CONTROL-B in WordStar, although in LocoScript text doesn't disappear off the side of the screen as it sometimes does in WordStar.

Headers and footers are of course included, plus the ability to vary the settings for odd and even page numbers. Printing can be done in background, so you can print one document while editing another. There is a slight speed overhead for this, but nothing too excessive.

Overall, the word processor provided with the PCW is a very powerful piece of software, even though it does take some time to get used to regardless of its pull-down menus and customised keyboard. The only things it doesn't have at the moment are a merge print facility or a spelling checker. According to Locomotive, both of these are on their way.

Two other pieces of software are bundled with the machine. One is the customary (for Amstrad) DR Logo, the other is Locomotive's Mallard Basic. Given Locomotive Software's fascination with the railways, I assume Mallard Basic is named after the old steam trains rather than a duck. Either way, it has been around for a long time on business machines and is well-respected. It is totally compatible with Microsoft Basic-80, so Microsoft Basic programs should run with no problems.

The original ROM-based Basic in the Amstrad 464 is a subset of Mallard Basic with operating system extensions. The Benchmarks show that the speed is respectable for an 8-bit machine.

One nice feature of Mallard Basic on the Amstrad is that it incorporates sophisticated file-handling routines, including a B-Tree algorithm.

With regard to generic CP/M 8-bit software, the PCW should run almost anything. I saw WordStar, dBasell, SuperCalc 2, Multiplan Cardbox and Friday! running quite happily on the machine.

Documentation

I was supplied with photocpies of the proof of the manuals, which seemed quite comprehensive. Apparently, the final versions will be supplied in two spiral-bound books. Most of the documentation has been produced by Locomotive Software, which makes sense — the company wrote the word processor and the Basic, and it also implemented CP/M Plus.

Prices

The PCW with a screen, 256k of RAM, one 170k disk drive, a keyboard and the printer will sell for under $1,500.

Conclusion

How can you criticise a machine that gives you 256k of RAM, a disk drive, a monitor, a printer, a very good word processor, Basic and Logo for $1,450.

END

Benchmarks

BM1	1.1
BM2	3.8
BM3	9.9
BM4	10.1
BM5	11.0
BM6	19.1
BM7	30.3
BM8	33.9
Average	14.9

All timings in seconds. For a full listing of the Benchmark programs, see End Zone.

Technical specifications

Processor:	Zilog Z80 4MHz
RAM:	256k
ROM:	None to speak of
Keyboard:	82-key semi-dedicated word processor layout
Display:	90 x 32 green screen
Mass storage:	170k 3in disk built in
I/O:	Amstrad printer interface; optional RS232/Centronics card
Operating system:	CP/M Plus
Bundled software:	LocoScript, DR Logo, Mallard Basic

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384K	836.00	955.00
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384K	1050.00	1260.00
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The hidden meaning

Data encryption need not be exclusive to tales of spying and espionage — it can be a way of protecting your networked data from prying eyes. Yoel Silver describes the methods involved for a micro, using algorithms and a cipher program.

With the interconnection of single computers into local area networks and the interconnection of local networks to form large inter-networks, computer systems are gradually replacing the traditional forms of communication. Electronic mail is on the increase, and even small firms are now using the medium for the transmission of sensitive material.

No-one can manually police the millions of bits of data that are daily being transmitted along the network channels of the world. The potential for eavesdropping is enormous: wiretapping is far more common that most people realise. When satellite transmission is used, the data is available to anyone who wishes to go to the trouble of erecting an antenna to listen. Clearly some kind of encryption is needed to make sure that the message is intelligible only to those for whom it was intended.

Networks require the user to give a password when logging on; this password must be verified before the user is allowed access to the network facilities. If he is using the network to access an online service, that service too will require the presentation of a password. The password must travel along the communicating channel in order to be received by the remote machine. Moreover, on large systems involving distributed databases, the information required for verification of the password may be held on a remote computer on the other side of the network. The local computer sends a verification request to the remote machine and waits for a reply before confirming or denying access. The original password may therefore travel many hundreds of kilometres along network channels before being verified. Anyone listening in gets the password for free!

Increasingly large computer networks are using encryption to code the data transmitted along their channels. This procedure, known as data link encryption, is a requirement of the system, not of the user. The packets sent along the channel will be enciphered by the sending computer and then deciphered by the remote host. All of this is transparent to the user, the entire process being carried out without his knowledge or participation.

Algorithms

End-to-end encryption actively involves the user. A message is prepared for transmission by first encrypting it according to an encryption algorithm; it is then transmitted in the normal way. In order for the receiver to understand the message, he must first decipher the received data using the same algorithm. Typically, the algorithm used will require the use of a key. If the key is known, deciphering the data is a trivial task. Without the key, you will have a hard time trying to unravel the nonsense that the algorithm produces. By restricting knowledge of the key, data security can be preserved.

The business of creating efficient and foolproof algorithms for encipherment of the data is what data encryption is all about. This activity was prevalent long before computers came onto the scene. In fact, computers make the data encryption game that much harder to play as their computational speed can be utilised in the cracking of codes whose complexity would otherwise be unmanageable. For example, suppose you have a password that consists of five alphabetic characters. The number of possible passwords is approximately 12 million, an inordinate number of combinations for a human cryptanalyst. On the other hand, a computer that could investigate one possible combination every microsecond (a reasonable speed) would take only three hours to exhaust the possible combinations, so on average it would take only 90 minutes to crack any password.

Computers have advantages for the cryptographer as well. Using a computer, the tedious task of coding and decoding data can be done automatically: it becomes simple to switch from one coding algorithm to another.

Encryption methods

Historically, encryption methods fall into two camps: substitution ciphers and transposition ciphers.

In a substitution cipher, each letter of the text is replaced by another letter to disguise it. If this is done in a systematic way, then anyone who knows the system can retrieve the original text by operating the substitution in reverse. For example, we could replace every letter by the letter three letters along on the alphabet, so 'a' becomes 'd', 'b' becomes 'e', 'y' becomes 'b', 'z' becomes 'c', and so on. The word 'computer' would be enciphered as 'frpsxwhu'.

This rather simplistic method can be generalised so that each letter is shifted by a different amount, and the amount by which it is shifted is given as a key. For example, if the key is 'dog', then the first letter of the text will be shifted by four letters, the second letter by 15 letters, the third letter by seven letters, and the fourth letter by four letters again (Fig 5).

The key is laid along the original text to produce the ciphered text. Each letter of the original text is shifted by the appropriate amount to produce the ciphered text. The reverse process will reproduce the original text but only if you know the key, otherwise rubbish is produced. The longer the key that is employed, the more difficult it is to crack the code. If the key is longer than the text itself there will be no possible repetition, making the task almost impossible.

This is the basis of the 'one-time pad' used so successfully during the second world war. The key to be used is a page of text from a book. The person who is decoding the text merely has to know from which letter of the book to begin his

decipherment (naturally this was a closely-guarded secret!).

A further stage in substitution ciphers is not to code single letters but combinations of letters, digrams or even trigrams. This is equivalent to using an alphabet of 26 x 26 letters, with each possible digram combination being considered as a different letter.

```
100 '   Cipher:  Translates plain text to cipher text using substitution method
110 '
120 GOSUB 340              Inits
130 '
140 PRINT "Processing ... "
150 WHILE NOT EOF(1)
160    BYTE$=INPUT$(1,1)
170    GOSUB 240
180    PRINT#2, BYTE$;
190    WEND
200 CLOSE 1
210 CLOSE 2
220 PRINT "done"
230 END
240   '   Process byte
250 DELTA = ASC(MID$(CIPHERKEY$,KEYBUF,1))
260 IF MODE$ = "D" THEN DELTA = -DELTA
270 BYTE= ASC(BYTE$) + DELTA
280 IF BYTE < 0 THEN BYTE= BYTE + 256
290 IF BYTE > 255 THEN BYTE= BYTE - 256
300 BYTE$ = CHR$(BYTE)
310 KEYBUF = KEYBUF + 1
320 IF KEYBUF > LEN(CIPHERKEY$) THEN KEYBUF = 1
330 RETURN
340 ' Inits
350 KEYBUF=1
360 CLS
370 PRINT "Cipher Program"
380 PRINT
390 PRINT "Enter input file name ";
400 INPUT INFILE$
410 PRINT "Enter output file name ";
420 INPUT OUTFILE$
430 PRINT "Enter encyption key ";
440 INPUT CIPHERKEY$
450 OPEN "Input", 1, INFILE$
460 OPEN "output",2, OUTFILE$
470 PRINT "Enter mode (C)ode or (D)ecode ";
480 INPUT MODE$
490 IF (MODE$ <> "C") AND (MODE$ <> "D") THEN GOTO 470
500 RETURN
```

Fig 1 The cipher program

The feature of substitution ciphers is that they preserve the order of the original text, which can be a great help to anyone wanting to break the code. Transposition ciphers, on the other hand, reorder the letters in a systematic fashion but do not diguise them. The key to the cipher is a word or phrase not containing any repeating letters. The purpose of the key is to number the columns; column one being under the key letter closest to the start of the alphabet, column two the next closest, and so on (Fig 6).

Cipher research

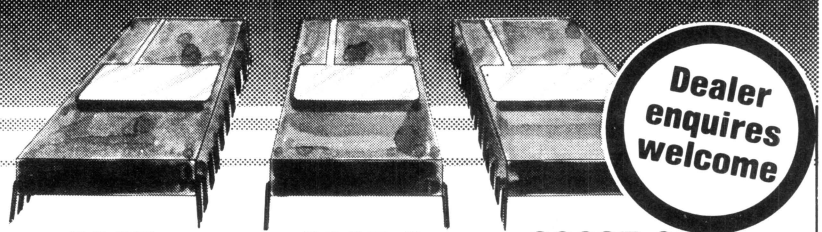
As previously stated, the advent of computers has greatly eased the task of anyone wishing to break an enciphering code. You will therefore not be surprised to learn that much effort has been given to devising algorithms for encipherment that even a computer would find difficult to break. Perhaps 'difficult' is the wrong word to use: the only real form of defence against an ardent code-breaker is to make sure that even with the fastest computer at his disposal, it would take an inordinate amount of time to even come close to breaking the code. Of course, with advancing technology this barrier is forever being crossed, but if an algorithm can generate a mean solution time of the order of millions of years with the fastest-known computer, you should be safe for a while.

There are two research efforts that are important to mention in this connection, as they probably point the way to the methods and standards that we will all be adopting in the not too distant future. They are the Data Encryption Standard and Public Key Cryptography.

In January 1977 the US government adopted a product cipher developed by IBM as its official standard for unclassified information. This is now known as the Data Encryption Standard. The algorithm is a mixture of substitution and transposition ciphers in series with one another. By including a sufficiently large number of substitutions and transposition, the output can be made to bear little functional resemblance to the input. This is important, as anyone in possession of a piece of ciphered text, even a large piece, should not be able to make educated guesses as to the form of the input (for example, the occurrence of spaces within the text or the recurrence of certain words such as 'the', 'and', and so on). This is particularly a problem if the source of the text is known to be, say,

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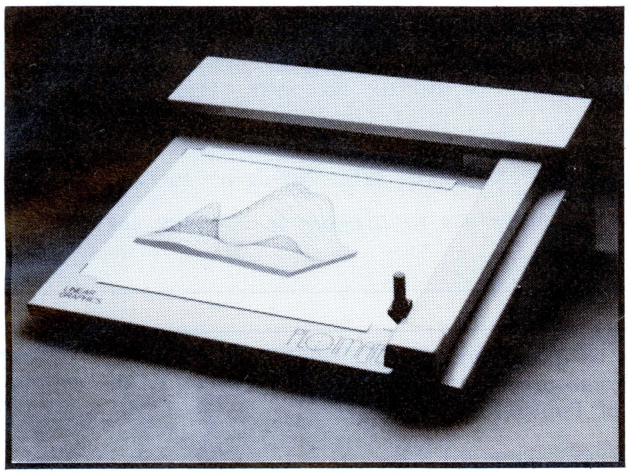
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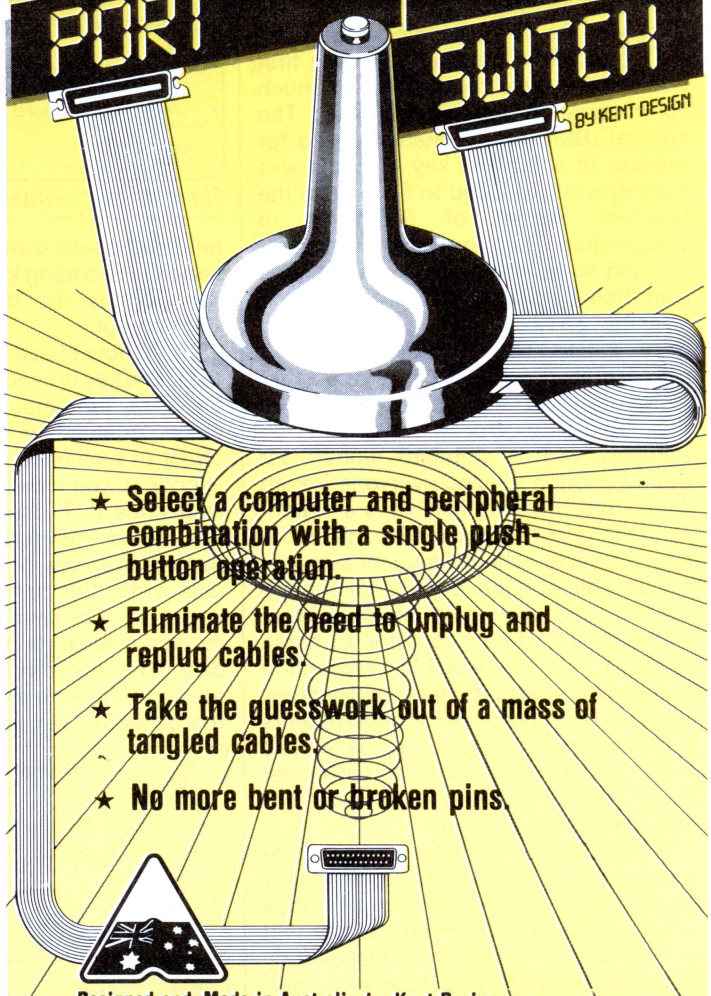
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a financial transaction. The would-be spy would expect to see certain words or phrases repeating themselves often — million, dollar, Federal Reserve.

Controversy

The Data Encyrption Standard has become widely adopted in the US. Most chip manufacturers now sell chips dedicated to implementing the algorithm, and they are becoming cheaper all the time. When the standard was first published it was the subject of much controversy in academic circles. The original IBM implementation called for the use of a 128-bit key, but this was subsequently reduced to 56 bits by the National Bureau of Standards in Washington. There was also an incident that led some observers to the conclusion that publication of research into stronger versions of the algorithm was being stifled. The net effect of a short key, secret design principles and other factors has led some critics to believe that the US Government might not be unhappy with a standard cipher just strong enough to keep everyone except itself from breaking it. This is a significant charge when you realise that in the near future, telephones may contain micros capable of digitising and encrypting speech, and mail may be sent electronically from home terminal to home terminal. If unbreakable encryption ciphers were used in these applications, it would be impossible for governments to tap phones surreptitiously and read electronic mail, this being an activity that many modern governments feel that they cannot do without.

If two people wish to communicate using the Data Encryption Standard prior to the communication of any data, they must previously decide on the key that will be used for coding and subsequently decoding that data. This involves the setting up of a separate communications channel (letter, word of mouth, courier) for the transmission of the key. This has significant disadvantages. The security of the key is of the utmost importance, and it is not a good idea to have to communicate this every time you wish to send encrypted data. The more times you distribute the keys, the greater the likelihood that their security will be compromised. It also makes it very inconvenient to communicate with people with whom you have never previously communicated.

Before any transmission of data can take place, you must go through the tedious and time-consuming process of sending the keys for the decipherment of the data you want to send. It would be much better if the communication channel itself could somehow be utilised to send the decoding keys in a secure manner. This is the basis of Public Key Cryptography.

```
9YT  U`fOYk  af]MWF^  f[cb  Lb\`XS UW IVRa[[ [\^ Tc\ZJSeb a] W
M]eV iaOSL eWW jkIgmZhcZNT_ \Wk^VX  pZhV  G ZXVa elfW`bVX YK^p
EWW  i[Ziee  cT  ZMJ  V]U`fOYk^Y\Z NX dcai[K  ilZbU  ZMJ  fbWi
i\di]]SJ KN]T `XcL" MYY ^XTLcP_  Y[N]gd  Vg VWT^_f`dN haV iaKW
K`a f_[ Pbifh TOQJ _P_\" [\^ `ibVZY  WX^\  dHa^z hVK PJj ca Y[
\g^U  U\J YMV \a[[ q YgTcRK TW UTUfZL" Be  hVKS  IZbbcW`g  mYY
[KXXRVW vFYc\VYaYNSXn  i__Sgm  e\S  VWTTTej_U[  hW hVK KN]T [j
[_Y\fhSJp <YT` k^L cnedcZ KN]T ZXi  IY^_  gO\JI e^ f_[ JikcY\Z
KN]X`^ i`gmVa bNJ RVbeX]L s=`bSe NX UXegbHm^U U\J  YMV _df]YUf
VbRYp
```

Fig 2 An experimental message

Up to now I have tacitly assumed that the same key is used for both coding and decoding the data. With a substitution cipher, instead of adding a particular offset to a character of data in order to encode it, you would subtract the offset to decode it. Possession of this single key would therefore enable anyone to decode the data or to encode his own data with the same key. Public key encryption uses two keys, one for encoding and a separate one for decoding the data. The encoding key can be made public for anyone to use, but as long as the decoding key was kept secret, no-

Letter	%freq	Letter	%freq
A	7.15	B	1.22
C	3.90	D	4.26
E	12.99	F	2.50
G	1.94	H	3.99
I	8.50	J	0.05
K	0.20	L	3.55
M	2.62	N	6.74
O	7.29	P	2.09
Q	0.14	R	6.51
S	7.73	T	9.93
U	2.63	V	1.12
W	1.18	X	0.30
Y	1.35	Z	0.01

Fig 3 Typical frequency distribution for standard English text letters

```
100 '   LetterFreq:  Given a file, computes the frequency of letters
110 '
120 DEFINT A-Z
130 GOSUB 170              ' Inits
140 GOSUB 230              ' Compute
150 GOSUB 360              ' Display
160 END
170 '   Initialisation Procedure
180 CLS
190 DIM LETTERS(26)
200 PRINT "Enter file name ";
210 INPUT FILENAME$
220 RETURN
230 '   Compute Procedure
240 PRINT "Processing ..."
250 OPEN "Input",1, FILENAME$
260 WHILE NOT EOF(1)
270    BYTE$=INPUT$(1,1)
280    COUNT = COUNT + 1
290    IF (BYTE$ >= "a") AND (BYTE$ <= "z") THEN BYTE$= CHR$(ASC(BYTE$)-32)
300    LOCATE 5,5
310    PRINT "Character count : "; COUNT;
320    IF (BYTE$ >= "A") AND (BYTE$ <= "Z") THEN

                LETTERS(ASC(BYTE$)-65) = LETTERS(ASC(BYTE$)-65) + 1
330    WEND
340 CLOSE 1
350 RETURN
360 '   Display Procedure
370 CLS
380 PRINT "Letter   Freq   %Freq            Letter   Freq   %Freq"
390 FOR I = 0 TO 25
400     PRINT "   "; CHR$(I+65);"      " USING "####"; LETTERS(I);
410     PRINT "   ";
420     IF LETTERS(I) <> 0 THEN PRINT USING "##.##";LETTERS(I)/COUNT * 100;

                        ELSE PRINT "      ";
430     IF (I AND 1) = 0 THEN PRINT "            "; ELSE PRINT
440     NEXT I
450 PRINT
460 PRINT "total characters = "; COUNT
470 RETURN
```

Fig 4 The Letfreq program

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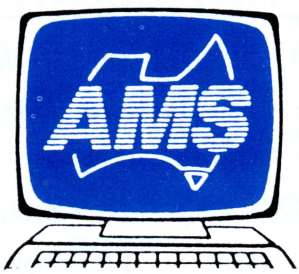
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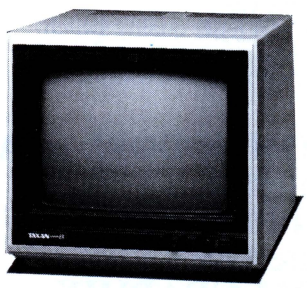
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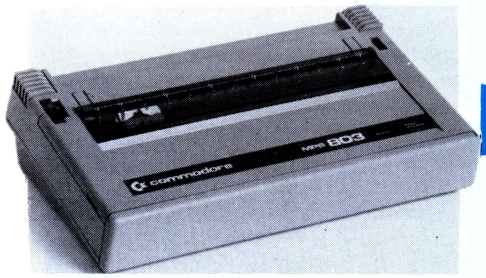
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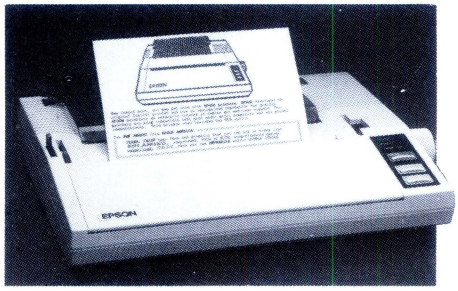
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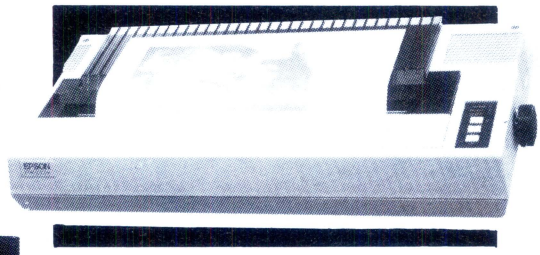
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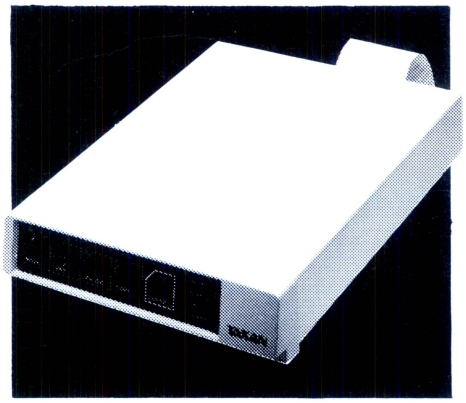
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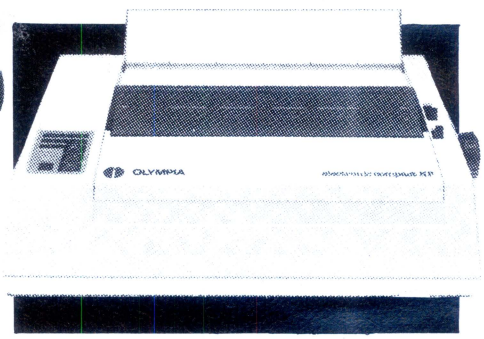
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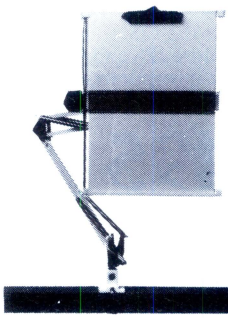
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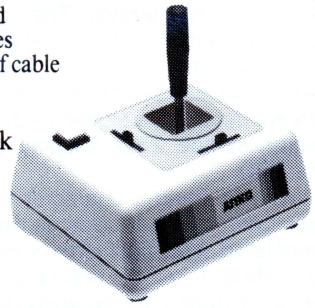
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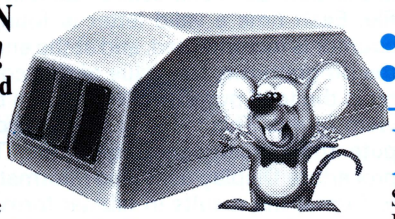
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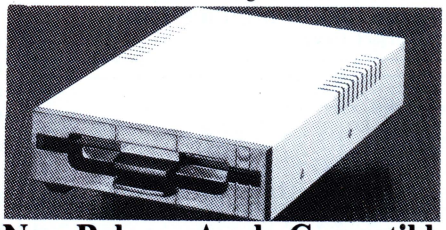
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one would be able to decode any data that was intercepted. For example, if user A wishes to communicate with user B he sends B a message, encoding it using B's public key. When B receives the message he decodes it using his own secret decoding key, and may send a reply using A's public key. At no stage in the exchange does B have to communicate his decoding key to A.

The fundamental idea is very simple; the difficult part comes in trying to find an algorithm that would meet the requirements of the situations. We require a decoding algorithm which, when applied to coded data, reproduces the original data, but at the same time a decoding key which is not derivable from the encoding key.

```
Original text: THIS IS SOME TEXT TO BE DECODED
Key          : DOGD OG DOGD OGDO GD OG DOGDOGD
Ciphered text: XWQW XA WDUI IMBI BS QM HTKSSMH
```

Fig 5 The key is laid along the original text to produce the ciphered text

```
Key  : K E Y R I N G
Order: 4 1 7 6 3 5 2
       ---------------
       t e l l m e e
       v e r y t h i
       n g y o u k n
       o w a b o u t
Original text  :  tellmeeverythingyouknowabout
Ciphered text  :  eegweintmtuotvnoehkulyobeegw
```

Fig 6 A transposition cipher where the key numbers the columns

One solution to this problem that has been offered involves the use of very large prime numbers. If two prime numbers are multiplied, the result of this multiplication will have only one pair of factors — the two prime numbers. Of course if you know one factor you can calculate the other, but if one of the factors is sufficiently well disguised, it can be used as the basis for an encoding key that can be made publicly available. Given a large number, it is exceedingly difficult to discover the identity of the factor pair — factoring a 200-digit number requires approximately four billion years of computer time. It is likely that Public Key Cryptography, probably based on an algorithm not unlike the one published here, will play an increasingly important role in the data communications marketplace of the future.

The cipher program

The cipher program (Fig 1) will encode or decode the contents of a file using the substitution method with a user-supplied key. The result of the encipherment is stored using the user-supplied filename. The program begins by prompting the user for the input filename, the output filename, the key to be used and the mode — encode or decode. It then displays the message 'Processing' while the processing of the file is executed. When the output file has been saved to the current filing system, the message 'Done' is displayed and the program ends.

The program's main area is from lines 150 to 230. The procedure Init initialises all required variables. The procedure also prompts the user for all the required input, and is located between lines 340 and 500.

The main processing is in the procedure called in lines 240-330. The routine looks at every character and decides whether it should be substituted for another character, and if so, which one.

We now have to discover the value of the latest character in the user-supplied cipher key. The key itself is held in a separate buffer — CIPHERKEY$. KEYBUF is a pointer into this buffer, being the character number of the latest ciphering character within the buffer. Lines 310-320 make sure that this value stays within the range 0-key length. Having decided the value of KEYBUF, the actual character is loaded.

The next decision is to ascertain which mode the program is in — code or decode. This information is supplied by the user and is held as the contents of the variable mode$. If the value of mode$ is 'C' the value of the cipher offset is added to the contents of BYTE, otherwise it is subtracted. The result is that the contents of a particular location in the input has been replaced by the appropriately ciphered or deciphered output character.

When the whole of the input file has been processed, the files are closed and the concluding message is displayed.

Given an enciphered text such as this, how do you go about attempting to restore the original? The first thing to establish is what kind of encryption algorithm has been used. A transposition algorithm moves the letters around but does not change any of them. On the other hand, a substitution algorithm preserves the original order of the data but changes the text in a systematic way. If a transposition algorithm has been used, a count of the frequency of the letters in the text will reveal the expected distribution for standard English.

With a substitution algorithm we would expect this distribution to be radically altered. For example, in standard English text the letter 'E' takes up about 13 per cent of the characters. The second most popular letter is 'T' at approximately 10 per cent. The typical frequency distribution of letters for standard English text is shown in Fig 3.

A table of percentage frequency distributions such as the one in Fig 3 can be produced for any file using the Letfreq program, also published here (Fig 4). The main part of the program is at lines 130-150 where three procedures are called. The procedure Init initialises all variables and arrays. The procedure Compute performs the actual processing of the contents of the file, and the procedure Display prints the results to the screen. Init begins at line 170, Compute begins at line 230, Display begins at line 360.

When it finds a character within the alphabetic range, it updates the location associated with that letter's occurrency by adding 1 to the previous contents. These locations are an array, letters.

When the contents of the file have been processed in this way, these locations contain the absolute frequency of the alphabetic characters found in the file. Each time a valid letter is found a counter is incremented, and at the end of the program run, the value of this counter is the total number of characters that were found. This value is used to compute the percentage frequencies. The procedure Display uses this information to format the results in tabular form.

'... a strategy for cracking the code can be established that will succeed — eventually.'

Conclusion

By first establishing what kind of algorithm has been employed and then making successive guesses at the length of the enciphering key, a strategy for cracking the code can be established that will succeed — eventually. If you are attempting to crack such a code there are three basic requirements — a lot of text, a large computer, and a lot of spare time. Good Luck!

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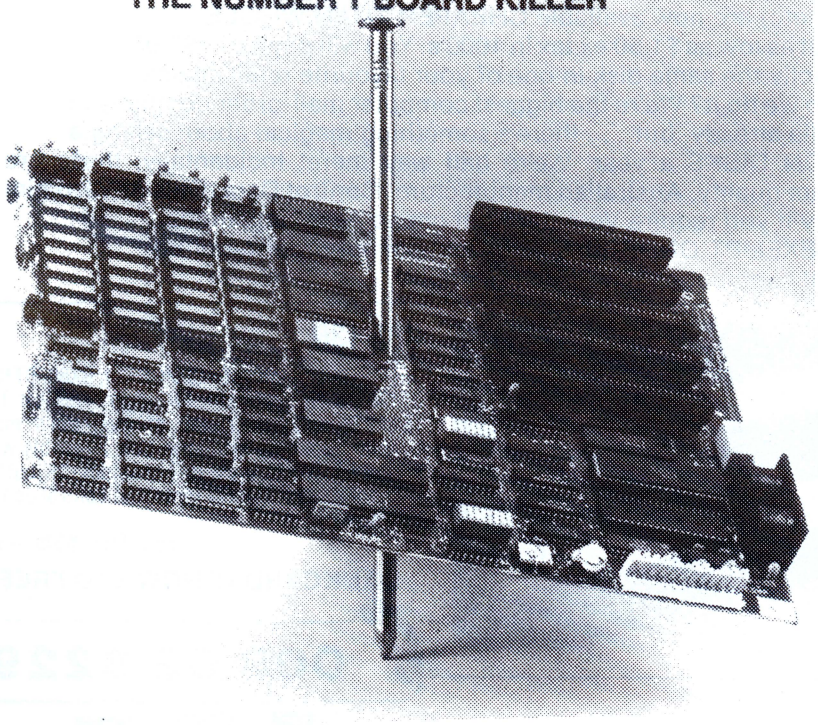
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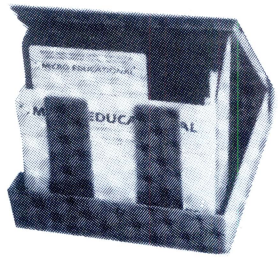
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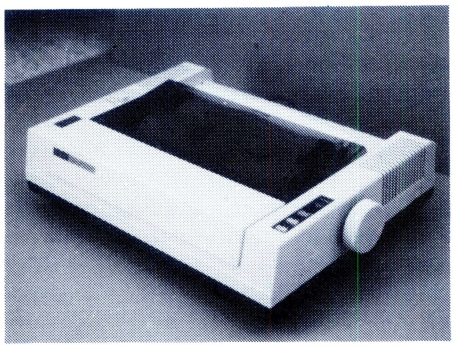
Hello again,
Well we're really excited with all the buzz of new things happening. The mail list is over the 20,000 mark now and has been promoted from the Apple to an IBM compatible with a consequent speed improvement on the hard disk of between 3 and 30-fold. We're running it on dBASE with FRAMEWORK linking it to a HP Laserjet printer. Our latest colour catalog is out now. If you didn't get one in the mail ring now and we'll send you one free.
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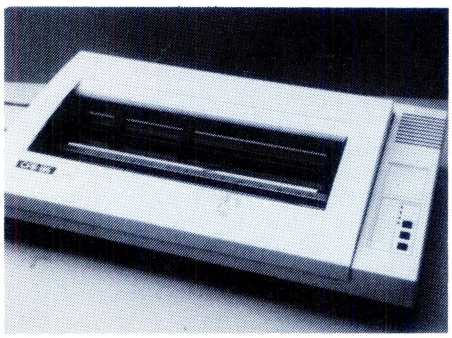
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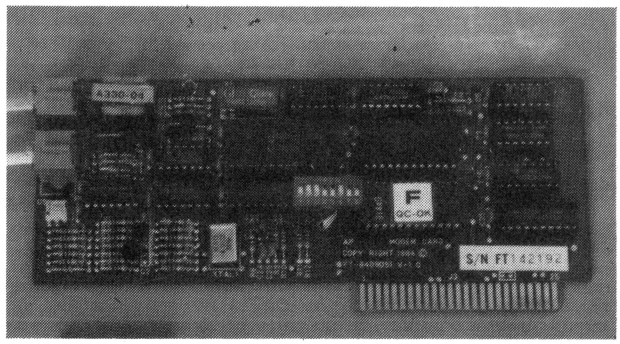
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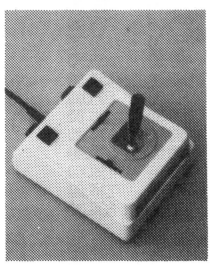
	ex	inc
3A	110	120
6A	120	130
10A	130	140



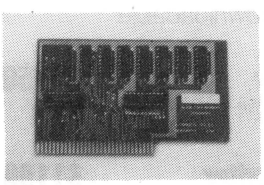
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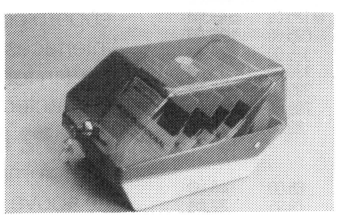
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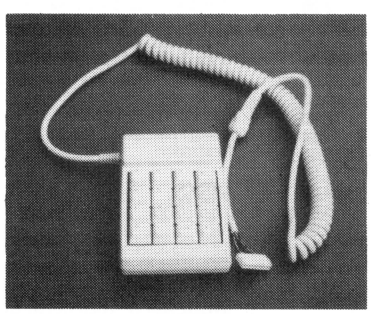
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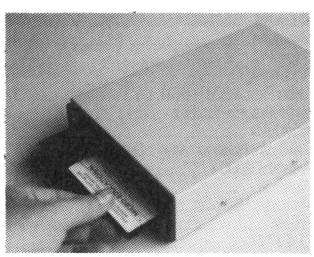
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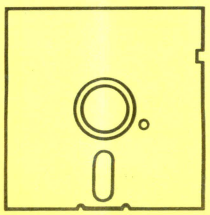
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* Offer valid till end December 1985.



TJ'S WORKSHOP

Our monthly pot-pourri of hardware and software tips for popular micros. If you have a favourite tip to pass on, send it to 'TJ's Workshop', 2nd floor, 215 Clarence Street Sydney 2000. Please keep your contributions as concise as possible. We will pay $10-$25 for any tips we publish. APC can accept no responsibility for damage caused by using these tips, and readers should be advised that any hardware modifications may render the maker's guarantee invalid.

WORDSTAR FILE CONVERSION

These routines make it easier to transfer text files between WordStar and other word processors. The first takes a file produced by answering 'Y' to WordStar's 'DISK FILE OUTPUT (Y/N)' question when printing a file and answering 'N' if asked 'FORMAT OUTPUT FOR RE-USE BY WORDSTAR', and taking the default for all other questions.

When a file is produced this way, and then run through the first of the programs, all the printer control codes are stripped out, leaving an output file which can be used by another word processor or transmitted by electronic mail.

Many word processors, including WordStar, end each line of file output to disk with a carriage return/line feed sequence. While WordStar accepts this as an input file, it prevents reformatting unless all extra carriage returns ('hard' ones) are removed. The second program strips these out, leaving a file that is easier to manipulate.

Both programs are Microsoft Basic for an IBM, but should work on any machine supporting disk I/O.

H Glover

```
10 CLS
20 PRINT : PRINT
30 PRINT "This is designed to covert a  Wordstar printed file into an  ASCII"
40 PRINT "file that can be transmitted to another system.   All non-printing"
50 PRINT "characters are  stripped  from the  output except <cariage return>"
60 PRINT "and <line feed>.     The  source  should be a  file that  has been"
70 PRINT "'printed' to disk by Wordstar."
80 PRINT : PRINT
90       INPUT "Source file     "; FILE1$
100 OPEN FILE1$ FOR INPUT  AS #1
110       INPUT "Output file     "; FILE2$
120 OPEN FILE2$ FOR OUTPUT AS #2
130 IF NOT EOF(1) THEN LINE INPUT #1,A$ ELSE GOTO 230
140 C$=""
150 FOR N=11 TO LEN(A$)
160 B$=MID$(A$,N,1)
170 IF ASC(B$)<32 OR ASC(B$)>127 THEN B$=""
180 C$=C$+B$
190 NEXT N
200 PRINT C$
210 PRINT #2,C$
220 GOTO 130
230 PRINT "Conversion complete"
```

```
10 CLS
20 PRINT : PRINT
30 PRINT "This is designed to covert an ASCII text file into a Wordstar"
40 PRINT "format  file  with  paragraphs  that  can be  re-formed by ^B"
50 PRINT "The  contents  of the  output file are echoed to the  screen."
60 PRINT "Non-printing characters are shown by their ascii value within"
70 PRINT "angle brackets. Thus ^Z appears as < 26>."
80 PRINT : PRINT
90 INPUT "Source file     "; FILE1$
100 OPEN "R", #1, FILE1$,1
110 FIELD #1,1  AS A$
120 L=LOF(1)
130 INPUT "Output file     "; FILE2$
140 OPEN "R", #2, FILE2$,1
150 FIELD #2,1  AS D$
160 P1=0
170 GET #1 : P2=ASC(A$)
180 GET #1 : P3=ASC(A$)
190 GET #1 : P4=ASC(A$)
200 IF (P1<>13 AND P1<>10) AND P2=13 AND P3=10 AND (P4<>13 AND P4<>10) _
      THEN P2=141 : P2$=CHR$(141)
210 C$=CHR$(P1)
220 LSET D$=C$
230 PUT #2
240 IF ASC(C$)<32 OR ASC(C$)>127
      THEN PRINT "<"+STR$(ASC(C$))+">"; ELSE PRINT C$;
250 P1=P2 : P2=P3 : P3=P4
260 GET #1 : P4=ASC(A$)
270 IF LOC(1)<=L THEN GOTO 200
280 PRINT : PRINT : PRINT "Conversion complete"
```

AMSTRAD HEADER READER

This short program reads cassette file headers. Line 210 initialises the registers and calls CAS READ. 64 bytes are read in from the header, of which 27 contain data about the program on tape. The rest of the bytes are available for use by the programmer.

The program then displays the information about the program on tape. Logical variable names help to explain how the data is stored. The program offers the option to continue and read another header, or stop.

J Marshallsea

```
10 REM
20 REM
30 REM
40 REM
50 REM
60 REM
70 REM
80 REM
90 REM

100 MODE 1:INK 1,5:INK 2,26
110 LOCATE 12,1:PRINT CHR$(24);" INSERT TAPE ";CHR$(24)
120 PRINT:PRINT TAB(18)"&";:PRINT
130 PRINT TAB(12);CHR$(24);" PRESS  PLAY ";CHR$(24)
140 PRINT:PRINT TAB(16);"then":PRINT
150 PRINT:PRINT TAB(7);"Press ";CHR$(24);" any key ";CHR$(24);" to begin "
160 MEMORY 43890:RESTORE 210
170 FOR I=43891 TO 43902
180   READ D:POKE I,D
190 NEXT

200 CALL &BB18
210 DATA &21,&80,&12,&11,&00,&40,&3e,&2c,&cd,&a1,&bc,&c9
220 CALL 43891:CLS:PEN 2
230 LOCATE 10,1:PRINT CHR$(24);" HEAD 'X' ANALYSIS ";CHR$(24):PEN 1
240 T$=""
250 FOR I=4736 TO 4751
260   A=PEEK(I):IF A<32 THEN A=32
270   T$=T$+CHR$(A)
280 NEXT
290 Blo.Num=PEEK(4752)

300 Blo.Len=PEEK(4756)*256+PEEK(4755)
310 Pro.Lengh=PEEK(4761)*256+PEEK(4760)
320 Load.Add=PEEK(4758)*256+PEEK(4757)
330 Type=PEEK(4754)
340 Blocks=Pro.Lengh/2048
350 IF Blocks<>INT(Blocks) THEN Blocks=INT(Blocks)+1
360 Pro.Load.Add=Load.Add:B=Blo.Num
370 IF B>1 THEN Pro.Load.Add=Pro.Load.Add-2048:B=B-1:GOTO 370
380 Pro.End=Pro.Load.Add+Pro.Lengh
390 LOCATE 9,3:PRINT" NAME---------- "T$

400 LOCATE 9,5:PRINT" TYPE---------- ";
410 IF Type=0 THEN PRINT"UNPROTECTED"
420 IF Type=1 THEN PRINT"PROTECTED"
430 IF Type=2 THEN PRINT"CODE"
440 IF Type=22 THEN PRINT"ASCII"
450 IF Type>2 AND Type <>22 THEN PRINT "UNKNOWN"
460 LOCATE 1,7:PRINT" CURRENT BLOCK NUMBER-";Blo.Num
470 LOCATE 1,9:PRINT" TOTAL BLOCKS IN FILE-";Blocks
480 LOCATE 1,11:PRINT" BLOCK LOAD ADDRESS----";Load.Add;"  &";HEX$(Load.Add)
490 LOCATE 1,13:PRINT" BLOCK LENGH----------";Blo.Len

500 LOCATE 1,15:PRINT" PROGRAM LOAD ADDRESS-";Pro.Load.Add;"  &";HEX$(Pro.Load.A
dd)
510 LOCATE 1,17:PRINT" PROGRAM END ADDRESS--";Pro.End;"  &";HEX$(Pro.End)
520 LOCATE 1,19:PRINT" PROGRAM LENGH--------";Pro.Lengh;"  &";HEX$(Pro.Lengh)
530 PEN 2:PRINT:PRINT
540 PRINT" Press ( P ) to playin a tape":PRINT" Press ( S ) to stop":PEN 1
550 K$=UPPER$(INKEY$):IF K$="" THEN 550
560 IF K$="P" THEN RUN
570 IF K$="S" THEN CLS:CALL &BC02:END
580 PRINT CHR$(7);:GOTO 550
```

COMMODORE 64 REGISTER DISPLAY

This is a utility designed to help machine code programmers. While developing a machine code program, the states of the internal registers often need to be known to determine if the program is working correctly or not. This machine code utility detects a BRK instruction and passes control to the rest of the routine; the start and address is given in locations $0316 to $0317.

To display the registers when running a machine code program, insert a BRK command at the desired point, followed by a NOP command. To use the routine, type in the Basic program and save it. Now run it and type SYS 32768: the READY message will appear and the routine is ready to use. It is stored in locations $8000 to $81AD.

I Redmore

```
10 PRINT"■":SA=32768:L=429
20 N=0:READ D$:IF D$="*" THEN 80
25 PRINT"■■ DATA BYTES LEFT : ";L
30 FOR X=1 TO 2
40 T=ASC(MID$(D$,X,1))
50 Y=T-48+(T>57)*7
60 N=N*16+Y:NEXT X
70 POKE SA,N:SA=SA+1:L=L-1:GOTO 20
80 PRINT"■■■USE 'SYS 32768' TO ENTER ROUTINE"
85 PRINT"■■■■USE 'SYS 33185' TO EXIT ROUTINE"
90 END

100 DATA 78,A9,0D,8D,16,03,A9,80,8D,17
110 DATA 03,58,60,68,8D,AB,02,68,8D,AA
120 DATA 02,68,8D,A9,02,68,8D,AC,02,68
130 DATA 8D,A8,02,68,8D,A7,02,48,AD,A8
140 DATA 02,48,AD,AC,02,48,A2,00,BD,A9
150 DATA 02,48,E8,E0,03,D0,F7,A2,00,18
160 DATA 0E,AC,02,A9,00,90,02,A9,01,9D
170 DATA AD,02,E8,E0,08,D0,EE,A9,00,8D
180 DATA 20,D0,8D,21,D0,A9,03,8D,86,02
190 DATA A0,00,B9,28,81,20,D2,FF,C8,C0

200 DATA 50,D0,F5,18,A2,03,A0,00,20,F0
210 DATA FF,A2,03,A9,20,20,D2,FF,CA,D0
220 DATA F8,A9,07,8D,86,02,A0,00,B9,A7
230 DATA 02,29,F0,20,23,81,20,14,81,B9
240 DATA A7,02,29,0F,20,14,81,C8,C0,02
250 DATA D0,E8,18,A2,03,A0,0B,20,F0,FF
260 DATA A0,00,B9,A9,02,29,F0,20,23,81
270 DATA 20,14,81,B9,A9,02,29,0F,20,14
280 DATA 81,A9,20,20,D2,FF,C8,C0,03,D0
290 DATA E3,18,A2,03,A0,16,20,F0,FF,A0

300 DATA 00,B9,AD,02,20,14,81,A9,20,20
310 DATA D2,FF,C8,C0,02,D0,F0,A9,2D,20
320 DATA D2,FF,A9,20,20,D2,FF,A0,00,B9
330 DATA B0,02,20,14,81,A9,20,20,D2,FF
340 DATA C8,C0,05,D0,F0,18,A2,0A,A0,00
350 DATA 20,F0,FF,A0,00,B9,79,81,20,D2
360 DATA FF,C8,C0,28,D0,F5,20,E4,FF,C9
370 DATA 20,D0,F9,4C,BC,FE,C9,0A,30,05
380 DATA 69,36,4C,1F,81,69,30,20,D2,FF
390 DATA 60,4A,4A,4A,4A,60,93,20,20,50

400 DATA 52,4F,47,52,41,4D,20,20,52,45
410 DATA 47,49,53,54,45,52,53,20,20,53
420 DATA 54,41,54,55,53,20,52,45,47,49
430 DATA 53,54,45,52,20,20,20,20,43
440 DATA 4F,55,4E,54,45,52,20,20,41,2E
450 DATA 20,58,2E,20,59,2E,20,20,20,4E
460 DATA 20,56,20,2D,20,42,20,44,20,49
470 DATA 20,5A,20,43,20,20,20,20,2E,2E
480 DATA 2E,50,52,45,53,53,20,53,50,41
490 DATA 43,45,20,54,4F,20,52,45,54,55

500 DATA 52,4E,20,54,4F,20,50,52,4F,47
510 DATA 52,41,4D,2E,2E,2E,20,78,A9,66
520 DATA 8D,16,03,A9,FE,8D,17,03,58,60
530 DATA *
```


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IBM PC SWITCHING

This routine checks to see if a colour graphics board is present. If one is, it then switches to colour mode directly from Basic, without needing to quit to DOS and use the MODE CO command. The alterations to the routine necessary to switch to monochrome mode are also shown. Programmers who wish to use the method in non-Basic programs should be able to get the necessary information from the program.
M Curtis

```
10 GOSUB 1000 ' Check for Color/Graphics board
20 IF COL=0 THEN PRINT "No Color/Graphics board present":END
30 GOSUB 2000 ' Switch to colour monitor
40 REM Rest of program
50      :
60      :
70      :
1000 REM Check for Color/Graphics board
1010 SCREEN 0,0,0
1020 DEF SEG=&HB800
1030 SUM=0
1040 FOR I=2000 TO 2010 STEP 2
1050 POKE I,170
1060 SUM=SUM+PEEK(I)
1070 NEXT I
1080 IF SUM<>1020 THEN COL=0 ' No Color/Graphics board found
1090 IF SUM=1020 THEN COL=1  ' Color/Graphics board present
1100 RETURN
2000 REM Switch to colour monitor
2010 DEF SEG=0
2020 POKE 1040,157
2030 SCREEN 0
2040 WIDTH 40
2050 LOCATE ,,7,7
2060 RETURN

To switch to a monochrome monitor alter lines

1020 DEF SEG=&HB000
1040 FOR I=4000 TO 4010 STEP 2
2020 POKE 1040,189
2040 WIDTH 80
2050 LOCATE ,,10,11

If this does not work on your IBM compatible then to find the correct
values to POKE into location 1040 :

Monochrome monitor                  Color/Graphics

In DOS type                         In DOS type

MODE MO                             MODE CO
BASIC                               BASIC

When in BASIC                       When in BASIC
DEF SEG=&HB000                      DEF SEG=&HB800
PRINT PEEK(1040)                    PRINT PEEK(1040)

Replace the values 189 and 157 with the 2 given values respectivly.
```

APRICOT MICROSCREEN LEDS

The microscreen LEDs on an Apricot PC or Xi can be switched on and off from a Basic program using the escape sequence ESC/n, where n is a number from 0 to 63. The format of the statement is: PRINT CHR$(27)+"/"+CHR$(n). If n=0 all the LEDs are switched off, while n=63 will switch them all on. The variations in between are based on binary bit patterns and can be worked out by creating a pattern. Assign each LED to a bit in order, and set it to 1 if you want the LED on and 0 if you want it off. The binary number thus created should be converted to decimal and this will give the desired result.

This method is fine for a Basic program. If you want the same effect under MS-DOS (say, in conjunction with the MISCREEN KEY) you can use the MS-DOS command TYPE followed by the name of a file containing two-digit hexadecimal codes. If the hex codes include the ESCAPE code (27 in decimal, 1B in hex), followed by the code for the backslash character (47 in decimal, 2F in hex), followed by a number between 0 and 63 (0 and 3F in hex), then the result will be the same as in the Basic command above. Other escape sequences can be handled

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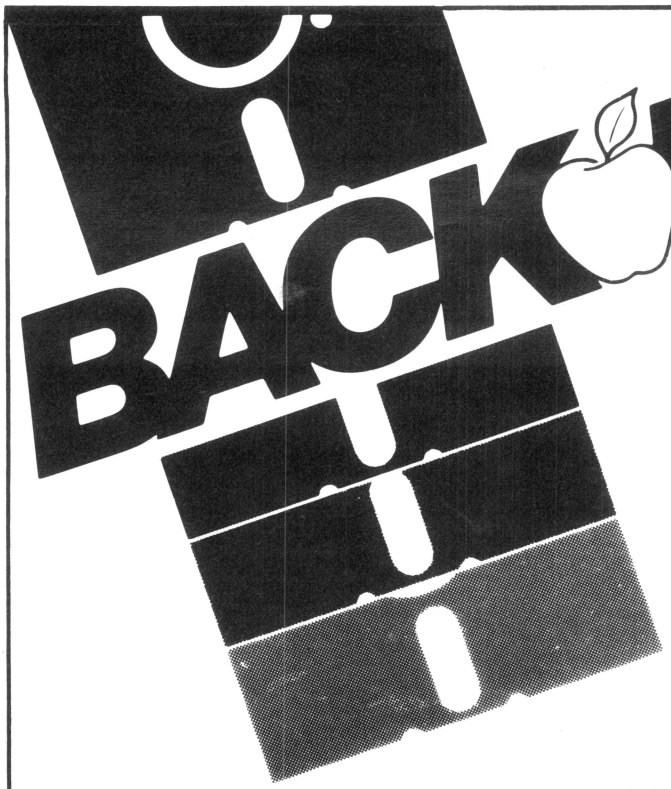
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by MS-DOS in a similar way; for example, 1B45 will clear the screen.

To create a hex file as above, use the outline routine. Before running it, write down the exact sequence of hex codes you want to use. Do not leave spaces or other separators between the codes. The last code in the sequence must always be 1A as this is treated as an end-of-file marker. Everything in a file after a 1A will be ignored, so it must occur in one place only — at the end.

A Wardrop

```
*****************************************
100 REM H$ - INPUT STRING REPRESENTING HEX
110 REM H$ - MUST BE TERMINATED BY 1A (IN HEX)
120 REM J$/J% - EVALUATES H$ TWO AT A TIME
130 C$="":REM C$ - TO BE A STRING OF HEX CODES
140 INPUT"FILENAME";F$:
150 INPUT"HEX-STRING";H$
160 J$="&H"+LEFT$(H$,2)
170 J%=VAL(J$)
180 C$=C$+CHR$(J%)
190 H%=LEN(H$):H$=RIGHT$(H$,H%-2)
200 H%=H%-2
210 IF H%=0 THEN GOTO 220 ELSE GOTO 160
220 OPEN"O",1,F$
230 PRINT#1,C$
240 CLOSE#1
*****************************************
```

DIRECTORY COMMENTS

Some files either need to be loaded using ',8,1' or just ',8'. I sometimes find it quite difficult to remember which method to use on a particular file. A simple remedy, apart from including the reminder as part of the file name, is to use a shifted space. For example, when saving a file, type

SAVE "PROGRAM NAME <SHIFTED SPACE>,8,1"

,8,1

This will be displayed in the directory as

"PROGRAM NAME",8,1

and all that is needed to run the program is to move the cursor to the line and hit RETURN.

This method can also be used to remind one of the SYS address of a program.

Normal loading of a file is not affected and the comment is not part of the filename.

W Dimmlich

THREE STICK VIC

The VIC-20 has only one port for the joystick but with the hardware described below you can connect up to three joysticks at the same time.

Parts needed:

- One 24 way edge connector (available from Commodore service centres)
- Four diodes 1N4148 or 1N914
- Two 9 pin 'D' type connectors
- Two joysticks

After the interface has been assembled, you can plug in the joysticks and test them with the program below.

```
10 POKE 37138,0
20N=PEEK(37136)
30PRINT N
40GOTO 20
```

After typing in the program type RUN. You should see numbers scrolling on the screen, the value depending on the position of the joystick.

The directions are detected as follows:

Right joystick:
north 255-1
south 255-2
west 255-4
east 255-8

Left joystick:

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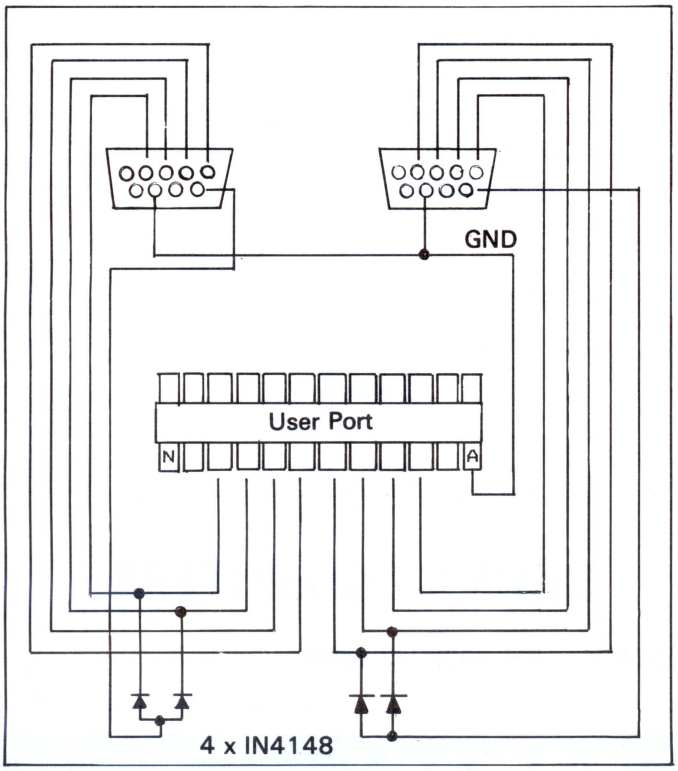
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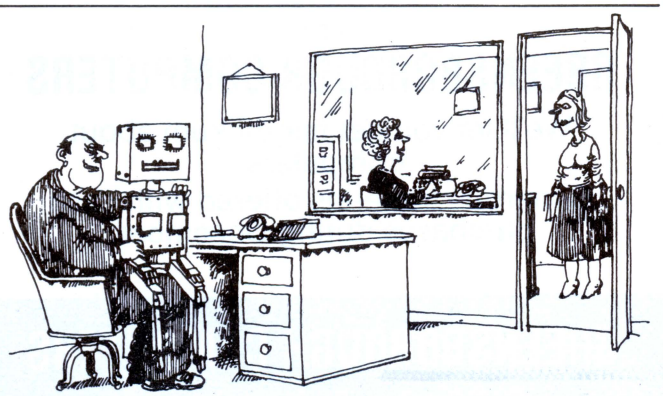
SELECTIVE RESTORE

This short routine for the Commodore 64 allows you to restore the program data pointers to a certain line number.

The common format, for example, is Restore (Line Number). To use this version you type SYS (START ADDRESS OF ROUTINE) Line Number. The routine is totally relocatable by changing AD in line 10.

```
10 AD = 49152
20 For I = AD to AD + 33
   :Read :Poke I, A :Next
30 Data 32,138,173,32,
   247,183,32,19
40 Data 166,165,95,208,
   2,198,96,198
50 Data 95,165,95,133,65
   165,96,198
60 Data 66,165,20,133,
   63,165,21,198
70 Data 64,96
```

T Lindsay



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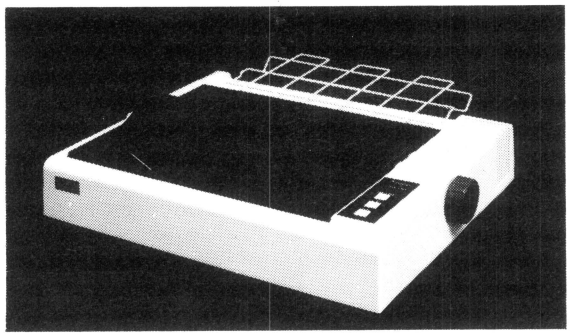
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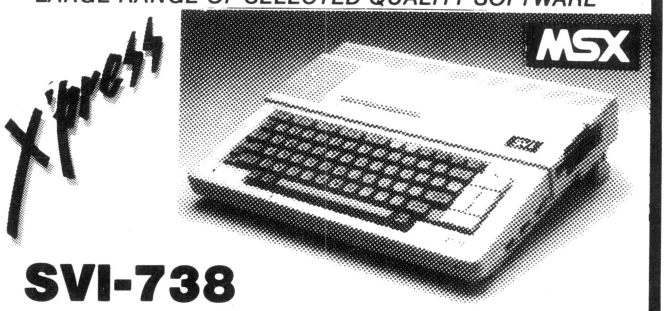
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Spectravideo X'press

The MSX standard rolls-on, despite lack-lustre performance in the marketplace. Kester Cranswick tests what Spectravideo hopes will be a winner.

Spectravideo must take the credit for initiating the MSX standard. MSX evolved from the first Spectravideo home computers, and the Hong Kong company is in there battling with the likes of Sony, JVC and Toshiba for a share of the MSX market. The X'press is Spectravideo's latest MSX offering and a cut above what the rivals are doing. They will follow suit, but Spectravideo has got there first.

The standard MSX micro, until now, has been a 64k machine with Microsoft Basic, sprite graphics, three channel sound and a middling price tag. The most exciting feature is the compatability. MSX software will run on any MSX computer, and an MSX peripheral will fit any MSX computer. But, most critics agree that the first MSX computers represented nothing new in technology, and they have not wiped the likes of Commodore and Amstrad off the face of the earth.

The X'press is an MSX computer with a whole lot more added. It comes with a price tag of $999. That gets you a 64k MSX computer with a built in 9cm disk



drive, and an RS232C port, in addition to the usual MSX specifications. You also get two disk operating systems — the old favourite, CP/M 2.2, and MSX-DOS, the standard MSX disk operating system. As a bonus, there are a number of utilities, such as a multi-function schedule package and a combination word processor/spreadsheet program.

No one could argue against the merits of compatability. Too often, buyers have purchased a system and then found that either the company has gone out of business, or a new, incompatible model has come along leaving an unsupported computer. MSX was going to be the standard that put an end to all this, and it is slowly, very slowly, getting established. It is also a standard that, if all goes to plan, will link not only home and office computers, but also let the home micro talk to other electronic devices, such as video disk players.

Spectravideo's first MSX computer was business orientated. It was the only MSX machine with a numeric keypad, and Spectravideo was the first company to really get its act together with peripherals. Now, with the X'press, it is determined to establish itself in the upper echelons of the MSX market.

Hardware

The first thing to hit you about the X'press is its packaging. It comes packed in a blue-grey, padded bag that can be slung on the shoulder or carried. It comes with two disks, four manuals, a power supply and the whole package, on first impressions, oozes style. The implied portability reinforces an idea that this computer is meant to be used at home and in the office.

Debagged and unpacked, other clever design points come to light. For instance, the rear array of ports is protected by a panel that acts, firstly, as a handle, but more importantly, folds down to raise the back of the computer by about four centimetres.

The casing is cream, with buff keys. There is more than a passing similarity to an Apple IIe. The disk drive mouth is on the right of the unit, behind ports for two joysticks and a cassette player.

All the in/out action is along the back. Starting from the left, there is a rocker-type on/off switch. Next is the socket for the sizeable power adaptor. Spectravideo follow the others in having either a built-in power supply, or a permanently attached cord. Then there is a phone socket, for headphones or a sound system, a monitor socket and a TV phono socket. A lead for this is supplied.

An odd feature is next along — a perspex covered panel in which you put a card with your name and a personal ID number written on it. No more will you have to identify which is your computer. Then comes a parallel Centronics port for the usual range of printers, a port for a second disk drive and a nine pin RS232C port. Completing the in/out arrangements is an MSX expansion slot on the top of the main body. You'll find that most MSX computers have two of these. Still, none to date have a built-in RS232C port, or a disk drive port.

The keyboard is normal MSX style with five dual function keys, 48 alphanumeric keys, two shift keys and caps lock, a large space bar, tab, Esc, backspace, stop, three edit keys and the MSX oddities — graph, code and select. The caps lock has an engaged LED inset in it. Other lights show power on and disk drive in operation. The keyboard has numerous graphics, Greek and mathematical characters and foreign accents available.

On the right of all this is a cursor keypad. It is better than that on the first MSX from Spectravideo, but those who use cursor keys to play games will find these still too small and too close together.

That's the outside. Inside is the familiar MSX engine, an eight bit, 3.58MHz Z80A. It addresses 64k of RAM for data and programs, plus 16k video RAM. There is a fair bit of ROM inside too. MSX Basic takes up 32k. Handling the RS-232C is another 8k of ROM, and there is 16k of disk firmware. That all adds up to 136k.

The disk drive is for single sided, 9cm disks, rapidly becoming standard, storing 360k of data when formatted to an IBM standard, so disks from a JX could be used. The data transfer rate is just 250Kbits per second.

Operating Systems

With the power supply and a monitor or TV connected, just switch the X'press on. Up comes a blue screen, and the disk drive whirrs to see if an operating system disk is in place. If not, the computer defaults to MSX Disk Basic, prompting for a date entry.

MSX Disk Basic is MSX Basic with another 24 commands. MSX Basic is one of the better Basics around — the disk extensions merely take into account some disk handling functions.

Graphics are displayed on a screen capable of 16 colours and a resolution of 256 x 192 pixels. 80 column and 40 column text display is supported too.

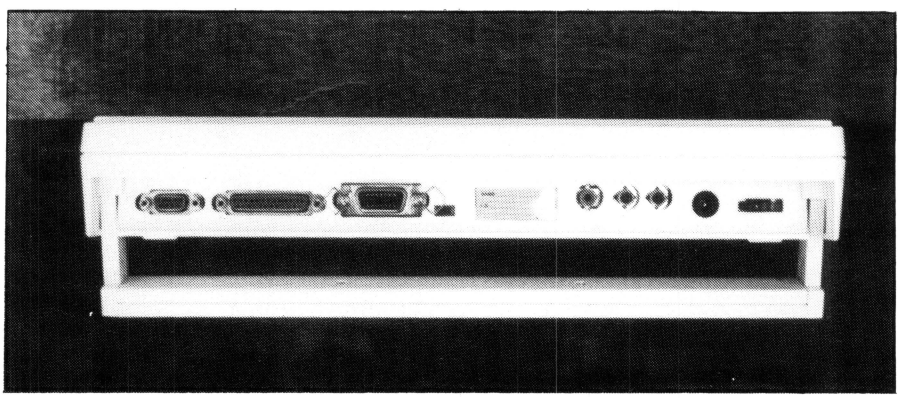
The Basic is very open. It copes with joysticks, communications, has a full screen editor, programmable function keys, 14 significant place arithmetic and has sublanguages for both sound and sprite graphics. It is not particularly fast, but is very versatile. It is a close relation to GW-Basic too.

MSX Disk Basic gives access to almost the entire range of MSX software available.

That will be either on tape or cartridge, in which case the cartridge is plugged in the expansion slot.

A growing range of good quality MSX software is available, from Britain and Japan. As MSX grows in popularity, more and more games are being written, or converted to, MSX. Whether your taste be arcade action, tantalizing adventures, useful education or serious applications, there is something to use. The graphics and sound features of the MSX world make for good games and sophisticated applications.

We haven't seen any games converted to disk, yet, but this will surely come as MSX Disk Basic becomes more widely known. Most MSX programs will run, unless they have been written without regard for compatability. If they fall foul of differences between MSX and MSX Disk operating systems, the manual advises pressing the shift keys as the program loads. By and large though, what runs on an MSX micro will run on the X'press.



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SPECTRAVIDEO

MSX Disk Basic might be OK for running programs on tape or cartridge, for the home programmer writing simple applications and learning how to computer. But, if you want to use the disk facility of the X'press, you will find little or anything available. That's why two other operating systems are supplied.

MSX-DOS is what MSX proponents hope will become the standard home micro disk operating system. It comes out of the Microsoft labs and is very closely modelled on MS-DOS, as the name might suggest.

The difference is that MS-DOS is for 16-bit machines, whereas MSX-DOS is for eight bit micros. The X'press can read data files created with MS-DOS applications, so you could, for instance, run WordStar on your office PC and download files for homework on the X'press. It should also be quite easy to port MS-DOS applications to MSX-DOS.

The operating system is loaded from a supplied 9cm disk, also containing MSX Disk Basic. The first prompt is for a data, as you find with MS-DOS.

The system disk contains ten command files. COMMAND.COM contains the MSX-DOS commands. DIR, DEL, REN, COPY, FORMAT and TYPE are obvious commands. BASIC goes to MSX Basic. DATE displays and sets the date. Other commands include MODE, to set the display width, PAUSE, for batch processing and REM, for remarks. Anyone familiar with MS-DOS will soon feel right at home with MSX-DOS.

DEMO.COM is a repeating program that shows off the graphics and system potential of the computer. Presumably it is intended for shopkeepers to have running. Watch it once and erase it.

COLOR.COM is a utility that enables you to change background and foreground colours, to any of the 16 available hues.

The standard display is 40 columns wide. To set the X'press up for 80 column display, use WIDTH80.COM. When formatting new disks, CHANGE.-COM enables WIDTH80.COM to be run. TERMTYPE.COM alterms the terminal type between VT52 and ADM-3A.

Changing the action of function keys is possible with EDITFKEY.COM, to set up new commands, and LOADFKEY.COM to load the new set of commands.

Finally, there is 4-IN-1.COM. This combines a simple memo writer, spreadsheet, file handler and disk maintenance programs. Simple is the operative word.

The disk maintenance section lets a user look at a directory of files, erase and rename them.

The text editor is simple to use and limited in functions. Text is typed in, inserted or deleted, a character at a time, with normal keyboard actions. Function keys scroll the text up and down a line or a screen at a time, go to the start or end of a file and reform it after corrections have been made. Whole lines can be deleted too. It can be printed out across 40 columns, stored to or loaded from disk. That's all this section does. The authors have not claimed it to be anything more than a memo writer, and they are wise not to do so.

File handler is also pretty basic. Forms can be designed by the user, but only one form is stored in memory. Fields and lengths are specified.

Records, when keyed in, can be viewed in sequence or field by field, erased and inserted. Files can be transferred to and from disk or printed out. But, there is no search facility and a Habadex file might do a better job.

The spreadsheet, called Calc, is possibly useful for the odd financial calculation. It takes text and (very) simple formulae. You can goto a particular cell, insert columns or rows, recalculate the sheet and save data to disk.

The sum of 4-IN-1 is not very much. Once you get any 'business' software at all, you'll find that it just takes up disk space. If you have never used a computer before, it might, just might, be of some use.

With its similarities to MS-DOS, MSX-DOS might capture the imagination of budding programmers, and might get some software converted to it by those after a new market. Don't count on it for some time though. There are already enough operating systems competing for software houses' attention.

Spectravideo are sensible enough to realize this and have therefore provided the established CP/M 2.2 operating system. The CP/M disk has a full complement of CP/M commands — including assembler and debugging utilities, sysgen and PIP. Documentation is poor, so a good CP/M manual is essential if you wish to delve into the operating system and use the wealth of public domain software available.

Other CP/M command files exist too, COLOR.COM is to change display colours. EDITFKEY and LOADFKEY deal with the function keys. TERMTYPE changes the terminal display type. FILECOPY has the useful ability to copy files from MSX-DOS to CP/M and back,so data files from one operating system can be used in another. RS232 is a program that gets the RS232C port into action, with parameter changing, file sending and receiving and a conversation mode. All you need to access data bases is a modem. You can also access the RS232C port through MSX Basic, using Comhelp and Comini commands and opening the port.

Software

The main CP/M utility is Scheduler+. Before running this, the CP/M disk must be backed up and the program run from the backed-up copy. If this isn't done, you'll corrupt the system disk. You have been warned.

Scheduler+ works with an 80 column display and has five sections. The first is a two screen notepad for personal notes and reminders. Then there is a calendar, good until 1999 and with space for appointments. Data can be listed or printed out, input and edited.

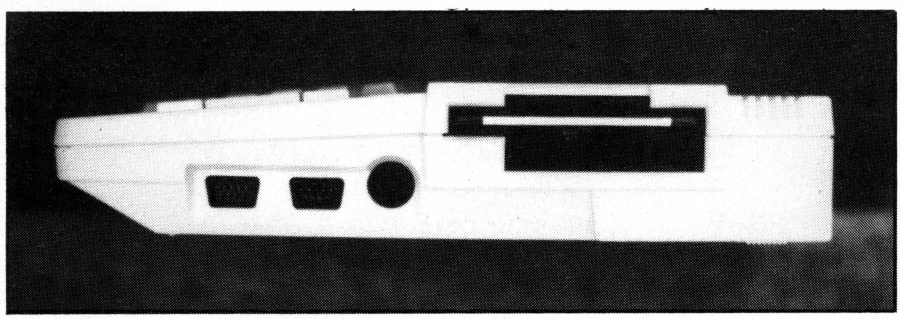
The phone/address section stores telephone numbers and addresses. It has a search facility and data can be printed out.

Unit conversion is a program to convert metric and imperial measurements. Menu driven, it has a wide range of options. Finally, world time is the section of the program that shows the time in 120 countries.

Put together, Schedule+ is a package of some use. A common desk diary much the same, but a computer is more fun, isn't it!

Using the 80 column display mode highlights the need for a monitor rather than a domestic television set. If you are going to run 80 column applications, you'll need a monitor to be able to read them properly.

There is a little CP/M software avail-



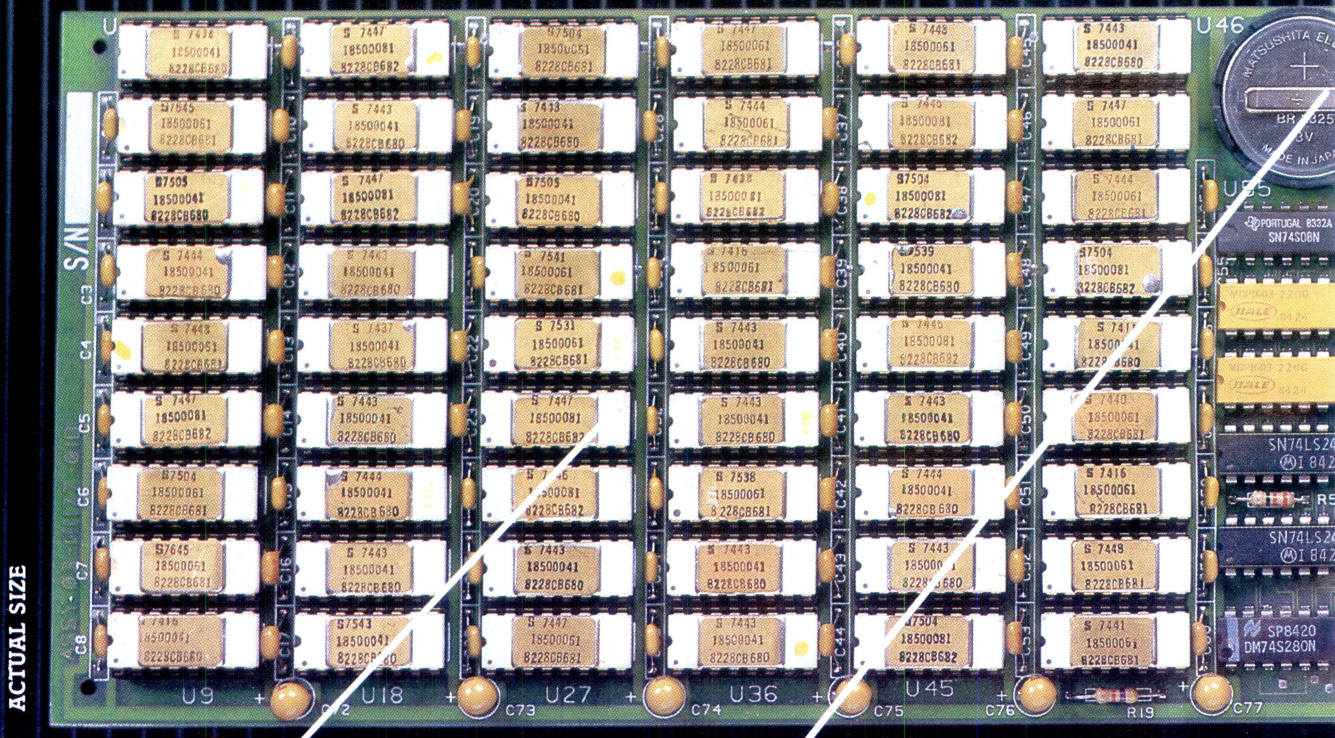
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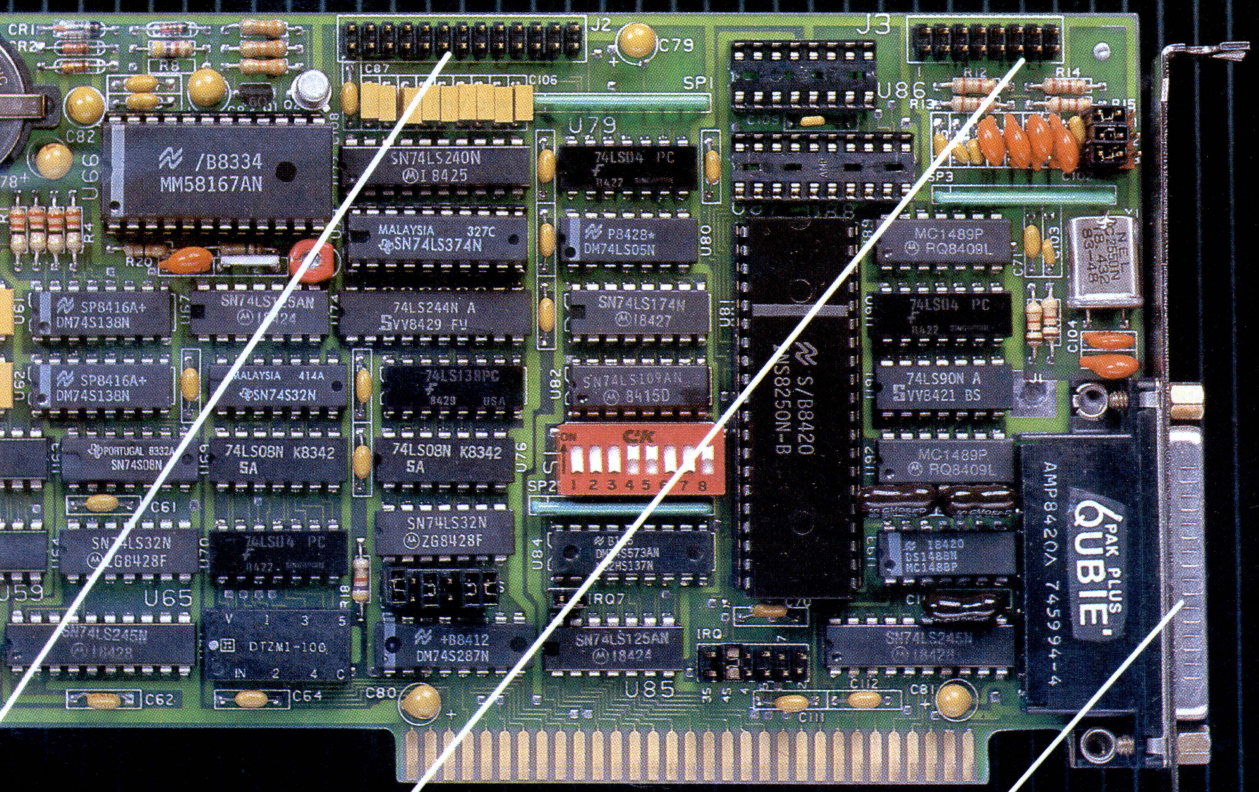
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able for the MSX machines. Spectravideo's Australian distributor, Rose Music, sells a package of WordStar, MailMerge, ReportStar, CalcStar and DataStar on 9cm disks for $599. It also has an accountancy package called Information Business Manager priced at $499. No doubt more CP/M software will be made available in the months to come.

Peripherals

The same distributor also sells a range of MSX peripherals, from Spectravideo. There is the inevitable range of joysticks, for games players. Other add ons include a stringy floppy tape storage device holding 80k of data, a 64k RAM expansion pack and a graphics tablet.

Additional disk drives are $599 — rather on the pricey side. They match the X'press in colour, are powered by the computer and make computing that much easier. But, look out for locally made disk drives costing quite a bit less.

The X'press has quite a bit of potential then. With both CP/M and almost MS-DOS operating systems to draw on, plus MSX Basic, software shouldn't be far away. With a useful range of peripherals and backing of Japan's major electronics companies, it is not going to disappear overnight.

But, when all is said and done, it is you, a keyboard and an operating system. The X'press will need a cassette player if you wish to run any MSX software on it. It will need a proper monitor if you wish to use the 80 column display. It will need a printer for hard copy and a modem for communications.

The X'press keyboard is good to work with. A numeric keypad might be nice, but Spectravideo tried that the first time round and it didn't catch on. Once bitten, twice shy. The function keys are soft in each operating system, a boon for repetitive command sequences. The cursor control keys help too.

For word processing and serious applications, if they can be run, you'll find the X'press fine to use. If there is a criticism, it is of the disk drive. Slow is hardly the word for it. Formatting and copying disks is best done when you have a spare evening, rather than a few minutes.

Another frustrating thing is the omission of a reset button or switch. Having to reboot the operating system every time the keyboard locks up is not fun, given the slowness of the disk drive. Perhaps it is best to look on the X'press as a home computer with aspirations to being a business micro. As a home machine, it cannot compete with the MicroBees and Commodores of this world when it comes to software and support.

In perspective

There is plenty of competition for the X'press, with the major rival being the Amstrad CPC 664. This has a built in 9cm disk drive, 64k RAM and the CP/M operating system. With a colour monitor, it sells for around $1,000, so must rate better value. However, the disks only hold 160k per side and there is no access of any kind to MS-DOS data. It also has no RS-232C port. Its biggest selling points are software availability and the supplied monitor.

A 64k Spectravideo SV728 costs around $400. Adding a disk drive takes the cost up to around $1,100. There is no competition to the X'press, so if you want disk, go for the new machine.

MicroBee is the other major supplier with a CP/M machine. The Computer-in-a-Book package costs $995. That gets you a 64k MicroBee, a 400k, 9cm disk drive, a monochrome monitor, CP/M, Basic, a word processor and a choice of other software. It is a popular machine with plenty of software available too, but again is nowhere near MS-DOS compatibility.

If you are thinking primarily business, the Sinclair QL at $800 has excellent specifications but is not very well established. It uses microdrive cassettes for data storage. Or, if you spend $1,500 or so, you could pick up a Taiwanese PC clone, with access to the mass of MS-DOS software. On balance then, the X'press offers quite good value for money and plenty of potential. It will be interesting to see how quickly other MSX companies follow suit.

Documentation

Each operating system has its own manual, and there is a general manual too. Everything is dealt with, but a little too scantily for someone not familiar with the disk operating systems. Investment in additional manuals would be a good idea, as the supplied literature is only just adequate.

Conclusion

You may find yourself a trifle lonely by having an MSX micro. It has the potential to be a great home micro, but that potential has not yet been realized.

As a business micro, the X'press is cheap and could do a great deal if applications were made available and you chose to live with the slow disk drives. But investing a few hundred dollars more in a cheap PC clone would bring immediate benefits in what you could do.

The best way to regard the X'press is as a computer for somebody who wants a good but relatively unsupported machine. Do some tinkering with the operating system, write your own applications in Basic, CP/M or MSX-DOS, adapt public utility software and study operating system manuals. Then you will be able to get a great deal out of it. Alternatively, use it to explore the world of computing, by seeing what you can make it do.

At under $1,000, the X'press is potentially a great microcomputer. Take a punt on the future of MSX and you could be well rewarded. But, it is the future potential, rather than present capability that you are buying. Accept that and you'll be very happy with it.

Benchmarks

BM1	2.1
BM2	6.0
BM3	16.8
BM4	18.3
BM5	19.3
BM6	31.2
BM7	44.8
BM8	216.3

All timings in seconds. For a full listing of the Benchmark programs see 'End Zone'.

Technical specifications

Processor:	Zilog Z80A, running at 3.58MHz
RAM:	64k user, 16k video
ROM:	32k Basic, 8k RS232, 16k Disk firmware
Mass storage:	360k 9cm built-in disk drive
Keyboard:	74 key, MSX style qwerty keyboard
Size:	37.5cm x 29.5cm x 6cm
I/O:	RS-232C, disk, Centronics, RF, video, audio, AC, 2 x joysticks, cassette, MSX expansion port
Software:	MSX Basic, MSX-DOS, CP/M, 4-in-1, Scheduler+

END

SCREENTEST

Cornerstone

Infocom's Cornerstone is a data management package for users of the IBM PC and close compatibles who like a lot of interaction. Kathy Lang gets to know its various facilities.

For its originators, Infocom, Cornerstone is an unusual product, as the American software house is noted mainly for its adventure programs. As you might expect, therefore, there are some unusual aspects to the package, especially to the 'user image', the way instructions are given to control how the package works. Its basic functionality, however, is much more conventional, including a wide range of powerful features and with a few surprising omissions.

Cornerstone's strong points include a wide variety of data types and record display styles, excellent data validation facilities, flexible features for relating information in one set of records to those in another, good reporting capabilities, and the ability to import information in a wide variety of formats. It would be easy to use Cornerstone in conjunction with a spreadsheet package such as Lotus 1-2-3; not only are software facilities provided for this, but the manual also includes a good introduction to sensible ways of approaching the problem.



The area of greatest weakness is the direct retrieval of one or more records from a large number, especially if you want the records shown in a particular order. It will be easier to explain the problem when you have a more detailed grasp of the way Cornerstone works, so I'll describe the weaknesses in more depth in my conclusion. Also, due to the way relationships are created between sets of records, it would be difficult, if not impossible, to treat Cornerstone as a relational database with implications for the kind of data which can be handled.

The net result is that, for a reasonable volume of information with a simple or complex structure, consisting mainly of straightforward items such as numbers, codes, calculated fields and short text fields, Cornerstone is extremely easy to use and highly recommended. It is not so suitable for information containing large amounts of free text, such as library catalogues, and it could be unacceptably slow or tedious for large sets of data, especially where values of fields used for retrieval are changing often.

Constraints

The main limitations on running Cornerstone are shown in Fig 1. A notable feature of Cornerstone is the variety of types of information which it can distinguish. The common types of integer, numeric, date (several formats), charac-



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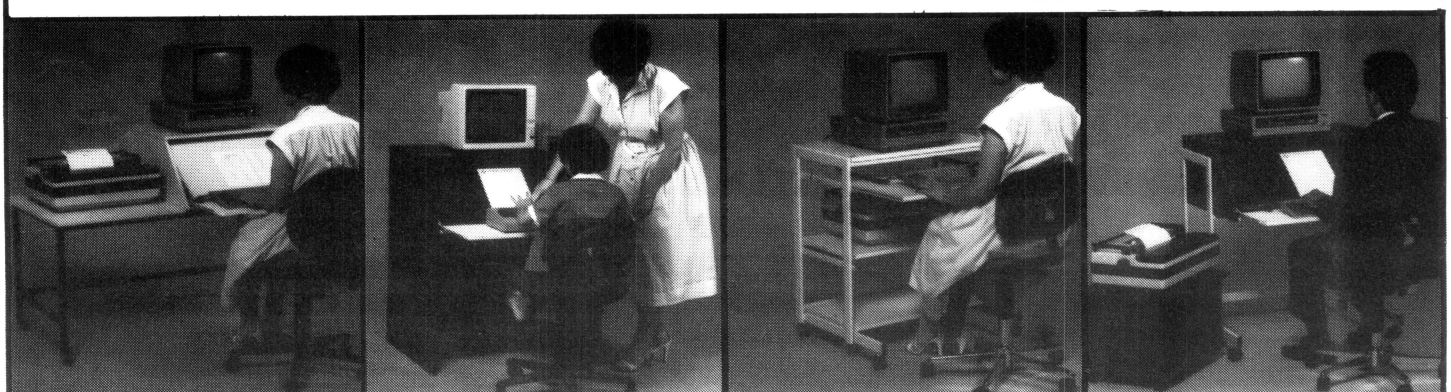
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ter and Boolean (that is, Yes/No) are available. In addition, Cornerstone permits other types: time, calculated (in which case it may be an initial value, which does not change except when explicitly recalculated by a user-given command, or a derived value which is not stored but recalculated each time the record is processed), and sub-record. This last type allows you to specify that there may be several instances of a group of fields attached to one record. For example, the main record may consist of purchase order header containing a reference to the customer's name, address, and so on, with a sub-record for each item ordered giving stock code, description and price. It is possible to derive sub-record fields from main record items, and to aggregate sub-records to totals in the main record. Any field may be multi-valued: that is, any one record may include several values for the same item. For example, you may have several contact names at a single customer site.

Max file size	8Mbytes
Max record size	380chars
Max no fields	158
Max field size	255 chars
Max digits	Not stated
Max prime key length	255 characters
Special disk format?	No
File size fixed?	No
Link to ASCII files?	Various formats
Data types	Num, Char, Date, Time, Reference by index only
Fixed rec structure?	Yes
Fixed record length stored	No
Amend rec structure?	Yes
Link data files?	Yes
Data files open	Eight (30 may be linked)
No sort fields	Unlimited
No keys	Unlimited
Max key length	255 chars, one field
Subsid'y indexes kept up-to-date	Yes
Data validation	Good
Screen formatting	Default, paint-a-screen
Unique keys	Optional
Report formatting	Default, paint-a-screen
Store calculated data	On input, batch recalc
Totals & statistics	Yes, good range
Store selecn criteria	Optional
Combining criteria	AND, OR, NO
>1 criterion/field?	Yes
Wild code selection?	Yes, in any test pos'n
Browsing methods	Any field
Interaction methods	Menu, commands
Reference manual+	****
Tutorial guide+	***
Reference card+	**
Online help+	****
Hot-line	Dealer support

Note: Maximum five stars possible

Fig 1: Features and constraints

Data validation is also reasonably powerful. In addition to direct checks on data values and the ability to restrict values to the elements in a list (called enumerated fields), you can also constrain field values to values already existing in a field in another file — for example, to ensure that only customer codes from existing customer records are entered on purchase orders.

File creation and indexing

The first step in creating a Cornerstone file is to set out the record definition; this process may involve two levels of detail. The short form contains just the name, a caption (to act as a screen prompt) and the field type, and this is the minimum you need to set up a record definition — all other attributes have default values. To set these yourself, you use the long form of the record definition. The attributes you can set in this way include mandatory fields, whether calculated field values are automatically maintained, and so on.

At the time the file is created, or subsequently, you can tell Cornerstone which fields are to be indexed to speed retrieval. Indexes are kept up-to-date, but they do not affect the order in which information is displayed. For the records to appear in a particular order they must be sorted, and this order is not maintained during editing and addition of records. However, sorting on fields which are indexed is quite fast, and you can specify that the data is always resorted at the beginning of a session, which helps a bit.

The indexes are used for all selections which involve searching for records starting with a particular sequence, but not those using more complex wild code specifications.

When a record structure has been defined, you can usually still amend the details; the only aspect which you cannot change is the field type.

In addition to defining the structure of individual files, you can also relate records in one file to those in another.

Data input and updating

Records may be entered or amended onscreen using a format which Cornerstone supplies, or one (or more) which you can set up yourself. To select records for updating, you can scroll through the file in its list form to obtain the one you want; you can flag all the records to be updated by scrolling through, marking as you go; or you can select a group of records by filling out a selection form (see 'Selection and sorting').

Most data management systems expect you to specify a key field value within the update procedure. Cornerstone's approach is less common, but the selection form process does use an index if there is one so the effect would be similar, if a little more cumbersome, for larger sets of data. When you have found an individual record, you can continue to scroll through the records in the current display order. If the records have been sorted by the appropriate field, you can find a group of records by going to the first and then scrolling in the manner employed by most data management systems.

Overall, the effect is to make updating in Cornerstone a little more tedious for larger data sets, and slicker for smaller sets, than a more conventional approach. 'Smaller' means small enough to scroll through comfortably, displaying one record per line — say, two hundred or so records.

When entering data, there are a variety of Cornerstone features which help to speed things up or to ensure accuracy. You can save a record at any time without necessarily having to enter all field values (except, of course, those which are mandatory), field values can be copied from the previous record, and derived fields can be prevented from alteration.

In addition to updating onscreen, you can amend records in batches where predictable changes are to be made to an identifiable group. For example, increasing the prices of all parts with a particular initial code letter by 10 per cent.

Screen display

Cornerstone provides three basic modes of viewing records onscreen: columnar (one record per line or group of lines); detailed (one field per line); and format-

ted (using a format you set up yourself). In each case, you can choose which fields are displayed. The initial columnar mode displays just the first field, while detailed mode starts by showing all fields. The display width of fields in columnar and detailed modes is controlled by the value entered during the record definition.

When Cornerstone is first used, the default display is columnar when viewing records and detailed when updating. In either case, you can define a different display format which may be automatically invoked on each subsequent use of view and update. Any printed report may be previewed on the screen.

Printed reports

Cornerstone provides some powerful reporting features, including the ability to design the layout onscreen, and subtotals on sorted fields. You can produce a variety of aggregate items of information, such as totals, averages, counts, standard deviations and variances. You can also create new values for calculated fields, using all the features described under 'Calculation'.

The ability to include unlimited text in reports would make it possible to use Cornerstone in a limited way to produce personalised letters. However, you could not go very far with including varying information within running text, as Cornerstone does not supply any facilities for amending the layout of the text line according to the length of the field value inserted — no word processing wrap-around features here.

Selection & sorting

The simplest method of selecting a subgroup of records is to list the whole file using the columnar format and flag the required records. To select a group of records using tests, you fill in a form showing the values of fields which are to be tested. On a single selection form, you can enter several values for a single field (when the test is passed if any of these values is present), and values into several fields (when the record is selected if each field passes its test). It is possible to have several forms in the same selection, and combine them either with AND (the tests on this form must be passed) or OR (the tests on this form or its predecessor must be passed). You cannot 'bracket' forms to ensure the desired order of evaluation of several forms, so it is important to set up the selections in the right order.

Tests allowed include exact matches and matches using the usual range of relational operators, ranges, negation, and the use of wild codes (that is, testing for partial matches).

When a selection has been set up, it can be carried out at once or stored for subsequent use.

Records may be sorted in ascending or descending order by any field, and by any sequence of fields — there is no limit on the level to which sorting can be taken. However, records are not maintained in any particular order during editing and addition. Cornerstone indicates the current state of the file by displaying a message which reads 'sorted' immediately after sorting, and is changed to 'unsorted' when you go into update mode.

'(Cornerstone's) basic functionality... is much more conventional, including a wide range of powerful features and with a few surprising omissions.'

Calculation

Calculated values are allowed in sorted records and in reports; you can also calculate totals, means, and so on. In any calculation a considerable display of function is provided, including log, remainder, round, abs, some data and time field manipulation functions, financial functions such as net present value, and string functions such as substring and searching for one string within another.

'... for those who always need to have information displayed in a particular order, the information would have to be frequently resorted.'

Multiple files

Records in one file may be related to those in another. For example, you could specify that a file of sales orders is to be linked to a file of customer details, via a customer code, to enable invoices to be purchased using information from both files. You must specify one field in each file to be the link, and it must be possible to identify the linked record uniquely. The implication is that, while it would be easy to specify one-to-one relationships in Cornerstone, there would be some difficulty in specifying one-to-many relationships directly, although by using the multi-valued field type you could probably achieve an acceptable result. Many-to-many relationships could not, I think, be constructed within the current range of Cornerstone facilities.

The ability to restrict values in one file to those in another is a great help in ensuring the integrity of related files.

Tailoring

You can adjust various default attributes

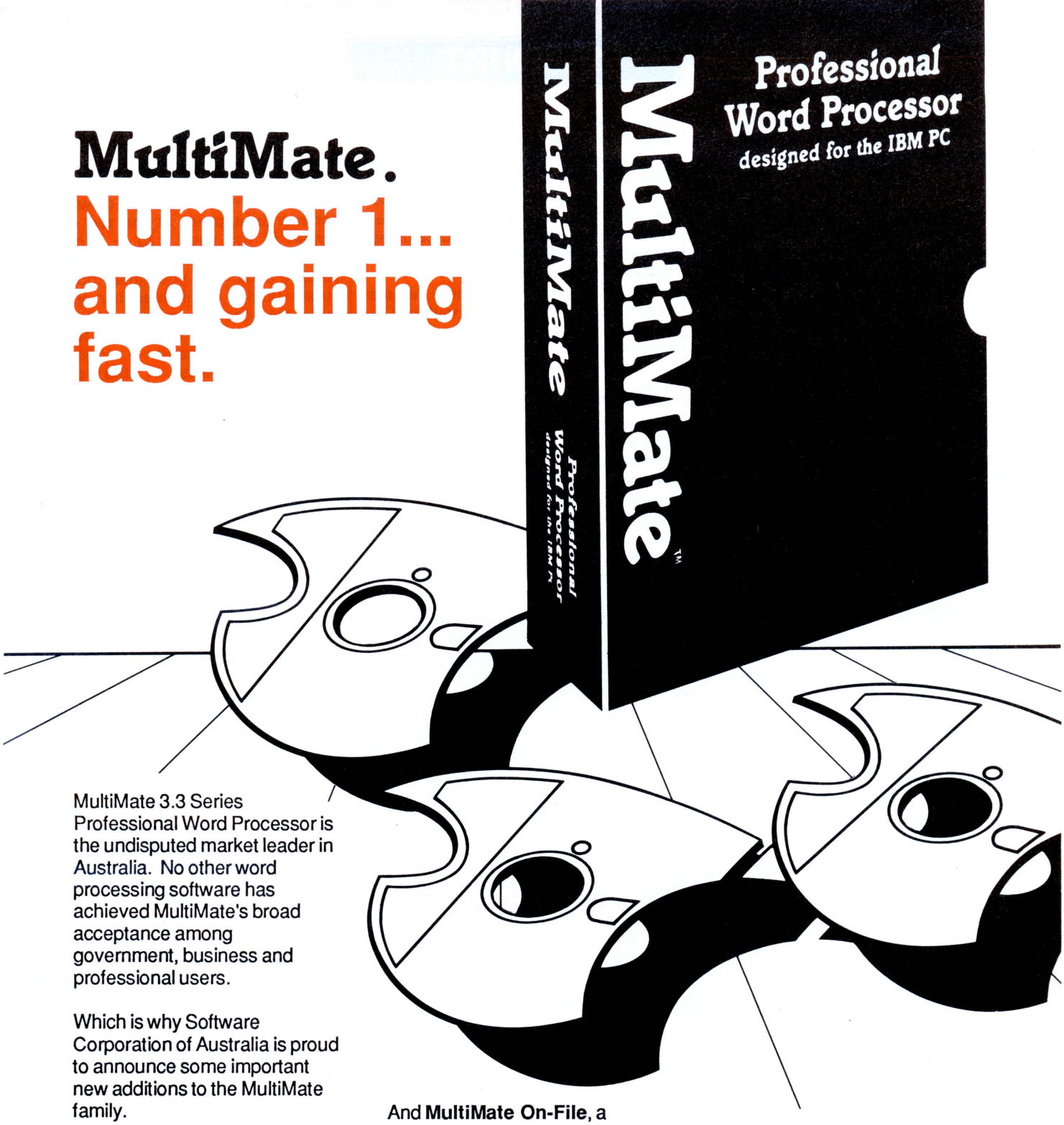
BM1	Time to add one new record	Inst
BM2	Time to select record by primary key	Inst
BM3	Time to select record by secondary key	Inst
BM4	Time to access 20 records from 1000 sequentially on three-character field (same field as in BM2 key)	46secs
BM5	Time to access 20 records using wild code	20 secs
BM6	Time to index 1000 records on three-character field	3mins 15 secs
BM7	Time to sort 1000 records on five-character field	2mins 31secs/48secs
BM8	Time to calculate on one field per record and store result in record	3mins 44secs
BM9	Time to total three fields over 1000 records	1min 53secs
BM10	Time to add one new field to each of 1000 records	Amend def

Time to import a file of 1000 records: 23mins 13secs

Note: *First time is for unindexed field, second for indexed field

Benchmark times recorded on IBM PC/XT/H

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in Cornerstone, such as controls over scrolling. Probably more important to most users is the ability to customise such aspects as the way in which data is displayed in each of the three formats and in each mode (view, update, and so on), but there is no ability to store sequences of keystrokes, still less a pseudo-programming language with conditional commands.

Security & housekeeping

Forms used to display records for updating need not include all the fields in a record. As you can ensure that a particular form is used to display records in update mode, this provides some answer to the need to allow junior staff to update some parts of records which also contain confidential information. However, it is relatively easy to invoke commands which revert to full display of the record. An alternative would be to put the two sets of information in two different files, linked by an appropriate field, but then absence of any protection mechanisms, such as passwords, would make security difficult to enforce unless the confidential file were kept on a separate floppy disk.

All the main file-handling requirements can be operated within Cornerstone, including deletion and the creation of security copies of data files.

Links with outside

Cornerstone can import data from files in dBaseII, PFS and Lotus 1-2-3 internal formats, in DIF format, and in ASCII text form either in comma-delimited records (mail-merge) or in records of fixed length. Cornerstone files can be output in DIF, Lotus 1-2-3, and the two ASCII formats.

Package	*Cost ($)*	*Summary*
Cornerstone	800	Powerful screen and report features, simple links between files, unlimited indexes kept up-to-date (but not used for ordering display). For IBM PC and close-compatible users with small-to-medium data sets who like lots of interaction. Good for varying length records.
Power-base	795	Powerful database management system with linking of many files, batch updating, up-to-date indexes, reporting adequate (no letter-writer), excellent links with other packages, for example Lotus 1-2-3. No system development tools. Easy to use, documentation excellent.
TIM IV	549	Good value for money as an easy-to-use package with basic features. Extensive indexing gives flexible direct access and ordering. Especially suitable where you need simple relationships between files, or output to range of spreadsheet formats.

Comparison of similar data management packages

Summary

Supplier:	Imagineering
Telephone:	(02) 662 4499
Cost:	$800
Systems:	PC-DOS
Version reviewed:	1.0
Type:	Novice users, structured data
Features:	Easy-to-use data management system for single and linked files. Powerful and flexible display and reporting, powerful indexing, batch updating. Excellent links to other packages including Lotus 1-2-3. OK for varying length records as it stores data only.
Drawbacks:	Only for IBM PC and close compatibles. Access for onscreen editing rather cumbersome: sorted order not maintained.
Ease of use:	Excellent: lots of help for novices, abbreviated commands for experienced users.

User image

Cornerstone is controlled by the use of commands — VIEW, DEFINE, EDIT, and so on. At each stage, a menu of available commands appears at the top of the screen (if you wish it to — it can be turned off as you become proficient). To select a command, you either move the cursor until a highlighted bar appears over the desired option and press RETURN, or you enter the first few letters of the command — enough to ensure uniqueness in the current menu.

Options are handled in a similar way; the result being that the novice user always has available a display of the current options, while an experienced user can set a task in motion by typing a few very abbreviated words and pressing RETURN just once.

Another good feature is the OPTIONS key; this provides a display of currently available values, for example a list of field names when setting up a report format. Good onscreen help is provided, always through the same function key, and includes supplementary information about error messages — an important but much neglected feature.

The ability to control the default modes of viewing, to have several display formats which can be stored by name, and the facility for choosing whether or not to store selection criteria are all very useful. I did not find the method of setting up selections so helpful, though, when the criteria became more complex — personally, I think there is a limit to what you can do with forms. I would prefer to see the use of commands extended to become an alternative to forms for setting up selection criteria. It would be a natural extension of Cornerstone's other features and would be much quicker for experienced users.

In some commands (DEFINE, for example, which allows you to set up file definitions and amend them) the use of sub-menus is unnecessarily extensive for experienced users, and a single command line could take the place of several menus here. Another fiddly criticism applies to the design of forms: there seem to be no commands which allow you to make groups of changes. For example, to design an entry form, you can start with the detailed default format and move fields to suit your tastes, but you cannot move a block of fields. If you want, say, the last six fields in the record to be moved up alongside the previous six, you have to shift them one at a time with cursor movements which are none too quick.

In addition to screen-displayed commands, there are some commands

An apology.

We would like to apologise to anybody who has already bought a communications package for their Commodore 64.

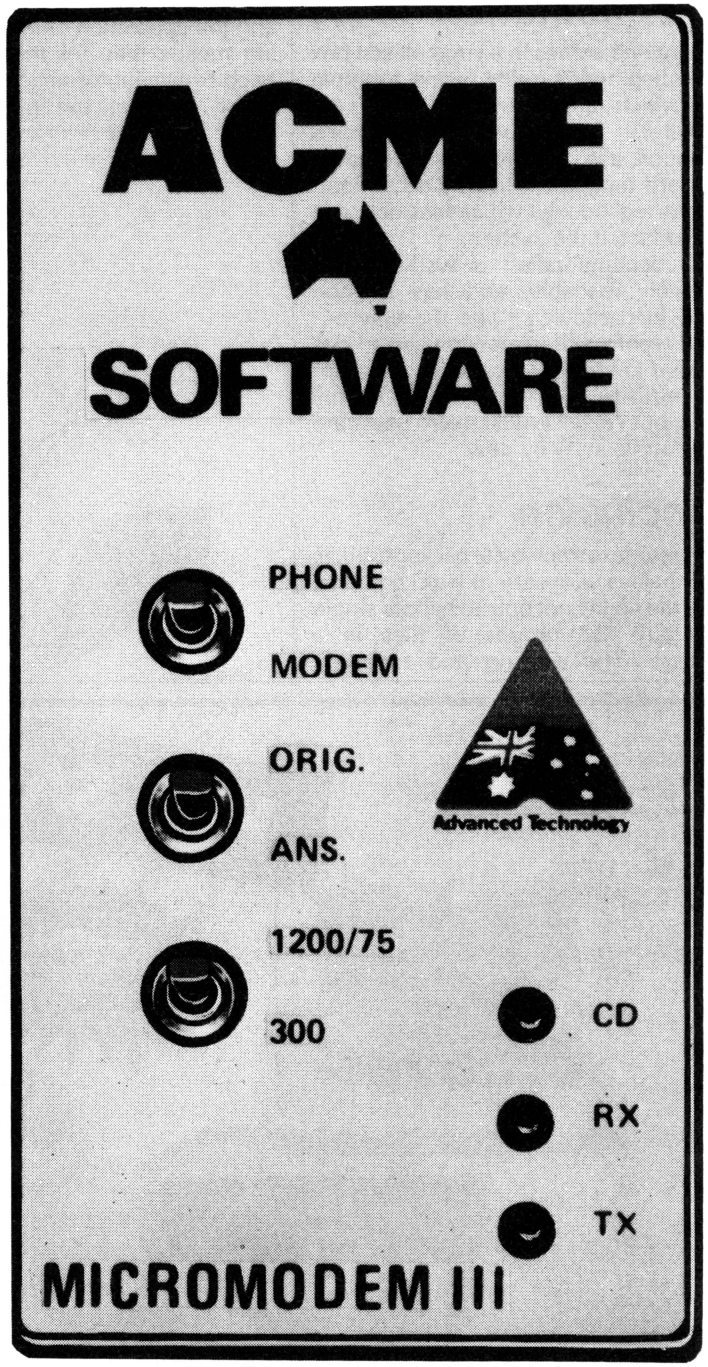
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which are invoked from function keys. For example, completion of tasks such as setting up selection criteria is signalled by pressing the DONE key. Other functions include help and options.

Documentation

Cornerstone comes in a large plastic box with a beginner's guide (using example files which are distributed with the software), a two-volume owner's handbook, a quick reference card and a keyboard template. There is also a 'getting started' booklet which instructs you how to install the system.

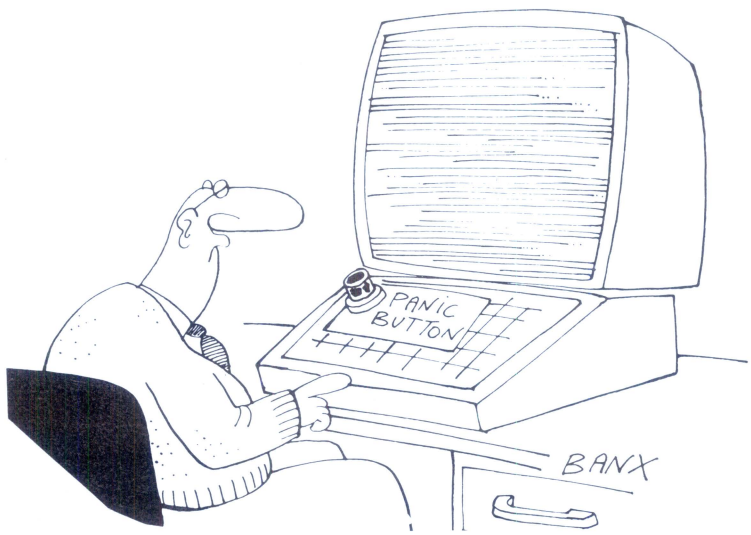
The documentation is well set out, extremely readable, and has a good index. In particular, I like the way different typefaces have been used to cue different kinds of information. Some of the language was rather folksy for my tastes, but I expect most micro users are used to this style by now.

Conclusion

Cornerstone is a powerful package, but is nevertheless very easy to learn and use. It has the ability not only to handle single files, but also groups of files in a database. The viewing and reporting features are powerful and well implemented. I particularly like the ability to have both an abbreviated list format and a more detailed one-record-per-screen format.

It is not quite as easy as it should be to retrieve individual records for editing, and the separation of indexing and sorting means that, for those who always need to have information displayed in a particular order, the information would have to be frequently resorted. On a relatively small database, neither of these drawbacks would be a great cause for concern, but when analysing several hundred or a thousand records per file it could be more of a nuisance.

There is no true built-in letter formatting facility, nor any spreadsheet or graphics functions, but links to the appropriate packages could be easily effected through the convert utility. END



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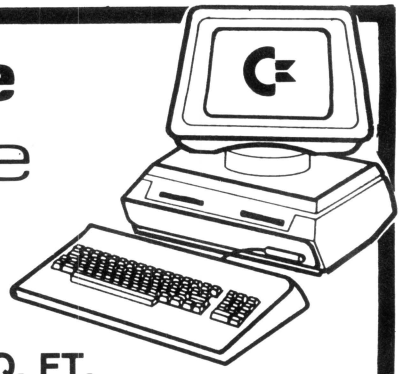
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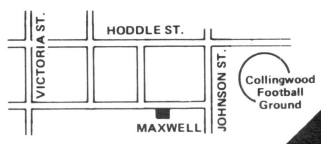
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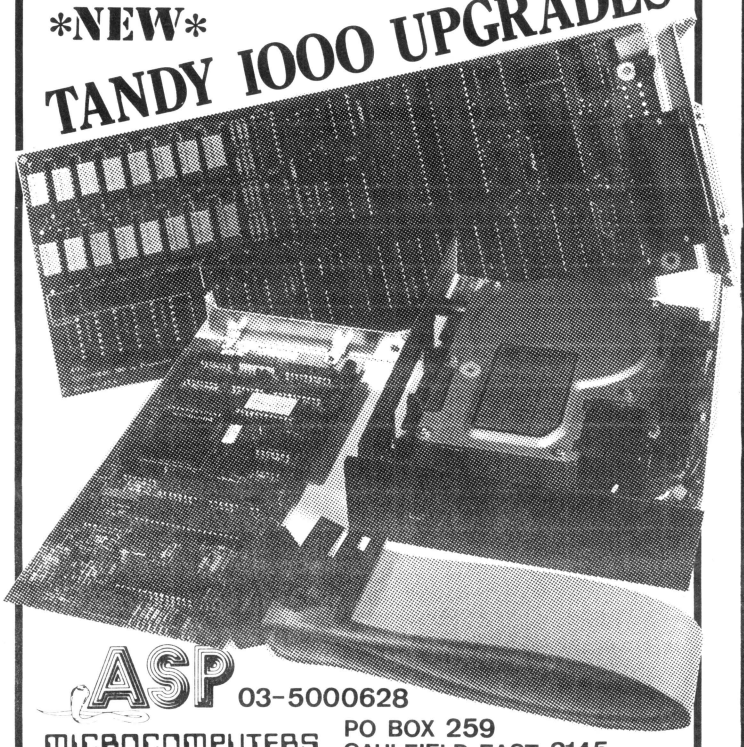
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Side by side

In contrast to the standard Von Neumann architecture (sequential — one function performed very quickly), parallel architectures have been developed which do lots of things at once. Is parallelism the ideal, or are computers most efficient when concentrating on one task? Richard Forsyth examines the question.

As well as being the 40th anniversary of the atomic bomb, 1985 marks 40 years of another revolutionary technological innovation — the Von Neumann computer. The logical design of the computers we all use today is attributed to John Von Neumann, a Hungarian mathematician who emigrated to the US and, incidentally, made a significant contribution to the atom bomb project.

John Von Neumann has a lot to answer for, although — as far as computers are concerned — a number of other scientists had dreamed up the same idea at around the same time. This central notion is the concept of the stored program. Presper Eckert, Hermann Goldstine and John Mauchly in the US, and Alan Turing in the UK, all realised that the key to unlocking the computing power of the electron was in having a machine that stored its own instructions.

Still, history gives the credit, or the blame, to John Von Neumann. But whereas the fission bomb had spawned a far more devastating big brother, the fusion weapon, within 10 years, the basic design of the digital computer has remained unaltered.

Of course there has been progress — fantastic progress, some might say — in fabrication techniques, miniaturisation, speed, value for money and almost every other parameter you care to measure; but the fundamental design has stayed the same. This is curious because, as we shall see, people have been saying that the Von Neumann computer was obsolete since the day it appeared. One of those people was John Von Neumann.

Before I deal with this 40-year-old chorus of criticism, I had better define the terms and state briefly the essential characteristics of the 'classic' Von Neumann machine.

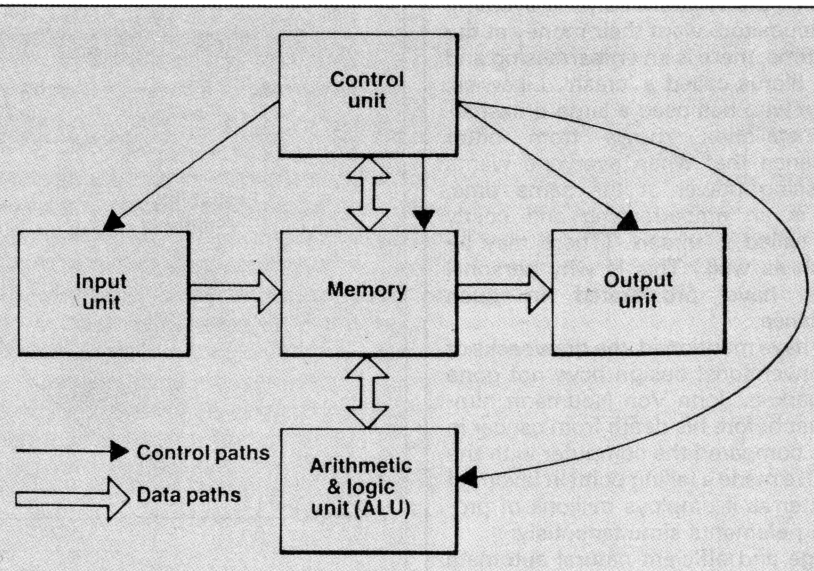
Characteristics

In conventional computers, the program is held in store. The basic design consists of five components — an input unit, an output unit, a storage unit, an arithmetic/logical unit (ALU) and a control unit. This is sketched in Fig 1.

The workings of the machine are governed by what is known as the 'fetch/execute' cycle, which is as follows:

1) Read the next instruction from the memory location given by the program counter (PC) into the central processing unit (CPU).
2) Transfer the op-code of the instruction to the control unit.
3) Decode the instruction and send signals accordingly to the ALU.
4) Put the address of the next instruction into the PC (usually by incrementing it).

This cycle may initiate another cycle if the instruction involves data in memory (as most do). In such cases, additional steps will be interleaved into the basic loop:



In the traditional Von Neumann computer, all units are under the control of a single control unit. Operations are carried out in sequence and the bottleneck is the CPU.

Machines that depart from this pattern are collectively termed 'Non-Von Neumann computers' (Non-Von for short). There are many kinds of Non-Von machines, differing in a variety of ways from Von Neumann's scheme.

Fig 1 Von Neumann computer diagram

3a) Fetch the data from memory.
3b) Store the results in memory.

The point to note is that there is a single processor which works in strict sequence. Consequently, the languages we use to write programs for such computers require us to specify the precise order in which operations are to be carried out, even when this is logically unnecessary.

Parallelism

That is the essence of the computing engines we have come to know and love over the last four decades. It is a design which, in its various guises, has proved capable of guiding spacecraft to Saturn and beyond, of paying your salary cheque (or unemployment dole) on the appointed data, of leading you through the Troll-infested forests of Middle Earth, and much else besides.

In view of the computer's astonishing versatility, why has a chorus of voices been raised since its advent protesting that it is manifestly, obviously and inescapably the wrong way to process information? The answer, in a word, is parallelism: like a recent US President, today's computers cannot walk and chew gum at the same time (so to speak).

They can give the impression of doing several things at once, by timesharing; but timesharing is a kind of conjuring trick (like the Western banking system). If all depositors want their money at the same time, there is an embarrassing and costly hiatus called a 'crash'. Likewise, anyone who has used a large timesharing installation knows from bitter experience that when everyone wants processing power at the same time, there is an embarrassing and costly event called a 'thrash'. (There may be a crash as well.) This is why personal micros have proliferated in such abundance.

As I have mentioned, the drawbacks of the conventional design have not gone unremarked. John Von Neumann himself, just before his death from cancer in 1957, compared the computer with the brain. He made a telling point in favour of the latter as it employs millions of processing elements simultaneously:

'Large and efficient natural automata are likely to be highly parallel'. (Von Neumann, 1958.)

Even today, in the age of array processors, floating-point chips, 'intelligent' database controllers and ULAs (all of which exhibit at least a degree of parallelism), it is not hard to find quotations in a similar vein.

'With the advent of the microprocessor and the ever-advancing technology of integrated circuits, it is becoming increasingly obvious that we need to break away from the straightjacket of the conventional approach to computing. The principles upon which it has been based are becoming less and less realistic in the light of present-day knowledge.' (John Sharp, 1985.)

But if there is one field where dissatisfaction with the Von Neumann model has been especially keenly felt, it is in artificial intelligence (AI). Many AI workers believe that a genuine breakthrough towards machine intelligence can only be achieved with radically new computer architecture, and this attitude has received a boost from the Japanese Fifth Generation Computer Project. The JIPDEC Report (1981) makes it quite clear that the basis for worthwhile advances in AI is a totally new approach to the design of highly parallel computing machines.

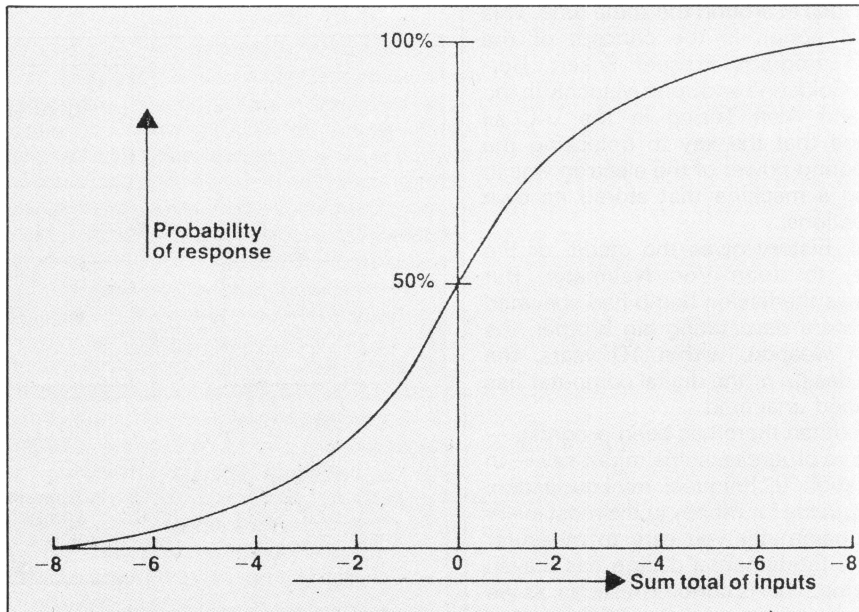
Now, I'll examine some of the ways that AI workers are seeking to overcome the shortcomings of traditional computing machinery, and consider whether the proposed solutions have shortcomings of their own. In particular, I'll look briefly at four novel kinds of computer architecture — the Boltzmann Machine, Igor Aleksander's WISARD, the Dataflow computer, and the Fifth Generation Project. All, in their different ways, have AI connections. That is, they are not just intended as improved computer designs, they are meant to move closer to the goal of thinking machines.

The Boltzmann Machine

Naturally enough, AI workers are fascinated by the human brain, and occasionally some of them are bold enough to attempt to simulate it. Simulating the brain as a way of designing intelligent computers found favour in the early days of AI, then fell from grace. The job was simply too hard. Recently there appears to have been a revival of interest in this approach, partly because we now have much more powerful hardware.

A team at Carnegie-Mellon University, led by Geoff Hinton, has begun to design a machine which is a deliberate attempt to mimic the behaviour of large neural networks, such as those in the human brain. They call their system the Boltzmann Machine (after Ludwig Boltzmann, a pioneer of statistical thermodynamics) as it works on statistical principals.

A Boltzmann Machine is composed of a network of many computing elements, all of which work in parallel. It can be



The basic processing element of a Boltzmann Machine is a probabilistic device. It computes the weighted sum of all its input convections and then decides whether to 'fire' — that is, to produce an output. Firing is determined according to the function graphed above.

During the 'simulated annealing' process, the response curve gets steeper. That is, it becomes more like a (deterministic) step function with a threshold at zero.

Fig 2 Processing unit response curve

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simulated on a conventional computer, but the ultimate aim is to use it as a blueprint for a novel form of computer.

The elements in the network are threshold units which produce binary outputs (0 or 1) by summing their inputs and 'firing' if the sum exceeds a certain-quantity; each processing unit is therefore a simplified nerve cell (neuron). An important point is that the thresholds are not fixed: they 'jitter'. The larger the input, the more likely the unit is to fire, but the response is probabilistic, not deterministic. This is illustrated in Fig 2.

All processing units are of the same type, but the connections between them vary. Connection strengths are symmetrical, so the link from A to B has the same value as from B to A. This is not like the real nervous system, but it makes proving theorems about the behaviour of such nets easier.

The network may be as complex as desired, and it may contain feedback loops, and so on. An example is shown in Fig 3.

This system can be made to learn. It acquires new input-output relationships by adjusting the connection weightings in the following way:

Phase one

1a Clamp the training pattern to the input units and the desired response pattern to the output units.

1b Allow the network to settle to equilibrium.

1c Increment the weights linking any two elements that are simultaneously active by a small amount.

Phase two

2a Remove the output connections but leave the inputs connected (that is, take away the teacher).

2b Let the network stabilise again.

2c Decrement the weights between any pair of elements which are active together by a small amount.

These two phases are repeated alternately until the input-output behaviour in phase two (unsupervised response) reaches some criterion of success. The procedure is known as 'simulated annealing' by analogy with the hardening of metal as it cools. A hot metal has plenty of random motion among its molecules. As it cools, they settle into fixed positions.

The idea behind simulated annealing is to 'shake' the system (by introducing randomness) in the early stages, but to let it become more and more deterministic later on. This helps to avoid the problem of getting stuck at a local optimum.

The Boltzmann Machine has brought neurological modelling back to the forefront of AI. Such systems can be taught a wide range of behaviour, but there is a catch. As Geoff Hinton says (1985):

'Our current simulations are slow for three reasons: it is inefficient to simulate parallel networks with serial machines; it takes many decisions by each unit before a big network approaches equilibrium: and it takes an inordinate number of I/O pairs before a network can figure out what to represent with its internal units. Better hardware can solve the first problem, but more theoretical progress is needed on the other two. Only then will we be able to apply this kind of learning network to more realistic problems.'

The Boltzmann Machine is an exciting idea thrown into the melting-pot of proposals on how to design the next generation of computer systems, but it is not a practical device.

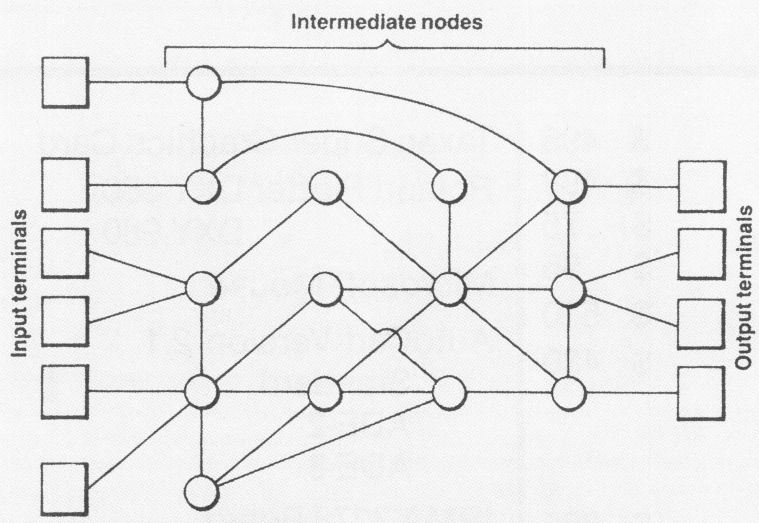
'Controlling a parallel machine is mind-bending fun for leading-edge thinkers in university AI labs.'

WISARD

Another innovative design with a neurological flavour is the WISARD system of Igor Aleksander (Aleksander & Burnett, 1984). The name stands for Wilkie, Stonham & Aleksander's Recognition Device. It was devised at Brunel University, although Professor Aleksander is now at Imperial College. It is a visual pattern recogniser.

The interesting point about WISARD is that it is a very highly parallel machine which is not a multi-processor system. In fact it has no processors at all, only memory. The system works by examining a TV image composed of 512 × 512 pixels, which are sampled in groups of eight at a time. There are over 32,000 groups, or octuples, and each can be in one of 256 states at any one time. In effect, each octuple is a primitive feature detector, and its state says something about the picture being presented.

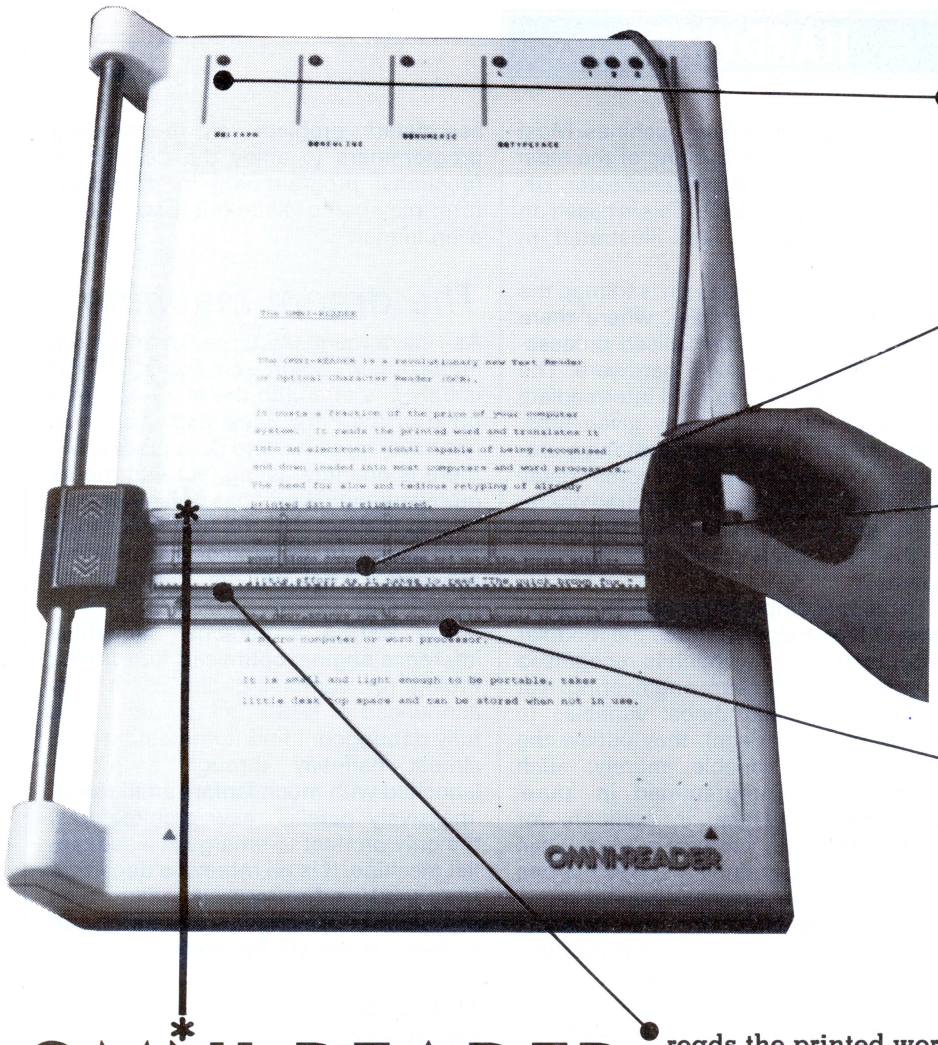
Every octuple is connected to a bank of 256 RAM locations; this allows the system to use a form of content-addressing. The state of the detector is used as an address (between 0 and 255) which points into its own RAM bank. During training, the bit to which it points is set when the image being taught is present. After the training phase, when an image is presented, all 32,768 detectors point to particular locations within their own RAM banks. The contents of these are read out and added up. A high total



The elements of a Boltzmann Machine are typically connected as in the schematic above. All connections are bi-directional and weighted. The system learns by adjusting the weightings.

There is no arbitrary limit on the number of intermediate processing nodes, nor on the complexity of their interconnections. More complex problems tend to require more nodes in a more complex network.

Fig 3 Boltzmann Machine network layout



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indicates that many detectors are in the same state as when they were seeing training examples. A low total indicates that most of them are not, and that the image is therefore not one the system has seen before.

WISARD effectively computes a 'fingerprint' or 'signature' of what it sees and compares this to past experience. It needs a lot of memory (one megabyte) but these days that is not excessive. It is highly resistant to 'noise' (that is, random distortions of the image). For example, it can learn to recognise a bearded face and then respond correctly to the same face with the beard shaved off and in a different orientation.

This is rather impressive. It is the type of thing that people are good at but computers, until now, have always proved poor at doing. Moreover, WISARD forms the basis for a commercially successful image recognition system that operates in real time, unlike many other AI vision systems which take up to half an hour just to process one frame of a moving picture. Nevertheless, WISARD is not a general-purpose computer: it is fast, but not flexible.

Dataflow computing

Unlike WISARD, dataflow computers are, in principle, quite general. They are capable of doing anything a Von Neumann machine can do. There are several classes of dataflow computer, but they all share the idea of liberating the programmer from the need to specify temporal ordering that traditional designs impose. A dataflow computation is one in which operations are executed in an order determined by the availability of resources and by the dependencies between data, not by a control sequence laid down by the programmer.

This takes a chore away from the programmer and allows the system to decide when things should happen. If the system is well-designed, this should permit better use of computing resources. Dataflow machines can work in two modes:

1) 'Greedy evaluation', in which operations take place as soon as their operands are ready.

2) 'Lazy evaluation', in which operations are not performed until their outputs are needed.

Under the first regime a unit, such as a multiplier, will 'fire' as soon as its inputs arrive; under the second, it will await their arrival and then delay further until the next unit 'downstream' issues a request for its result. Greedy evaluation is pushed by data, while lazy evaluation is pulled along by computations.

Several teams of computer designers are working on dataflow machines. Most exist only on paper, but one of the most advanced designs is in Manchester, UK (Gurd & Watson, 1980). This is based on a ring architecture and illustrated in Fig 4.

The object of this design is to map the idealised dataflow model, where there are infinitely many specialised processing units, onto physical hardware. The solution, in brief, is to hold intermediate results in a buffer. At any given time, there are many operands awaiting a processor. As processors become ready they are despatched, the required operation is performed on them, and the result is then fed back to join the operand queue.

Dataflow computers have a lot in their favour. They help to enforce the modular programming style which is recognised as essential to software engineering. Not only do they ban global variables (a source of many bugs), they outlaw the concept of a variable entirely; such machines are programmed in 'pure' functional languages. In addition, for many tasks, they promise a worthwhile speed-up in execution time, which is one reason why the Japanese have recently become interested in the dataflow framework. The trouble is that dataflow machines do not run Fortran.

A great deal of capital is tied up in existing software. The problem of automatically translating procedural software to take advantage of dataflow computers is as yet unsolved. The associated problem of re-educating programmers to enjoy the delights of functional programming in its purest form may be solvable, but it could take even longer.

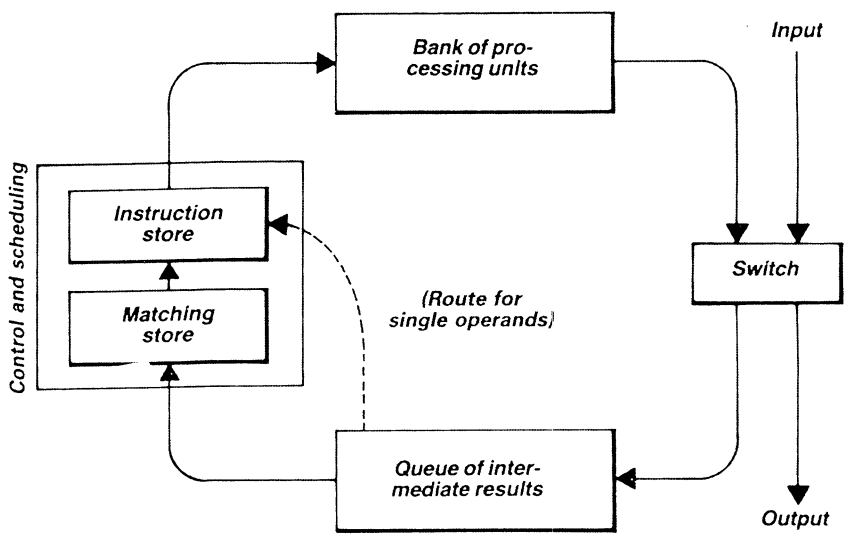
The dream machine

As I have mentioned, the Japanese are interested in dataflow concepts, but that is only one strand in the multi-coloured braid of the Fifth Generation plan. I do not have space here to do it justice, but there is one interesting fact that merits more attention than it has so far received. That is the fact that the first fruit of the ambitious Fifth Generation initiative is a sequential machine, the PSI, built by Mitsubishi.

The PSI is a personal sequential inference engine, optimised for running Prolog (or something like it). It was announced in 1984 and is now almost fully debugged. I find it interesting that, almost half-way through a project launched with much fanfare amid talk of 'massively parallel' new architectures, the only product to emerge is a sequential machine. It is no more of a departure from the Von Neumann paradigm than comparable Lisp engines that have been available in the US for years.

Paralellism in paralysis

The overall theme of doing many tasks in parallel has an intuitive appeal. It seems



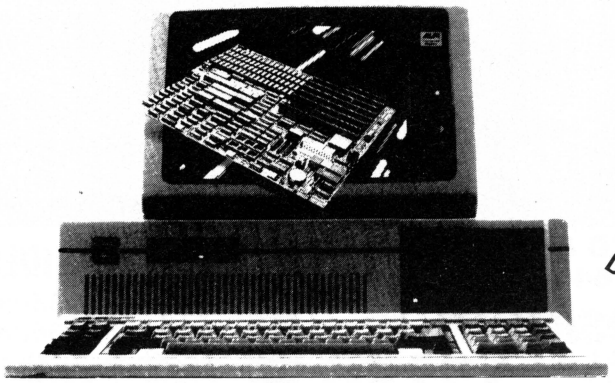
This model is based on a single ring structure. Data circulates clockwise. As new results are produced from the bank of processors, they are either sent for output or fed back to become inputs for succeeding operations.

Fig 4 Manchester University dataflow architecture

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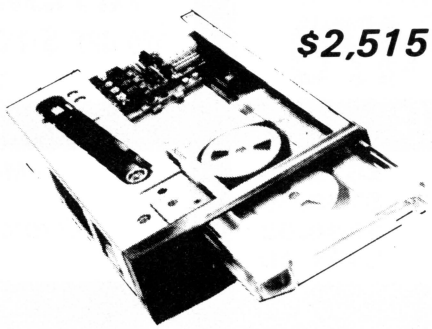
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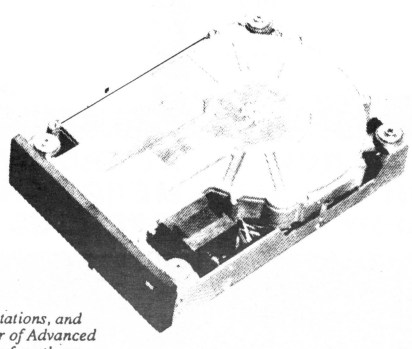
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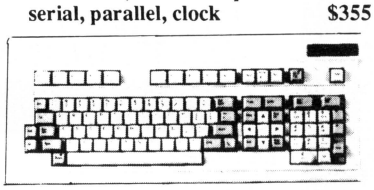
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obviously more efficient than just doing one thing after another, and yet sequential machines go from strength to strength while their more ambitious parallel cousins remain, for the most part, laboratory curiosities. Why is this?

There are several reasons, of which the first and most important is the way we think. Parallelism is all very well when you are walking along chewing gum (indeed, life would be intolerable without it), but when it comes to thinking, by which I mean doing intellectual tasks of some difficulty, we go in for something else. We call it concentration: we focus our mental energies on one thing. Intelligent problem-solving, which is what AI is all about, demands single-mindedness.

You could argue that lots of things are going on in the brain. At the neural level this would undoubtedly be true: millions of neurons are busily firing away. But at the cognitive level — the level of conscious awareness — we only do one thing at a time, at least when the job is a serious one.

Even if you accept this point (that when we think hard, we are in effect single processors) you could reply that we are not necessarily the last word in thinking machines. The single-minded approach may just be a limitation of human intelligence which we might want our machines to surpass, but the problem is — we have to design those machines. And, one hopes, we will want to control them, too. To control them, we need to write their programs, and this is where the limitation really bites. When all is said and done, we find it very hard to write programs for computers that work in parallel.

The gist of my argument here can be summed up as follows. The Von Neumann machine's success is no accident. It arises chiefly because it fits the human mind like a glove (or perhaps a suit of armour). Sequential thinking is natural thinking. On the other hand, parallel machines are alien. Controlling a parallel machine is mind-bending fun for leading-edge thinkers in university AI labs. For the rest of us, thinking about one process at a time is enough to give most people a headache.

If you don't believe it, think about the way politicians run the economy. The economy really is a parallel system. It has tens of millions of processing elements (firms and individuals) beavering away at the same time. As a result, it behaves in the most contrary and counter-intuitive ways. Governments always get it wrong. A government dedicated to reducing public expenditure implements its policies and they lead to a huge increase in public spending. A government dedicated to reducing unemployment sends it shooting up, and so it goes on. They are not all scoundrels; they just cannot cope with the complexity of highly parallel systems.

To look at it another way, writing a symphony is much harder than composing a simple melody. You might be able to come up with a catchy tune, but still be incapable of orchestrating it. The latter task requires the composer to imagine the effects of a multitude of concurrent musical events.

That is the primary problem of parallelism, but there is also a secondary problem. Parallel computers are often rather slow; this is one of the best-kept secrets in computing.

'Hang on a minute!' I hear you cry. 'Slow is just what they're not.' In theory you may be right, but in practice the payoff from increased parallelism has always proved disappointing. In certain specialised tasks parallel machines (like WISARD) perform well, but in many areas they unfortunately lag behind uniprocessor systems.

This is partly due to the fact that like all revolutionaries, designers of novel computers are split into factions. Each research lab is determined to prove that its pet project is the solution the the Von Neumann bottleneck. Consequently, there is no generally accepted design. This in turn means that most parallel machines are one-off jobs, put together with yesterday's technology. Inevitably, they cannot compete in cost/performance terms with mainstream products using the latest components.

Then there is the communications overhead to consider. Systems with multiple processors either share memory or have many processors with private memory sending messages to each other. With a large shared memory there is inevitably competition for access, and this leads to a degradation of performance which gets worse as the number of processors increases.

When each processor has to communicate with the others over a bus or a ring, the scarce resource is the communications channel. Delays arise while processors await responses from their neighbours. Ideally, a computation that takes T time units on a single processor should take T/N time units on a configuration of N processors, but in fact, this only happens with specially devised artificial problems. You will be lucky to find that a multi-processor system reduces the time taken to T/log(N).

There are many familiar instances of such diminishing returns in everyday life. Consider, for example, the rowing eight: a single sculler in the Olympics might take around 7 minutes to row 2000 metres; an eight would do the same distance in 5.75 minutes if they were going well. A 22 per cent increase of speed has been gained at the cost of a 700 per cent increase in effort — 800 per cent if you count the cox! And don't say that counting the cox is unfair: his role is to synchronise and steer the rest of the crew. A similar controller is typically needed in multi-processor machines.

Conclusion

There is a deeper reason for the relative failure of parallelism. Parallel machines have always been more specialised than sequential ones. They are typically optimised for one kind of task, such as signal processing, number-crunching, or database access. It would not be worth doing word processing on a CRAY-X/MP; on a Boltzmann Machine, it would not even be possible. The great thing about digital computers is their flexibility, not their speed. Designers of novel machines tend to forget this and sacrifice too much in the quest of raw computational power, which leads to over-specialisation.

Mankind as a species is a generalist — not very fast, not very strong, not (if the truth be told) very clever, but very adaptable. Until parallel computers can display the same kind of adaptability as their staid and boring conventional brethren, they will only be fit to act as slave processors for a few highly specific applications. That means that the kind of parallelism we will see in computing tomorrow is the 'creeping parallelism' that is already in evidence today; not a revolutionary change to a totally new architecture, but an evolutionary process.

As auxiliary devices (such as floating-point units, video controller chips and frequently-used subroutines embedded in hardware) are introduced on an *ad hoc* basis, the Von Neumann design gradually adapts itself to the needs of the future. In the process, it undermines the position of those who argue for radical change. END

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America online

It's a mixed comms bag this month, with BBS news from home and overseas, featuring a list of American systems.

We've received information about a whole range of systems in recent weeks, and we are especially grateful for the response to our appeal for details about certain systems.

Scorpio, Bresike Omen, Skull, and Zeta now appear in our listings thanks to Michael Cooper (sysop of Club-80), while his fellow New South Welshman Colin Wright provided the information about Irata and Palantir. Colin also assures us that Commboard is "the best BBS in Oz!!!!" — but then he is biased!

Mark Looi provided an update on several Queensland-based systems, namely Bex II, Tomorrowland, Brisbane MicroBee, and Competron. He also pointed out that the BBS we've been calling BCUG is actually named CCUG.

Moving to the other side of the continent, Graeme Platt provided a list of Western Australian systems. This was especially useful as he limited the list to those BBSs of which he has first-hand knowledge. Graeme runs NEMO, a system that we previously called The Mouse. It's good to get the facts from the horse's mouth.

We have also heard that Software Tools, Coco-Line, and the NZ Microcomputer Club Systems have new numbers, but our informant hadn't been able to discover them. Can anybody help, please?

We received some bad news from Shane Anderson of TISHUG. Visitor access to their system (now called Texpac) is no longer permitted "due to hacker disruptions and abuse." On a more positive note, Texpac will soon support V23 as well as V21, and the group can supply appropriate software for TI/99-4A users.

Sydney now has a system catering for MicroBee users. Bob Fryer's Bee-Tech BBS offers public access, 24 hours daily on (02) 607 7584.

Before we leave the domestic scene, it's red face time again. The number for the Newcastle Microcomputer Club RCPM has been printed wrongly in recent issues. Apologies to anyone inconvenienced by this.

All told, there are many changes to the listings this month. Not all of them are mentioned above, so it would be worth taking a close look.

Overseas

There's a couple of systems for Commodore users. The first runs on a Commodore 64 in Aberdeen on 0011 44 224 781919 (24 hours, V21). The second is a TBBS devoted to Commodore users called Eire International Resource Exchange (EIRE for short!). This is Bell 103 and 212 tones only at present, and runs 24 hours a day in Limerick on 0011 353 61 74614 (Bell 212 is the same as V22 1200 full duplex).

For CP/M users, a remote CP/M (although it's more in the style of a CBBS than a basic remote CP/M system) called Pete's Place can be found in Colchester on 0011 44 206 862354 (24 hours, V21).

In Swansea (Wales) there's a new FBBS on 0011 44 792 203953. This has colour for BBC users, and again is a 24-hour system.

For Atari users there's a new 24-hour Atari-based system in London on 0011 44 1 638 2034.

Apricot users are also receiving BBS support from Gosport Apricot BBS on 0011 44 705 524805, which is a 24-hour system with a hard disk and 1 Mbyte of RAM. It is sponsored by Gosport Computer Centre.

A specialist Macintosh system, Mactel, has been on line for some time, but has been having teething problems with interfacing US software to a UK modem. It should have settled down by now, and is on 0011 44 602 289783 (24 hours, V21/V23).

For those interested in outer space, a group of computer hobbyists working at the European Space Agency's European Space Research and Technology Centre, ESTeC, which is in Holland, have boldly set up a BBS. This runs on a BBC Micro, and offers information on ESA activities as well as the usual BBS facilities. It runs in English, but for the second time this month our sources couldn't come up with a phone number. It sounds interesting, so we'll keep trying.

Following our recent description of Fido, it might be worth mentioning two particular systems in the UK.

LaserMail offers the usual Fido facilities plus telex, telemessage and private mailboxes. The number is 0011 44 903 39290, and is a 24-hour online system.

Fido Haunting Thunder (love that name!) carries support for Olivetti users, being a database and message system for the UK Olivetti Users' Group. It runs 24 hours a day on 0011 44 752 364 059.

We've been taken to task by the Great Goblin, Sysop of the Gnome at Home for not mentioning his system. It runs on networked BBC Micros with at least two lines (engaged tones should be less likely). The number is 0011 44 1 888 8894, and it is a 24-hour viewdata-type system (V23).

Fig 1 is a list of US TBBSs which accept V22 and V22bis (1200 and 2400 full duplex) calls as well as the normal Bell 103 tones. The popularity of V22 and V22bis seems set to spread to this side of the Pacific as modem prices fall, but in the meantime this list is for the benefit of the affluent pioneers.

There is a certain amount of pressure on the space taken by this column, and the most obvious saving is to drop the list of overseas systems. The letters we receive make it clear that while this is a minority interest, there are those who take international communications seriously. Since we can only list a tiny fraction of the systems around the world (even if we stick to 24 hour public availability) it seems a waste to keep printing the same few numbers. From next month we will only print numbers that are new to us in the overseas section.

Microtex 666

There's been another burst of activity on Microtex 666. There are several new and interesting programs for downloading, including two business packages from Abraxas for the Commodore 64. Stock Control is self-explanatory, while The Collector is a combination of a "card file" database and a word processor. Both packages are considerably cheaper than

if purchased in the normal way, even though documentation is provided.

IBM PC users can take their pick from a collection of utilities, while Apple II users face a more lighthearted choice between several games and a race handicapping program. There are also some games for the BBC, along with speed reading and arithmetic tests.

If you are an avid reader of *APC's* Newsprint section, you'll be pleased to know that much of the material appears in Microtex 666's version before *APC* hits the streets.

Another new section is the User Group Board. Microtex 666 provides one page free of charge to each group in order to show areas of interest, contact address, and meeting time and location. If a group can use more space, extra pages may be rented for $10 per year. Groups can arrange to create and update their own pages, or Microtex 666 will take care of these chores for a small fee.

On a different track, Microtex 666 is starting two bulletin board-style services. Debate 666 is restricted to Microtex subscribers, while Blackboard is initially open to all Viatel users. At the end of the first six weeks a $20 annual subscription will be introduced for Blackboard, but Microtex subscribers will be exempt. The interesting thing about Blackboard and Debate 666 is that they are the only automatically updated services on Viatel. Operated through a gateway, the boards are "live" between 6pm and 11pm EST, Monday to Thursday. At other times the updates occur every 15 minutes. Depending on the level of activity, the "live" periods will probably expand over the coming months.

The Great Galactic Conflict will start on January 13th, 1986. This long-awaited multi-player game offers a very attractive first prize: $5000. The second and third spots each attract a printer, and there are 20 consolation prizes. Members of Club 64 get the cheapest entry at just $15, while other Microtex subscribers pay an extra $3. Normal Viatel users can join the fun for $35.

Still on the light-hearted side, Slangin' Session gives an opportunity to exchange humorous verse — make a point of reading the digital Desiderata.

Bulletin Boards

Each entry shows the available information in this order: name, phone number, access control ("P" for public access and "M" for member, possibly with a "V" for visitor access), operator's name, operating times, and any special notes including modem type if not V21 (300 baud).

Systems outside Australasia are only listed if we have been informed that they are available to the public 24 hours per day.

Australian Systems

Micro Design Lab Citadel. (02) 663 0150 and (02) 663 0151. P. Stephen Jolly. 5pm-7am weekdays, 24 hours weekends.

MI Computer Club BBS. (02) 662 1686. MV Rose Vines. 24 hours daily. Program downloading.

Sydney Public Access RCPM. (02) 808 3536. MV. Barrie Hall and David Simpson. 24 hours daily.

Prophet RBBS. (02) 628 7030. P. Larry Lewis. 24 hours daily.

Texpac RBBS. M. Shane Andersen. Mon & Tues 7pm-6.30am, Wed 7pm-Mon 6.30am. For membership write to TISHUG (attn Texpac Sysop), PO Box 595, Marrickville, NSW 2204.

AUGABBS. (02) 451 6575. MV. Mathew Barnes and Andrew Riley. 24 hours daily.

AUSBOARD. (02) 95 5377. P. Daniel Moran. 24 hours daily.

Club-80 RTRS. (02) 332 2494. MV. Michael Cooper. 24 hours daily.

Omen I. (02) 498 2495. P. Ted Romer. 4.30pm-9am weekdays, 24 hours weekends.

Oracle. Has temporarily closed down.

Infocentre. (02) 344 9511. M. 24 hours daily.

Dick Smith Electronics RIBM. (02) 887 2276. P. Ian Lindquist. 24 hours daily. Program downloading.

Sorcerer Users Group RCPM. (02) 387 4439. MV. John Woolner. 6pm-8am weekdays, 24 hours weekends. Ring-back system.

Contact BBS (02) 550 1004. MV. Steven Williams. 9am-11pm weekdays, 24 hours weekends. Computer dating.

Keeboard TBBS. (02) 629 2230. P. Philip Keegan. 6pm-8.30am daily.

RUNX Unix System (02) 487 2533. MV. Mark Webster. 24 hours daily. Call (02) 48 3831 for system status. Also or (02) 48 3831 (V22) and (02) 487 1860 (V23).

Tesseract RCPM. (02) 651 1404. MV. John Hastwell-Batten. 24 hours daily.

Tomorrowland's DIRECT. (02) 411 2053. NV. Mike Kidson. 24 hours daily. Helpline: (02) 412 3909.

RCOM BBS. (02) 667 1930. MV. Simon Finch. 24 hours daily. For Commodore 64 users, software downloading to registered users only $20/year to Box 1542, GPO, Sydney 2001. Half duplex.

BERT. (02) 211 0855. P. Resource Data. 24 hours daily. V23 videotex.

Commboard. (02) 664 2334. MV. Graham Lee. 24 hours daily. For Commodore 64 users, membership $25/year to 199 Coogee Bay Road, Coogee 2034.

Scorpio BBS. (02) 6 MV. Russ Morrison. 24 hours daily. C64, full access $25 — contact 64 Blacktown Users Group.

Bresike Omen (02) 457 8281. Geoff Arthur. 24 hours daily. TRS-80.

Skull BBS. (02) 529 8750. Les Ayling. 24 hours daily (but sometimes off-line). Apple.

Zeta RTRS. (02) 627 4177. Nick Andrew. 5pm-7am daily.

Irata BBS. (02) 600 9041. 6pm-12pm daily. Atari.

Palantir BBS. (02) 451 6576. P. Steve Sharp. 24 hours daily.

ACRIBBS. (02) 982 8252. 24 hours daily.

Bee-Tech BBS. (02) 607 7584. P. Bob Fryer. 24 hours daily. MicroBee, file up/downloading.

Newcastle Microcomputer Club RCPM RBBS. (049) 68 5385. MV. Tony Nicholson. 5pm-8.30am weekdays, 24 hours weekends. RBBS free to all, RCPM for members only — $4/year to PO Box 293, Hamilton, NSW 2303.

Canberra RBBS. (062) 88 8318. 24 hours daily.

Canberra IBBS (062) 58 1406. MV. 24 hours daily.

DSA-80 RTRS. (062) 41 4395. MV. Anonymous. 24 hours daily. Full access granted only to Canberra Micro 80 Users Group Inc and non-residents of Canberra.

MICOM CBMS. (03) 762 5088. MV. Peter Jetson. 24 hours daily.

Melbourne PIE. (03) 878 6847. P. Len Gould. 24 hours daily.

Sorcerer Computer Users Association CBBS. (03) 434 3529. MV. David Woodberry. 24 hours daily. Program downloading for members.

PC Connection IBBS. (03) 528 3750. Lloyd Borrett. 24 hours daily. IBM PC program downloading.

Omen IV. (03) 846 4034. Philip Westh. 24 hours daily.

Hisoft IBBS. (03) 799 2001. Richard

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87 Swan Street, Richmond, 3121. Phone: 429 1966.
Electronic Database/Shopping (03) 596 2340.

Tolhurst. 24 hours daily. IBM PC program downloading.

Computers Galore IBBM. (03) 561 8497. Bob Cooban and Martin Scerri. 24 hours daily. IBM PC program downloading.

East Ringwood RCPM. (03) 870 4623. Mick Stock. 4pm-midnight. Monday-Friday ONLY.

C64-BBS. (03) 489 4557. MV. Alan Miles. 24 hours daily. Commodore 64 software up/downloading.

MicroBee RBBS. (03) 873 5734. G. Forrest. 24 hours daily.

MicroPro BBS. (03) 568 8180. MV.

AM-NET. (03) 366 7055. MV. Peter Hallgarten. 24 hours daily. Membership $5/year.

National IBBS. (03) 818 1934. P. John Blackett-Smith. 5pm-9am. 24 hours weekends.

BUGM RCPM. (03) 500 0562. P. Sol Green. Midnight-6pm Monday-Saturday, Midnight-Midday Sunday.

Victorian Apple Bulletin Board. (03) 877 1990. Graham Willis. 24 hours daily.

Atlantis International Computers RBBS. (03) 277 6824. P. 24 hours daily.

Viatel Computers RBBS. (03) 288 3599. P. 24 hours daily.

Gippsland RCPM. Permanently off-line.

Mail-Bus. (051) 27 7245. M. Max Moore. 24 hours. Membership virtually essential. Write to PO Box 234, Newborough, Vic 3825.

MIN-NET. (054) 41 3013. MV. Mal Fields. 24 hours daily. Enquiries to (054) 43 2589 during business hours ONLY.

Software Tools RCPM. Current number unknown — can you help? Bill Bolton. 24 hours daily. CP/M, MS-DOS, Unix program downloading. V22 (1200 baud) only.

BEX II RCPM. (07) 395 1809. Rick Dalley. 24 hours daily.

Tomorrowland. (07) 394 2300. 24 hours daily.

CCUG. (07) 808 2125. 24 hours daily. Commodore users' group.

ACEA. (07) 341 0285. 24 hours daily. Commodore.

Brisbane Microbee RCPM. (07) 38 4833. 6pm-8am weekdays, 24 hours weekends.

Competron IBBS. (07) 52 9498. 24 hours daily.

HiTech C BBS. (07) 38 6872. 24 hours daily.

TI-BBS. (07) 263 6161. 7pm-6am weekdays only.

CAD-IBBS. (070) 51 1360. 6pm-8am weekdays, 24 hours weekends.

COCO-LINE. Off-line or number changed — can you help? 24 hours daily. Tandy Color Computer.

Adelaide Micro Users Group BBS. (08) 271 2043. MV. 9am-9pm weekdays, 10am-10pm weekends and public holidays.

Computer Ventures CBBS. (08) 255 9146. Daniel Schumacher. 24 hours daily. NB: This number has been misprinted in recent issues — please ensure your own records are correct.

The Electronic Oracle. (08) 260 6686. MV. Don Crago and Grayham Smith. 24 hours daily. Program downloading. Membership $35/year to 12 Brentwood Road, Flinders Park, SA 5025.

Multiple BBS. (08) 255 5116. 24 hours daily.

Nexus. (08) 243 2477. 24 hours daily.

SAC64. (08) 382 4631. 24 hours daily. Commodore users' group.

Red Centre RCPM. (089) 52 8852. 24 hours daily.

Omen II. (089) 27 4454. Terry O'Brien. 24 hours daily.

Outback RCPM. (089) 27 7111. Phil Sampson. 24 hours daily.

Omen III. (09) 279 8555. Greg Watkins. 24 hours daily.

NEMO. (09) 370 1855. Graeme Platt. 24 hours daily.

Computext. (09) 447 0522. Russell Stokes. 24 hours daily.

The PAD. (09) 337 2941. 9pm-4pm daily.

Mouse Exchange. (09) 330 5530 8.30pm-7.30am daily.

Atarians. (09) 409 7251. 24 hours daily.

MiniPro C64. (09) 337 3400. 24 hours, Mon-Fri only.

Trash II. (09) 478 2419 8pm-7am daily.

New Zealand systems

NZ Micro Club RBBS. Off-line or number changed — can you help? Chris Cotton. 24 hours daily.

Software up/downloading. Type "help" to log in.

Attache RBBS. 0011 64 9 78 9084. 24 hours daily.

North America

SPACE Citadel	0011 1 206 839 4759	
Ckcms Citadel	0011 1 206 329 0436	
Eskimo North Minibin	0011 1 06 367 3837	
Conn-80	0011 1 212 441 3755	TRS-80 Color Computer
CLEO	0011 1 213 618 8800	Job vacancies
Mindstorm Network	0011 1 812 235 0908	Networked BBSs

South America

CBBS Do Prado, Brazil	0011 55 11 813 2016	
CBBS Do Pinto, Brazil	0011 55 21 247 8440	
CBBS Do Otto, Brazil	0011 55 41 262 4743	
Forum 80, Brazil	0011 55 21 287 8844	
Sistema Samoa, Brazil	0011 55 11 853 6273	

Europe

ELFA ABC-MONITOR, Sweden	0011 468 730 0706	Half Duplex
ABC-Banken, Sweden	0011 463 511 0771	
ABC-MONITOR, Sweden	0011 468 801 523	Password required
CBBSD Gothenburg	0011 463 129 2160	75/1200 baud
BUG, Sweden	0011 468 463 528	BBC Micro
	0011 47 2 431 840	22Mb of public domain files
XD-BBS Helsinki	0011 358 072 2272	
Commodore BBS, Finland	0011 358 116 223	
Tedas, Munich	0011 49 89 596 422	
Decates, Germany	0011 49 66 154 51433	

UK

BABBS Felixtowe	0011 44 394 276306	Apple Users' Group
BABBS TWO Basildon	0011 44 268 778956	Apple Users' Group
Blandford Board	0011 44 258 54494	
CABB	0011 44 631 3076	300/300 and 1200/75 baud
CBBS South West	0011 44 392 53116	
CBBS Surrey	0011 44 4862 25174	
Clinical Notes Online	0011 44 524 60399	
Computers Incorporated Newcastle	0011 44 207 543555	
Gnome At Home	0011 44 1 888 8894	V23,7 bits, even parity
Gosport Apricot BBS	0011 44 705 524 805	
Liverpool Mailbox	0011 44 51 428 8924	
Microweb TBBS	0011 44 61 456 4157	BBC Micro
NBBS Birmingham	0011 44 827 288810	

Procedure define thyself!

Harvey Mellar looks at how procedures are built up in Logo, and presents a simple program generator.

In the November issue I introduced programs for pattern-matching based on lists. This month I'll show how lists enter into the actual 'mechanics' of the language — how to evaluate a list as if it were a command input from the keyboard, and how the definitions of procedures are themselves built up from lists. These features allow such things as adding new control structures and creating procedures that write other procedures, but be warned — it's worrying when programs start writing themselves. All the old cliches about computers only doing what you tell them suddenly begin to look somewhat less than obvious.

I'll also examine how keyboard input is dealt with and how errors can be trapped. These extra features combined with existing knowledge will allow us to write a simple program generator.

The primitive RUN takes one input, a list, which it evaluates (runs) as if it had just been typed in at the keyboard. RUN [FD 50] would have the same effect as FD 50, and RUN [:X < 5] would return TRUE or FALSE depending on the value of :X. The usefulness of RUN is evident in those cases where a procedure constructs a list which can then be run as if it had been a command. Another use for RUN is to find the value of an expression at various times during the running of a program.

RUN can be used to add new control structures to the language. Most versions of Logo do not have equivalents of WHILE . . . DO or REPEAT . . . UNTIL constructions as the same results can be achieved by using recursion, but if you find it easier to understand and write programs using these structures, they are easily added. For example, here is a form of a REPEAT . . . UNTIL loop:

```
TO UNTIL :COND :ACTION
  RUN :ACTION
  IF (RUN :COND) THEN STOP
  UNTIL :COND :ACTION
END
```

An example of its use would be UNTIL [XCOR > 100] [FD 1], which would cause the turtle to keep on moving forward one unit until its x-coordinate exceeded 100.

Looking at the definition of UNTIL, RUN is used twice. The first use is to cause the original command (ACTION) to be obeyed again; this is achieved by storing the command as a list and then RUNning it each time. The second use is to re-evaluate the condition (COND) under each new set of circumstances, whenever the procedure is called.

Logo does make one concession to iteration by including REPEAT, but otherwise an equivalent could have been defined as:

```
TO .REPEAT :NO :LIST
  IF :NO < 0.5 THEN STOP
  RUN :LAST
  .REPEAT :NO — 1 :LIST
END
```

RUN has many other uses besides adding new control structures, and I will give more examples later. Basic and Pascal have no equivalent to RUN, but Lisp has the very similar function EVAL.

None of the procedures presented so far have needed to read any data from the keyboard, due to the interactive nature of the language. I have defined procedures that require inputs rather than ones which have to ask the user for certain values while they are running.

There are clearly circumstances in which it is important for a procedure to be able to tell if a key has been pressed. To handle this task, Logo has two primitives, RC? and READCHARACTER (or KEYP and READCH in LCSI Logo versions). When a key is pressed, the corresponding character is stored in an input buffer. READCHARACTER causes Logo to read the next character in the input buffer; if the buffer is empty, Logo waits for the next key to be pressed. RC? is set to TRUE if there are any characters waiting in the buffer, otherwise it is set to FALSE.

Now that we can read characters from the keyboard, it is possible to write programs in which the procedures to be run are not known at the time of writing the program. A simple case would be a menu:

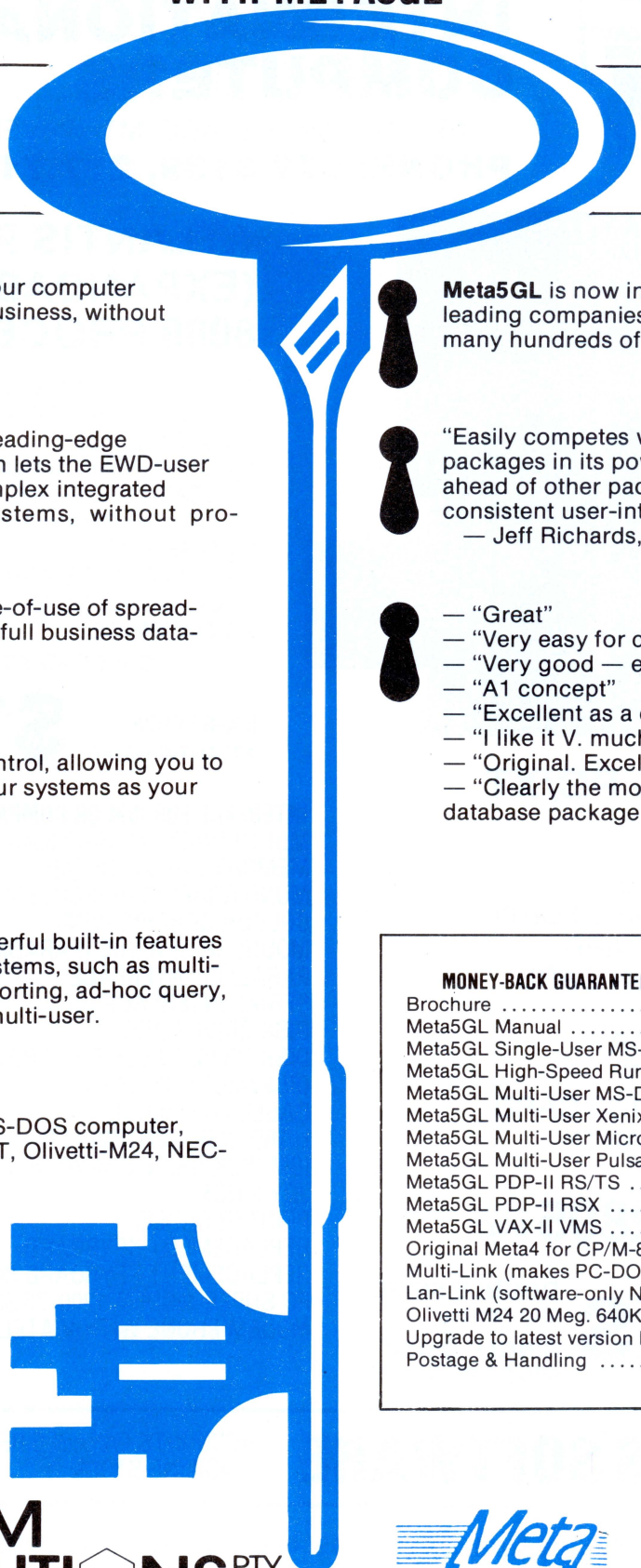
```
TO MENU
  PRINT [MENU]
  PRINT [1 SALES LEDGER]
  PRINT [2 PURCHASE LEDGER]
  PRINT [3 NOMINAL LEDGER]
  MAKE "INPUT READCHARACTER
  IF MEMBER? INPUT [1 2 3] THEN
    RUN (LIST WORD "PROG :INPUT)
  MENU
END
```

To see how this works, imagine that the user types 1. The input character is stored in INPUT, then WORD "PROG :INPUT creates the word PROG1 which is the name of the procedure to run the sales ledger. (LIST WORD "PROG :INPUT) now takes the word and makes it into a list — the brackets are needed here to inform Logo that LIST is only going to have one input rather than the usual two. We now have something, [PROG1], on which RUN can work in order to run the correct procedure.

This procedure would be unsuitable for uses such as video games, and in such cases the procedure READKEY can be useful:

```
TO READKEY ,
  IF RC? THEN OUTPUT READCHAR-
```

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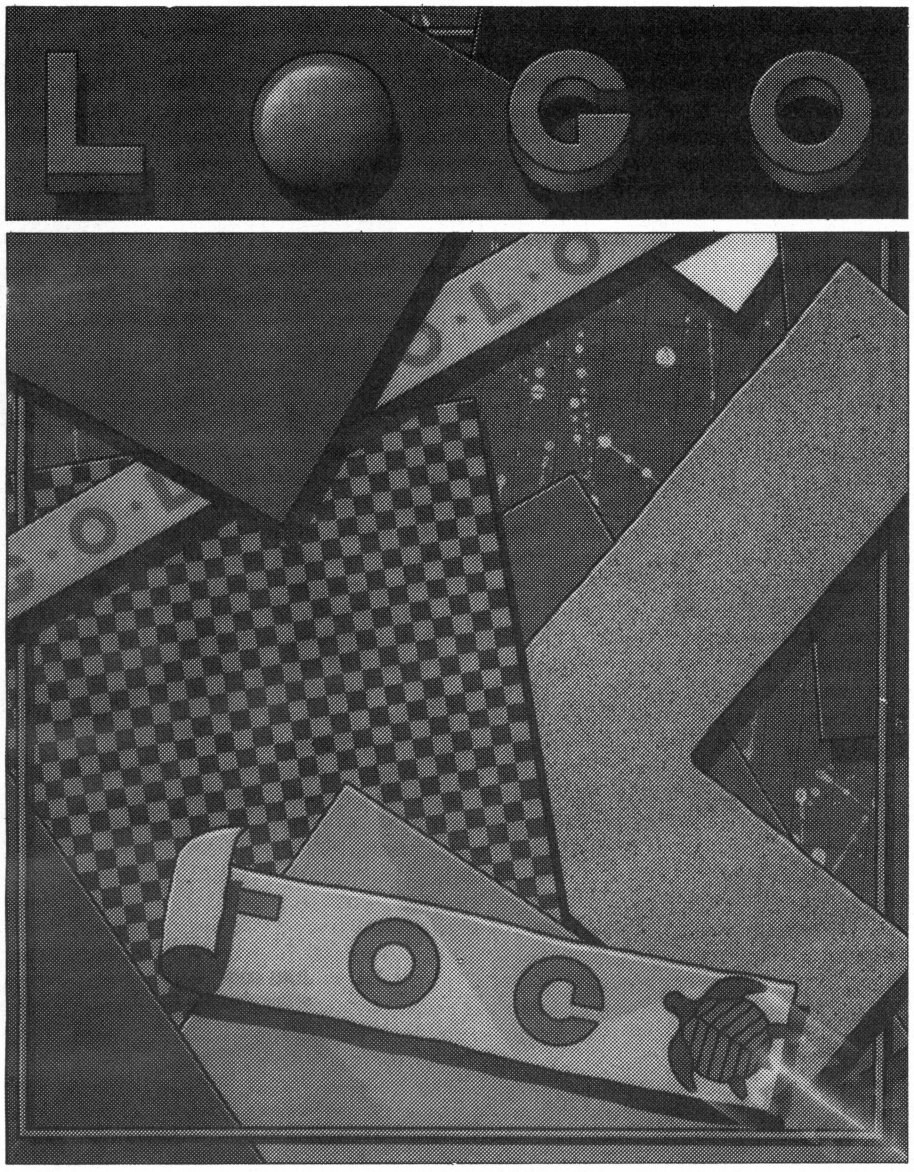
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```
    ACTER
  OUTPUT"
END
```

READKEY outputs a character if there is one waiting in the buffer, but otherwise outputs the empty word so that there is no delay in waiting for a keypress.

Procedure DEFINE thyself!

Now for the really interesting bit. Logo procedure definitions are stored as lists. Logo can manipulate the definitions of procedures, and by using the two primitives DEFINE and TEXT we are able to make procedures look into other procedures, to disect and rewrite them, to create new procedures — even to rewrite themselves!

To try this out, it is worth first defining a simple procedure in the editor:

```
TO TRI
  FD 50
  RT 120
  FD 50
  RT 120
  FD 50
  RT 120
END
```

TEXT takes a procedure and outputs its definition as a list. Try PRINT TEXT "TRI — the result should be:

```
[][FD 50][RT 120][FD 50][RT 120]
    [FD 50][RT 120]
```

PRINT always removes the outer level of brackets when it prints a list, so this is a list composed of lists, each of which is a single line of the procedure.

To see what the initial list [] is for, change the procedure to one involving inputs:

```
TO TRI :SIDE
  FD :SIDE
  RT 120
  FD :SIDE
  RT 120
  FD :SIDE
  RT 120
END
```

Now type PRINT TEXT "TRI and you should get.

```
[:SIDE][FD :SIDE][RT 120][FD :SIDE]
[RT 120][FD :SIDE][RT 120]
```

The first sub-list is simply a list of the inputs to the procedure.

The primitive which takes us the other way and defines a procedure from a list called DEFINE. Try DEFINE "SQUARE[[][REPEAT 4[FD 50 RT 90]]], then try running SQUARE and examining it in the editor to see exactly what has happened.

One very simple use for these primitives would be to combine them in order to make a copy of a procedure. For example:

```
DEFINE "TRICOPY TEXT "TRI
```

A more sophisticated application of these procedures would be to write a program that removes comments from a Logo program. In most versions of Logo, a; is used to mark a line as a comment. A well-commented procedure to draw a flag might look like this:

```
TO FLAG
  ; THIS PROCEDURE DRAWS A
    FLAG
  ; FIRST DRAW THE POLE
  FD 80
  ; THEN DRAW A SQUARE
  REPEAT 4 [FD 30 RT 90]
  ; THEN GO BACK TO WHERE YOU
    CAME FROM
  BK 80
END
```

When it comes to running a set of procedures, space may be tight, and it is then useful to be able to strip all the comments away but leave the rest of the program unaltered. This is what the procedure STRIP does:

```
TO STRIP :PROC
  DEFINE :PROC (FPUT (FIRST TEXT
    :PROC) (STRIP1 BUTFIRST TEXT
    :PROC))
END
```

This redefines the procedure. The first element of the list making up the new definition is the same as that in the original — this is simply the list of the inputs. The rest of the list is obtained by omitting any lines that begin with ;. STRIP1 removes all the comment lines and outputs the remaining text:

```
TO STRIP1 :LIST
  IF EMPTY? :LIST THEN OUTPUT []
  IF FIRST FIRST :LIST = "; THEN
    OUTPUT STRIP 1 BUTFIRST
    :LIST
  OUTPUT FPUT FIRST :LIST STRIP1
    BUTFIRST :LIST
END
```



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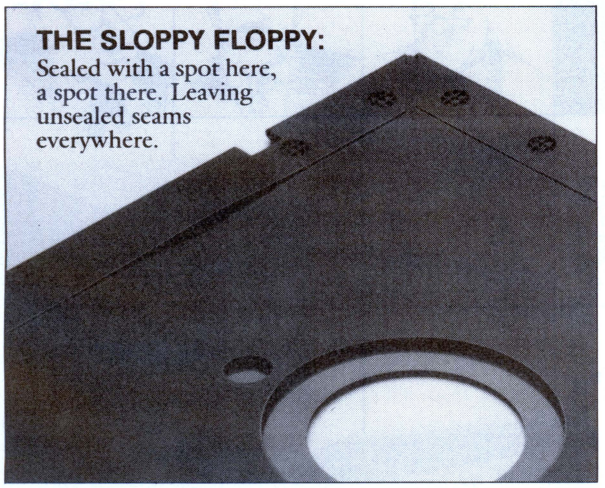
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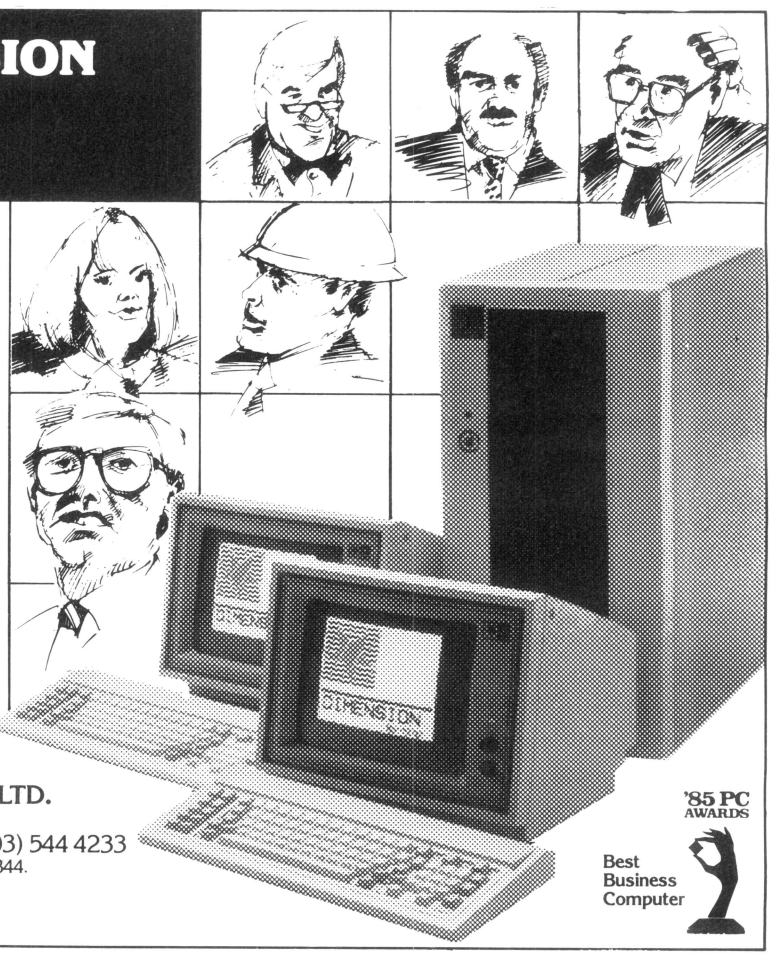
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To understand how this works, remember that the text of a program is a list of lists, so one element of this text will be a list corresponding to one line of the program. The next line of the program is given by FIRST :LIST; the first word on this line is therefore FIRST FIRST :LIST, and it is this we want to examine to see if it is a ;.

Type STRIP "FLAG and then examine FLAG to see what has happened.

Omitting whole lines of a procedure is not difficult, but it is less easy to replace particular numerical values in a procedure with new values that must be calculated at the time the procedure is run. The next example shows how DEFINE and RUN can work together to solve this problem.

The procedure GROW takes two inputs — the name of a simple shape-drawing procedure, and a list defining an operation to be performed on every side of that shape. GROW "TRI [+ 20] will define the TRI procedure with all its sides 20 units longer.

The procedures as shown here will only rewrite procedures whose drawing commands are all of the form FD followed by a constant, and do not allow the use of REPEAT, but it is not difficult to add a number of sophistications to this basic design.

```
TO GROW :PROCNAME :OPLIST
  DEFINE :PROCNAME REWRITE.
    PROC TEXT :PROCNAME
END
```

GROW does the redefining of the procedure, but it passes the whole task of determining the test of the new procedure to REWRITE.PROC.

```
TO REWRITE.PROC :TEXT
  IF EMPTY? :TEXT THEN OUTPUT []
  OUTPUT FPUT REWRITE.LINE
    FIRST :TEXT REWRITE.PROC
     BUTFIRST :TEXT
END
```

REWRITE.PROC divides the procedure into lines, and passes the task of rewriting each line to REWRITE.LINE TO REWRITE.LINE :LINE

```
  IF EMPTY? :LINE THEN OUTPUT []
  IF FIRST :LINE = "FD THEN
    OUTPUT CHANGE BUTFIRST
    :LINE
  OUTPUT FPUT FIRST :LINE
    REWRITE.LINE BUTFIRST :LINE
END
```

This looks for any occurrence of FD and replaces it with a new expression. If FD 20 and :OPLIST is [* 3], the new command should be FD 60. This is the task handled by CHANGE.

```
TO CHANGE :LIST
  OUTPUT ( FPUT "FD FPUT ( RUN
    FPUT FIRST :LIST :OPLIST )
     REWRITE.LINE BUTFIRST :LIST )
END
```

Notice the use of RUN here to cause the evaluation of the expression to take place before the elements are put together in the new line.

Most Logo editors do not include a global replace command which would replace all occurrences of X by Y within a procedure, for example. It is quite feasible to write a procedure along the lines of those given here, which can be used outside the editor to perform this task.

We often need to read in a line of text in one go. This is achieved in Logo by the command REQUEST which puts the input into a list.

MAKE "INPUT REQUEST causes Logo to halt until a line of text is entered, and then assigns it to INPUT. Individual items from this list can then be selected using the list processing commands. If only one word was typed, it still would have to be selected by means of FIRST :INPUT. The advantage of this method is that it does make it very easy to input several words and then to access those words individually.

RUN and REQUEST, used simultaneously are perhaps the two most fundamental commands of Logo. Consider this little procedure:

```
TO*LOGO
  PRINT1 "?
  RUN REQUEST
  *LOGO
END
```

(For PRINT1 use TYPE on LCSI versions.) Run this procedure and nothing happens! The procedure behaves exactly like Logo itself (at least until an error is found, at which point there is an error message and control returns to Logo). We can even go into the editor, define a procedure and come out again, and still be in this procedure, rather than back at top level. This procedure shows the highest-level structure of the Logo interpreter — print a prompt, get a command, run it, and do it all again.

Some versions of Logo have a primitive CATCH which enables us to deal with errors without the procedure losing control. We have added a simple form of error trapping to our earlier version of *Logo in the following example:

```
TO OUTER
  CATCH "ERROR[*LOGO]
  PRINT[THAT WAS AN ERROR]
  OUTER
END
```

Type OUTER. On meeting the line inlcuding the CATCH, Logo runs the final list, which in this case is simply the procedure *LOGO. However, if an error occurs while running *LOGO, control reverts to the line following CATCH "ERROR in OUTER. This prints an error message and then starts again. The only way now of breaking out of this loop is through CTRL-G or BREAK. Some versions of Logo enable you to examine the error and print out appropriate error messages or default to the original Logo error messages as required.

Program generator

The following program asks the user for a few inputs and creates a procedure. It then tries to run the procedure and if an error is found, it asks the user to start again. This particular program generator enables someone with very little knowledge of Logo to create interesting turtle graphic procedures without using the editor.

```
TO DEF
  CATCH "ERROR [DEFN]
  PRINT [ERROR, TRY AGAIN]
  DEF
END

TO DEFN
  NAME
  COMMANDS
  DEFINE :NAME FPUT [] :TXT
  RUN ( LIST :NAME )
  TOPLEVEL
END

TO NAME
  PRINT1 [NAME?]
  MAKE "NAME FIRST REQUEST
  MAKE "TXT []
END

TO COMMANDS
  STEP
  IF :STEP = [END] THEN STOP
  REPETITION
  COMMANDS
END
TO STEP
  PRINT1 [STEP?]
  MAKE "STEP REQUEST
END

TO REPETITION
  PRINT [DO YOU WISH TO]
  PRINT [1 DO ONCE]
  PRINT [2 REPEAT A FIXED NUMBER
    OF TIMES]
  PRINT [3 REPEAT INDEFINITELY UN-
    TIL A CONDITION IS MET]
  MAKE "CHOICE FIRST REQUEST
  IF :CHOICE = 1 THEN ONCE.CODE
  IF :CHOICE = 2 THEN REPT.CODE
  IF :CHOICE = 3 THEN UNTIL.CODE
END

TO ONCE.CODE
  MAKE "TXT LPUT :STEP :TXT
END

TO REPT.CODE
  PRINT1 [HOW MANY TIMES?]
```

```
  MAKE "NO FIRST REQUEST
  MAKE "TXT LPUT (LIST "REPEAT
    :NO :STEP ) :TXT
END

TO UNTIL.CODE
  PRINT1 [UNTIL WHEN?]
  MAKE "COND REQUEST
  MAKE "TXT LPUT ( LIST "UNTIL
    :COND :STEP) :TXT
END

TO UNTIL :COND :LIST
  RUN :LIST
  IF ( RUN :COND ) THEN STOP
  UNTIL :COND :LIST
END
```

The individual procedures are not difficult to understand and as to how it all fits together, this can be explained by an example interaction. In the following, the user's input is underlined.

This is part five of a six-part series.

```
NAME? SPI
STEP? MAKE "X 5
DO YOU WISH TO
1 DO ONCE
2 REPEAT A FIXED NUMBER OF TIMES
3 REPEAT INDEFINITELY UNTIL A
  CONDITION IS MET
(User presses 1)

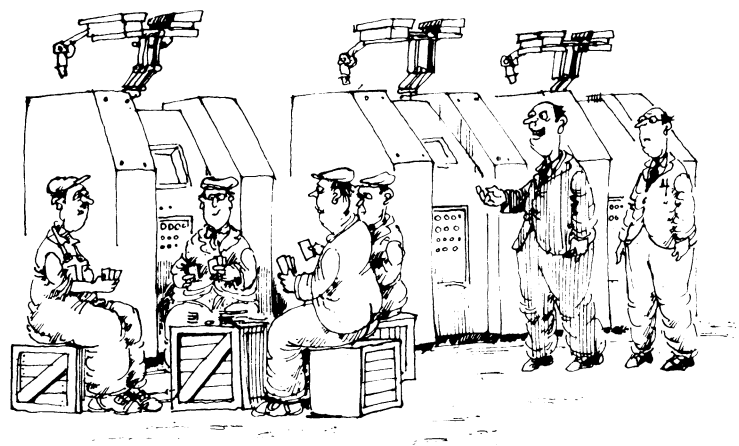
STEP? FD :X RT 120 MAKE "X :X + 5
DO YOU WISH TO
1 DO ONCE
2 REPEAT A FIXED NUMBER OF TIMES
3 REPEAT INDEFINITELY UNTIL A
  CONDITION IS MET
(User presses 3)

UNTIL WHEN? :X > 100
STEP? END
```

The procedure defined would be:

```
TO SPI
  MAKE "X 5
  UNTIL [:X > 100][FD :X RT 120 MAKE
    "X :X + 5]
END
```

This is part five of a six-part series. END



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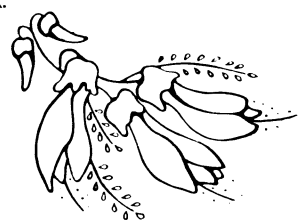
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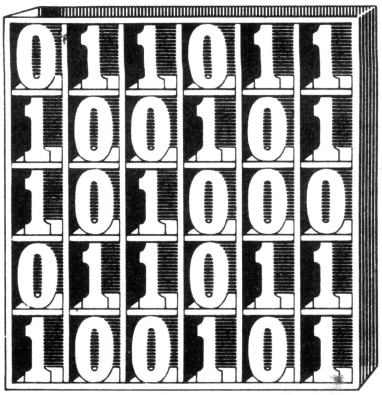
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Eternal triangle

Pascal (Datasheet 1) from John Hardman is a direct Z80 translation of the recursive 6502 Pascal's triangle routine in the June issue of *APC*.

The usual description of Pascal's triangle is as a tabulation of the probabilities for x heads showing among y tossed coins. It is actually a table of binomial coefficients for expansions of $(b+a)^Y$, calculated by the formula $C(x,y) = y! / (x!(y-x)!)$.

The coefficient formula uses both multiplication and division and can produce large intermediate values, so the algorithm in Pascal makes use of the triangle's structure to simplify the computation. Each cell value is formed by adding the two adjacent values on the preceding row.

Both the original 6502 routine and John's Z80 translation return the incorrect value P(x,y) = 1 for x>y (see Fig 1).

DATASHEET 1

```
;=============================================================
;= PASCAL    Calculate Pascal triangle cell value.
;=============================================================
;JOB         To calculate the value of a single cell in the
;           Pascal triangle (or coefficient of a binomial
;           expansion) by recursively calculating preceeding
;           cell values and adding.
;ACTION      (To calculate the Pascal number P(x,y) where x is
;           the column value and y is the row value, x and y are
;           repeatedly reduced until x=0 or x=y where P(x,y)=1.
;           The number of reductions gives the required value.)
;           IF x=0 OR x>=y:
;           THEN: [ P(x,y) = 1. ]
;           ELSE: [ Save current x,y.
;                   y = y - 1. Call PASCAL, compute P(x,y-1).
;                   Push current result.
;                   x = x - 1. Call PASCAL, compute P(x-1,y-1).
;                   Result = current result + stacked result.
;                   Restore x,y. ]
;-------------------------------------------------------------
;CPU         Z80
;HARDWARE    None.
;SOFTWARE    None.
;-------------------------------------------------------------
;INPUT       E = Pascal triangle cell column (x).
;           D = Pascal triangle cell row (y).
;OUTPUT      The cell value, P(X,Y), is in AHL.
;           P(X,Y) = Y! / (X! * (Y-X)!).
;           (If X=0 or X>=Y then result = 1.)
;           F is changed.
;           E and D are unchanged.
;ERRORS      Large input x or y values could cause overflow
;           of the 3-byte result variable.
;REG USE     A D E HL F
;STACK USE   x=0 or x>=y: 0.   0<x<y: 4 * (x + y - 1).
;RAM USE     None.
;LENGTH      26
;CYCLES      Not given.
;-------------------------------------------------------------
;CLASS 2      -discreet      *interruptable      *promable
;-***--       *reentrant     -relocatable        -robust
;=============================================================
;
PASCAL LD   HL,1      ;Initiialise result in AHL to 1    21 01 00
       LD   A,E       ;while testing input x value       7B
       OR   A         ;for zero, if so exit immediately  B7
       RET  Z         ;with P(x,y) = 1.                  C8
;
       CP   D         ;Compare x (in A) with y, then     BA
       LD   A,H       ;clear A and exit immediately      7C
       RET  NC        ;with P(x,y) = 1 if x>=y.          D0
;
```

```
       PUSH DE        ;Save current x,y.                 D5
;
       DEC  D         ;Compute P(x,y-1) by               15
       CALL PASCAL    ;recursive call to PASCAL.         CD lo hi
;
       PUSH AF        ;Save P(x,y-1) in AHL              F5
       PUSH HL        ;on stack.                         E5
;
       DEC  E         ;Compute P(x-1,y-1) by             1D
       CALL PASCAL    ;recursive call to PASCAL.         CD lo hi
;
       POP  DE        ;Recover low two bytes, then       D1
       ADD  HL,DE     ;high byte, of P(x,y-1) and add    19
       POP  DE        ;in to P(x-1,y-1) to give          D1
       ADC  A,D       ;P(x,y) in AHL.                    8A
;
       POP  DE        ;Restore x and y, then exit to     D1
       RET            ;next level or end PASCAL.         C9
;=============================================================
```

Columns (X):	0	1	2	3	4	5	6	7	8
Rows (Y): 0	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1
2	1	2	1	1	1	1	1	1	1
3	1	3	3	1	1	1	1	1	1
4	1	4	6	4	1	1	1	1	1
5	1	5	10	10	5	1	1	1	1
6	1	6	15	20	15	6	1	1	1
7	1	7	21	35	35	21	7	1	1
8	1	8	28	56	70	56	28	8	1

Fig 1

Blaise of glory

Dissatisfied with the slow speed and heavy stack use of his 6502 Pascal, Robert Gardner-Medwin presents Blaise (Datasheet 2).

Pascal saves the partial result found for P(x,y−1) while recursing to compute P(x−1,y−1). The two values are then added to form P(x,y). Blaise differs by initially clearing the result variable and performing a pre-recursion test for input x>=y, returning the correct zero value if that is the case (Fig 2).

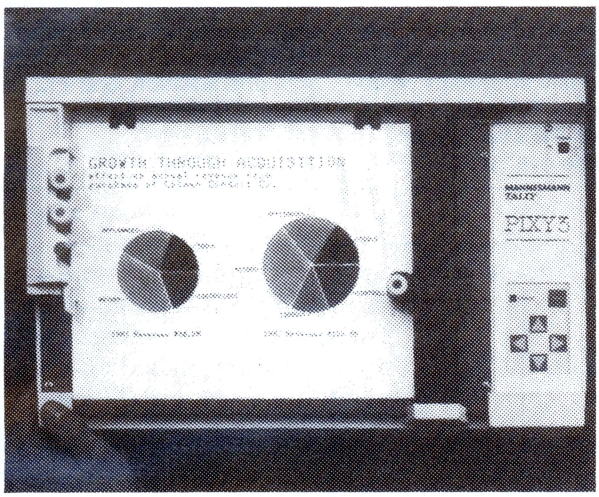
For legitimate triangle values, the improved routine needs to increment the partial result P whenever recursion reaches the lowest level (x=0 or x=y). Apart from correcting the error in Pascal the results are the same, but without the heavy stack requirements. Three bytes less on stack for every recursive call is a weighty consideration for 6502 with its single-page stack.

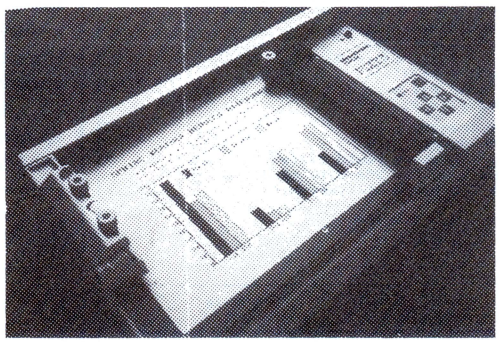
DATASHEET 2

```
;=============================================================
;= BLAISE    Calculate Pascal triangle cell value.
;=============================================================
;JOB         To calculate the value of a single cell in the
;           Pascal triangle (or coefficient of a binomial
;           expansion) by recursively calculating preceeding
;           cell values.
;ACTION      (To calculate the Pascal number P(x,y) where x is
;           the column value and y is the row value, x and y are
;           repeatedly reduced until x=0 or x=y where P(x,y)=1.
;           The number of reductions gives the required value.)
;           Result = 0.
```

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```
:           IF x>y
:           THEN: [ P(x,y) = 0. ]
:           ELSE: [ IF x=0 OR x=y:
:                   THEN: [ P(x,y) = 1. Result = result + 1. ]
:                   ELSE: [ y = y - 1.
:                           Recurse, compute P(x,y-1).
:                           x = x - 1.
:                           Recurse, compute P(x-1,y-1).
:                           y = y + 1. x = x + 1. ] ]
:-------------------------------------------------------------------
:CPU          6502
:HARDWARE     None.
:SOFTWARE     Local subroutine PINC, to increment a 3-byte
:             variable in M1,2,3 (low order byte in M1).
:-------------------------------------------------------------------
:INPUT        X = Pascal triangle cell column.
:             Y = Pascal triangle cell row.
:OUTPUT       The cell value, P(X,Y), is in M1,2,3.
:             P(X,Y) = Y! / (X! * (Y-X)!).
:             (If X=0 or X=Y then P(X,Y) = 1.)
:             (If X>Y then P(X,Y) = 0.)
:             M0, P and A are changed.
:             X and Y are unchanged.
:ERRORS       Large input X or Y values could cause the Stack
:             Pointer to wraparound the 256-byte stack or an
:             overflow of the 3-byte result variable.
:REG USE      P A X Y
:STACK USE    X=0: 0.   0<X<Y: 2Y.  X>=Y: 0
:RAM USE      M0 M1 M2 M3
:LENGTH       45
:CYCLES       Not given.
:-------------------------------------------------------------------
:CLASS 2      -discreet       *interruptable      *promable
:-***--       *reentrant      -relocatable        -robust
:===================================================================
:
BLAISE LDA  #0          :Initialise the three byte          A9 00
       STA  M1          :result variable M1,2,3 to          85 M1
       STA  M2          :return a default value of 0        85 M2
       STA  M3          :if triangle cell column            85 M3
       STX  M0          :value (x) is greater than          86 M0
       CPY  M0          :its row value (y), test for        C4 M0
       BCC  BLEND       :this and exit if so.               90 13
:
BLAREC TXA              :First test x value for zero,       8A
       BEQ  PINC        :if so, P(x,y) = 1.                 F0 11
:
       STY  M0          :Else store y value in page         84 M0
       CPX  M0          :zero for test if x=y,              E4 M0
       BCS  PINC        :if so, P(x,y) = 1.                 B0 0B
:
       DEY              :Else compute P(x,y-1) by a         88
       JSR  BLAREC      :recursive call.                    20 lo hi
:
       DEX              :Compute value at cell (x-1,y-1)    CA
       JSR  BLAREC      :by a recursive call.               20 lo hi
:
       INY              :Set x and y to index current       C8
       INX              :cell and exit either to compute    E8
BLEND  RTS              :next cell or exit routine.         60
:
PINC   INC  M1          :Either x=0 or x>=y. In both        E6 M1
       BNE  PINCH       :cases P(x,y) = 1 so increment      D0 06
       INC  M2          :result M1,2,3. Then exit this      E6 M2
       BNE  PINCH       :level to compute cell value at     D0 02
       INC  M3          :next level, or exit routine if     E6 M3
PINCH  RTS              :required cell value computed.      60
:===================================================================
```

Columns (X):	0	1	2	3	4	5	6	7	8
Rows (Y): 0	1	0	0	0	0	0	0	0	0
1	1	1	0	0	0	0	0	0	0
2	1	2	1	0	0	0	0	0	0
3	1	3	3	1	0	0	0	0	0
4	1	4	6	4	1	0	0	0	0
5	1	5	10	10	5	1	0	0	0
6	1	6	15	20	15	6	1	0	0
7	1	7	21	35	35	21	7	1	0
8	1	8	28	56	70	56	28	8	1

Fig 2

More speed, less stack

A feature of Pascal's triangle is that P(1,y) = y. The importance of this is demonstrated in Fig 3 which shows that 18 recursive calls and 10 increments have to be made by Blaise, or 18 calls and nine additions by Pascal, to compute P(2,5).

The recursive calls in the lower section of Fig 3 are unnecessary if, instead of testing x=0, a test is made for x=1 and the current value of y is added to the partial result. Only six recursive calls, three simple additions and one increment are needed.

Further improvement is possible. If you look at Fig 2, you will see that the triangle reflects about 2x = y with the result that P(y−1,y) also has the value y. By replacing the x=y test by a test for x+1=y, P(2,5) can be calculated in as few as four recursive calls and three additions of y to the partial result.

Any method of restricting the number of recursive calls is obviously important when calculating P for large x or y, where the stack might otherwise overrun the memory allotted to it. But the method can also improve timing on the calculation of small values.

Blaise, for example, will perform 18 recursive calls and eight increments to find P(1,8), and 54 calls and 28 increments to find P(2,8). A routine using x=1 or x+1=y as its lowest level will return P(1,8) without recursion in only one addition, and P(2,8) in just 10 calls and six additions.

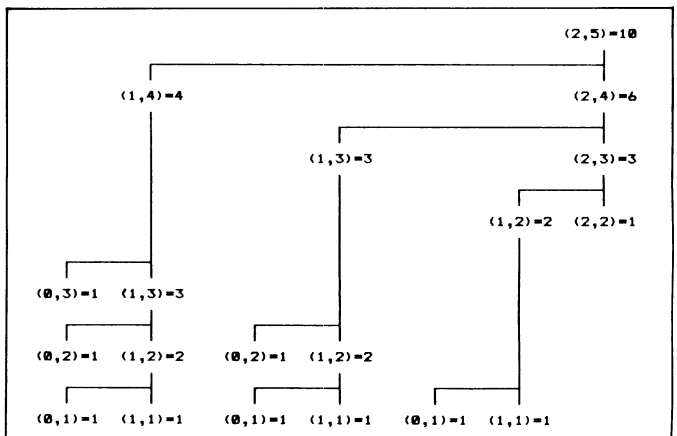


Fig 3

Lightning strikes

No sooner had I completed the discourse in 'More speed, less stack' than a letter arrived from Andrew Simpson of Perth. After noting the possibility of the improvements as mentioned, which he estimates will reduce the execution time by a factor of 10, he writes:

'One need not stop there! For x=2 and x+2=y, the required increment is the sum 1 + 2 + . . . + (y − 1), for which a simple decrementing loop suffices. This halves the running time again.

'Even then, for all but the smallest input values, the routine is just too slow, and implementing the coefficient formula is not all that difficult:

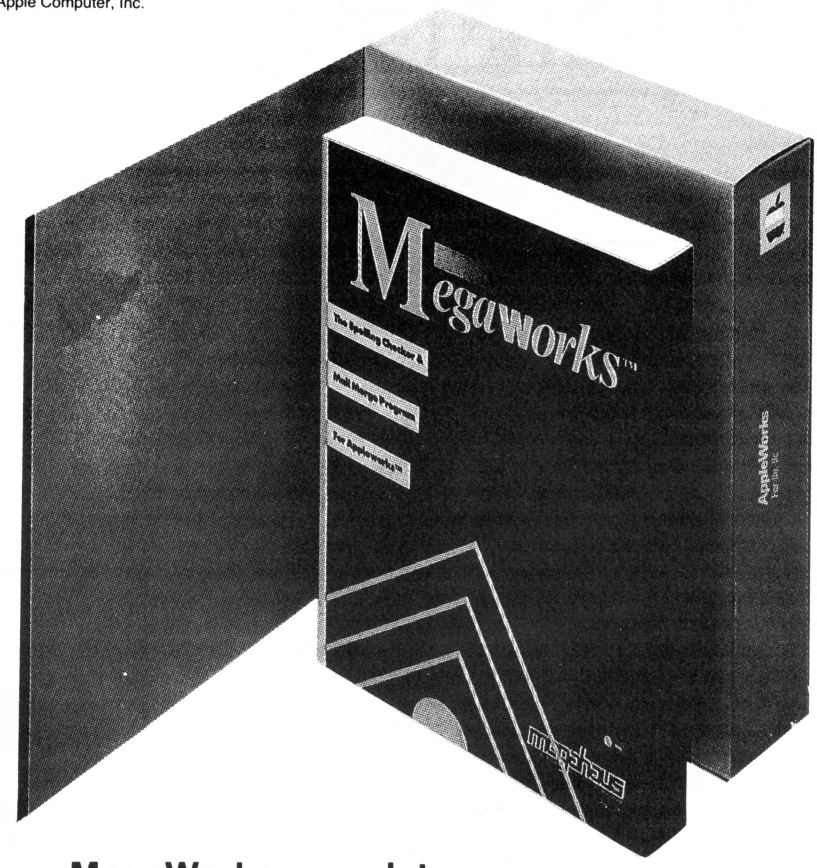
P(x,y) = y!/(x!(y−x)!)
= y/1*
(y−1)/2* . . . *(y−x+1)/x,
0<x<y.

'There are x number of terms to compute, but the identity, P(x,y) = P(y−x,y) may be used to reduce the number of terms when x>(y/2). Left-to-right evaluation generates the sequence P(1,y), P(2,y), . . . ,P(x,y), and the only large number involved is the developing result. This algorithm is fast, even in Basic, but I must leave it to the experts to come up with a lightning machine code version.'

Basic is notorious for its slow additions, so at what point does this algorithm become faster than the improved recursive method in machine code? No more 'Pascals' will be accepted unless they return a four-byte result with overflow flagged, and are documented with complete timing details.

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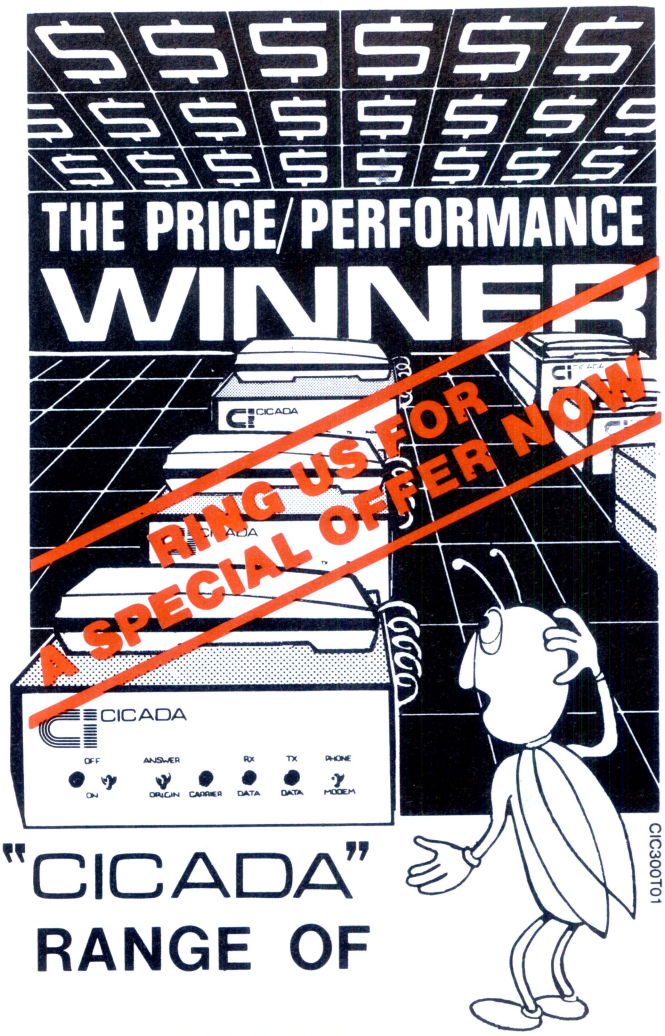
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Z80 countless loops

Ian B regularly runs out of registers in his more complex Z80 routines, leaving himself nothing to count loops with. To save the bother of writing sophisticated stack swap operations or relegating all his variables to memory bytes, he uses a sequence of CALL instructions placed before the routine to simulate looping.
This is commonly used for single repeats, such as the 6809 (Fig 4).

Assuming no registers are free to use as counters, Ian reckons that the method is as quick for counts up to 256 (single-byte count) and slightly faster for larger counts. The problems are an overly large increase in both code and stack bytes, and a loss of relocatability. END

```
;
;
LOOP16 CALL LOOP8      ;This sequence of CALL instructions
LOOP8  CALL LOOP4      ;is used for counts of 2^n. The number
LOOP4  CALL LOOP2      ;of "loops" doubles for each CALL
LOOP2  CALL CODEA      ;added to the sequence.
;
CODEA  .    .          ;Actual code executed in
       .    .          ;the simulated loop, RET causes either
       RET             ;another iteration or final exit.
;
;
LOOP_7 CALL LOOP_2     ;This sequence of CALL
LOOP_5 CALL LOOP_2     ;instructions is used to
LOOP_3 CALL CODEB      ;simulate odd count values.
LOOP_2 CALL CODEB      ;
;
CODEB  .    .          ;The actual routine code
       .    .          ;iterated 2, 3, 5 or 7 times
       RET             ;exiting or "looping".
;
```

Fig 4

The big software package with the small price tag.



Information Business Manager is a complete accounting package suitable for most businesses and compatible with 8 and 16 bit micro computers (all those with CP/M or MSDOS available).

Totally developed in Australia, Information Business Manager performs the following accounting functions

- Accounts Receivable
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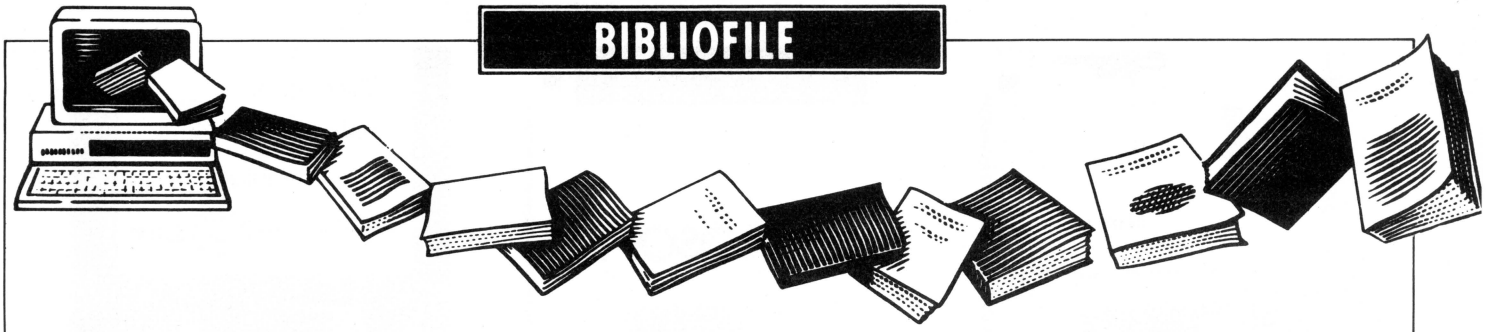
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BIBLIOFILE



David Taylor wades through a 6502 User's Manual and accounting with Lotus 1-2-3, in this month's review of computer literature.

Holy cow!

We must, I think, sympathise with Mr Grushcow. Not just because he has a name like Grushcow, but because just as he comes out with a nifty idea for using 1-2-3, Lotus comes out with Symphony. Holy Grushcow, I bet Jack's mad.

Still, there are an awful lot of 1-2-3 disks out there. It started out as a best-seller for the IBM PC way back in 1982, and has been the spreadsheet (with database and Herculean graphics) to beat ever since.

Jack's idea is to use 1-2-3 to perform the standard business accounting tasks of general ledger, accounts receivable, accounts payable and payroll. You could save $$$s, reckons Jack, as purpose-designed accountancy software doesn't as a rule come cheap. Also, the chances are that (if you're in business) you'll have bought 1-2-3 as a spreadsheet anyway.

What you may also do, I might add, is amaze your friends (or indeed the tax man), as 1-2-3 is neither intended nor designed for accountancy tasks. These by their nature involve recording umpteen transactions which will soon clog even fully-populated RAM (proper accountancy packages keep writing to disk, 1-2-3 uses memory), and will moreover soon clog the spreadsheet itself, showing its calculations.

What is potentially worse, spreadsheets aren't meant to spot rogue entries the way error-checking accountancy packages are, nor do they automatically create an audit trail. Tyro ledger keepers or ham-fisted typists should not go near this book!

Mr Grushcow acknowledges the problems, but persists that he is saving you money, and at worst he is giving you an insight into what a decent accountancy package should have. If, at the end of this book, you conclude you'd better throw in the towel and splash out on purpose-made software, you'll by then be well-informed, says Jack.

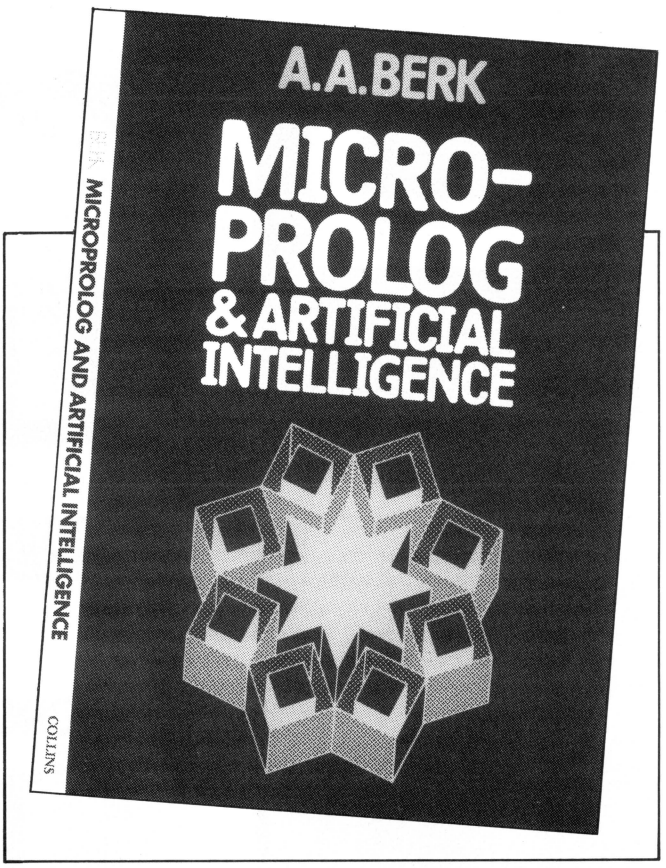
I daresay he's right at that. Jack's ingenious method of setting up bookkeeping worksheets within 1-2-3, despite the aforementioned limitations does work. It does give you a feel for what's what in accountancy software. It even gives you eyestrain setting it up, unless you send off for the model on disk.

What you must do is be very careful with your data input and be very certain this model is adequate for your needs. There's no sense saving $$$s if you inadvertently lose track of still more $$$ and perhaps go bust in the process!

Title: Business Worksheets for Lotus 1-2-3
Author: Jack Grushcow
Publisher: Reston (Prentice-Hall)
Price: $37.50

Do not pass Logo

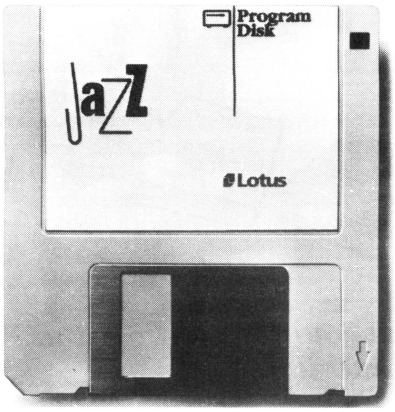
I imagine Ray Hammond does sometimes sleep. You do begin to wonder, though, noting that between fiction and TV dramas he's recently published decent books on three of today's most talked-about micro topics — communications, Logo and word processing; besides his daft series for kiddy-winks featuring the redoubtable Bobby Byte.



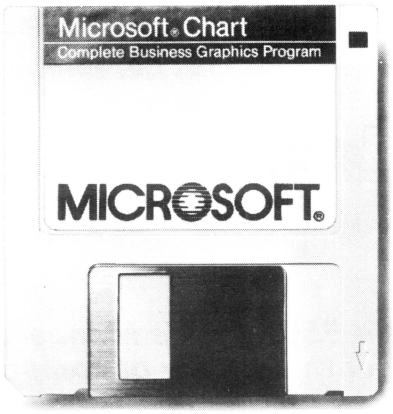
This book is about children, and the profound effect on their education of the computer revolution in general and the language and philosophy of Logo in particular. It is for parents and teachers who suspect that it's about time they got to grips with the smart-thinking US's controversial Logo (in which, by the way, FORWARD 100 is the first command you learn) and its claims to promote a startingly fresh approach to logical conceptual thought in schools.

Ray Hammond does a thorough and polemical job. By the time you have staggered through nearly 300 dense pages, you'll have a firm grasp of Logo technique and what it strives to achieve. You'll be clued-up on appropriate hardware, will have a structured plan of how to proceed, and will have digested the experience of others described in a series of case histories. It's also likely that you will have a headache.

After a slow start in Australia (where we've clung stubbornly to Basic) the merits of Logo's top-down



Lotus Jazz. Integrated word processing, business graphics, database management, data communications and worksheet.



Microsoft Chart. 42 different charts and graphs for presentations, sales reports and transparencies.



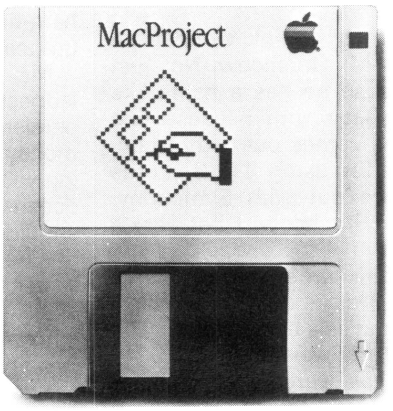
MacBusiness. Gain overall financial control of your small business with this integrated, intuitive accounting program.



Omnis 3 by Blyth Software. Single or multi-user data base manager featuring multiple file management and user definable menus.



PFS: File. Store and retrieve mailing lists, client records, collections, schedules and inventories.



MacProject. Create complex "critical path" flow charts for production schedules, timelines and managing projects.



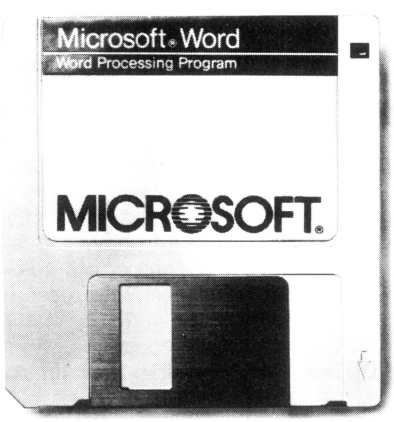
ThinkTank 512. An idea processor to organise projects, manage details, outline ideas and support decisions.



Microsoft Multiplan. Electronic spreadsheet for budget forecasting, business planning and "what if" analysis.



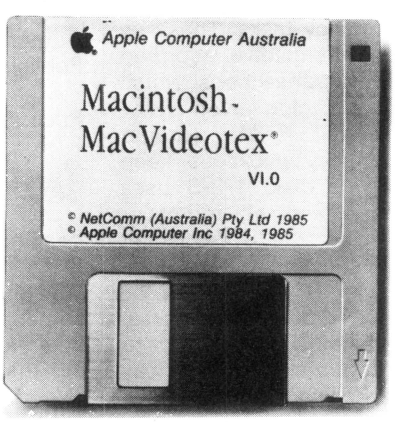
PageMaker by Aldus. Design newsletters, brochures, training manuals, presentations and more.



Microsoft Word. Full feature word processor for memos, personalised form letters, reports or any professional document.



Filevision. Visualise market trends, organise and track sales and present data in pictures.



MacVideotex. Access stock market, home banking, travel and other information via Telecom's Viatel videotex service.

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There are now more than 550 software programs available for the Macintosh computer.

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Like Microsoft Word, Living Videotext's ThinkTank 512, Omnis 3 by Blyth Software and the just-released Jazz from Lotus.

And our own MacProject, which creates sophisticated "critical path" charts that threaten to put common status reports on the endangered species list.

But more impressive than the sheer number of programs for the Macintosh is the sheer ease with which you can use them.

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methods of reducing complex problems to more easily managed bits are now more widely understood, and the previous tendency to tool about with turtles, using watered-down versions of proper Logo, is in decline. Ray Hammond clearly believes it's about time. His paperback paean is persuasive.

Title: Forward 100: Logo and Your Child: A New Way of Learning
Author: Ray Hammond
Publisher: Penguin
Price: $29.95

Berk's steerage

Dr Berk writes an eminently lucid but nevertheless testing introduction to what is a vexed and complex issue as well as a braintwisting language — a micro-tailored dialect of Prolog, around which most current research into artificial intelligence is centred and much of the operation of fifth generation computers will hinge.

Crumbs. Programming in micro-Prolog is allegedly eased by a package of special modules and 'front-end processors', one of which we get a good go on and which is cheekily called Simple. Still, wait till you try parsing. And Dr Berk insists we're only scratching the surface of list processing and expert systems in this book.

So far as I was able to get with smoke coming out of my IBM XT and both ears, it's mesmerising stuff provided you have the stamina or incentive to persevere, and would have to be more easily used as a textbook to lectures from Dr Berk or other fine polymath.

Title: Micro-Prolog & Artificial Intelligence
Author: AA Berk
Publisher: Collins
Price: $22.95

Gonna ride the 6502

Okey-doke, guys, here comes one for all you Apple II-with - the - lid - off freaks. All-American Joe Carr is all kinds of crazy for hacking the night away doing his pin-outs and his interfacing chores, assembling and programming in machine code with his well-thumbed manuals beside him — this one, pal Joey says, is intended to become dog-eared and worn from constant reference, oh yeah, as we Branch on Carry Clear, Return from Interrupt, Set Carry Flag and Push Accumulator Contents Onto External Stack, hot-diggety-dog.

If you have the faintest idea what I'm on about, I daresay you will relish this esoterically action-packed book.

If not, I wouldn't bother.

Title: 6502 User's Manual
Author: Joseph J Carr
Publisher: Reston (Prentice-Hall)
Price: $29.95

Integration

Integration seems to be the current buzzword in the computer world. What do terms like 'integration', 'integrated environment' and 'desktop' mean? and what exactly is the difference between them? According to this new book from McGraw-Hill there are five distinct categories of integrated environment and you can save yourself a lot of wasted time and money if you purchase the book before you purchase any integrated software.

Written in everyday language, 'Integrated Desktop Environments' sets out to study and compare four of these five types. For each category a single software package is discussed without the usual convoluted jargon.

The type of integration not included is that of the combined hardware/software integration, as exemplified by the Macintosh and Lisa. This is reasonable as the author states quite clearly that she is attempting to assist the potential purchaser of software, weighing the options between buying a completely new integrated system, on the one hand, or software that allows existing word-processor, spreadsheet and database to become integrated (to a degree) on the other.

The author, quite rightly, draws no conclusions, but offers the evidence necessary to allow the reader to make his own decision.

Title: Integrated Desk-top Environments
Author: Patricia Seybold
Publisher: McGraw-Hill
Price: $33.95

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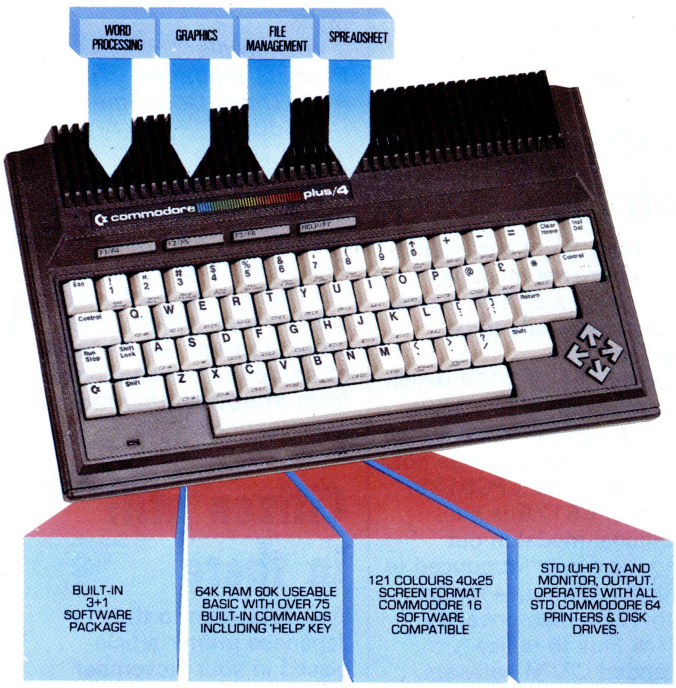
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But then again you could easily say the Commodore PLUS/4 computer alone is worth a lot more than the price. With 64K of memory, 60K fully usable, full size typewriter keyboard, four separate cursor keys, high resolution colour graphics, extended BASIC, split screen and windowing capabilities.

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Go from one program to another at the touch of a key. For not only are they built into the computer, they're built into each other. So, for example, in one document, you can go from words to numbers to graphs to names and addresses. In just a matter of moments.

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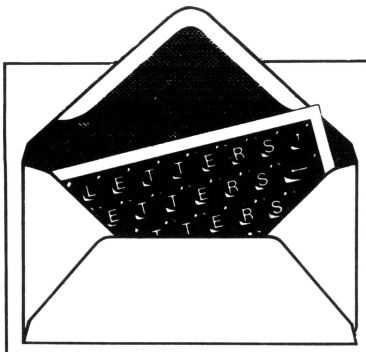
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LETTERS

This is the chance to air your views — mail to 'Letters', Australian Personal Computer, 2nd Floor, 215 Clarence Street, Sydney 2000. Please be as brief as possible and add 'not for publication' if your letter is to be kept private.

A destructive streak

May I warn your readers about a dangerous and undocumented feature of MS-DOS version 2.11 (probably other versions too, but I haven't been able to check them).

If you want to add one file to the end of another, you use the concatenation facility (copy file-1 + file-2). If all goes well, this gives you a new combined file called file-1, while leaving the old file-2 on disk.

There is, however, no way of creating such a new file and simultaneously deleting the old file-2. If the files are large, you have to make sure that you have enough free space on your disk for both the new combined file and the old file-2. But if you miscalculate the available space, MS-DOS will abort the operation and report 'insufficient disk space'. You will then find that it has destroyed the old file-1, and substituted an empty file with the same name.

This means that, if you want to add a 100k file-2 to a 300k file-1, but you only have 99k free on your disk, your 300k file will be irretrievably lost.

You might have thought that MS-DOS would restore the status quo before pulling out the plug, or that it would destroy file-2 to create space for the expanded file-1, or that it would write as much as the available space permitted — all these possibilities would allow you to rescue your text.

Instead, MS-DOS selects the most destructive possible option and stupidly destroys an entire file.

When it comes to destroying valuable data, MS-DOS has few rivals.

D Quirke

Our position fair

We notice there has been a few comments made in recent issues of *APC* which we believe needs to be clarified.

Firstly, the CPC664 which was released in July 1985 is still a current model in the Amstrad range and was not replaced by the CPC6128.

The CPC6128 is an additional model in our range and was introduced to offer an alternative model with 128k memory and CP/M Plus to utilise extended CP/M software.

Admittedly the CPC6128 is proving extremely popular partly due to the very competitive price tag however, since Amstrad have been able to produce an up to the minute product at a very low cost, due to improvements in technology and manufacturing efficiencies, we at AWA-Thorn believed it to be important that we pass on these cost advantages to the consumer as soon as they became available.

Computer technology has been making great strides forward and Amstrad pride themselves on their record of being able to be at the forefront of this technology and bring these advances to Amstrad users as early as possible and for the best possible price.

We would ask that all Amstrad users would see our intentions as good ones and directed towards adding interest and excitement to the personal computer market.

J W Chandler
Product Manager
AWA-Thorn Consumer Products

The above letter was published in fairness to AWA-Thorn and Amstrad. Previously the firms have not had the opportunity of stating their side of the story, against the barrage of complaints we've had from annoyed Amstrad purchasers.

Citizen still in there

With reference to the Japanese printer article placed in your November issue, Datronics advises that the reference to Citizen pulling out of the market is groundless.

The real situation is in fact quite the contrary. Citizen have recently launched in Japan and the US a further new dot matrix printer, the MSP120D, which is expected to be released in Australia shortly.

The source of the article was based on information supplied by Star, a competitor, and appears to be quite inaccurate. According to Citizen, Star supply no printers or components for the manufacture of printers to Citizen, and the basis upon which they made the claim is unknown.

With ten years experience in the manufacture of printers, the Citizen MSP products have already been successfully presented to the US market, where their compact design, competitive pricing, and Citizen's reputation for quality products has gained them a significant market share of the US domestic market.

In Japan the MSP range of printers recently gained the "Good Design" award by the MITI (Ministry of Industrial Trade & Industry). This award had previously only been made to Epson for a similar range of printers.

Rob Hack
General Manager
Datronics Corporation Limited

Careless reporting?

I carefully read the article in your July 1985 issue entitled "Commodore 128" by Peter Worlock. I own an SX-64 which I use extensively in my own work and it is an excellent machine. It is robust, portable and always works. I am a true blue fan of Easy Script and Superbase, and there is no cloud on my horizon except for the speed and capacity of the disk drive.

Consequently when I read the review of the new 1571 drive, I determined to trade in my SX-64, forsaking portability for power.

However, when I appeared at my local computer shop to buy the complete system to my disgust I see no 1571 drive. What is there? An *abomination* in the guise of a "1570". What is a "1570"? Not quite a 1571? How sadly true. When can I buy a 1571? NEXT YEAR! Why can't I have one now? THERE AREN'T ANY!

Two pertinent points emerge —

LETTERS

1. That computer companies are probably significantly affected by advance, careless reporting of new items — careless in that no hint of this 1570 *thing* was given by your's or any magazine and no regard for dropping sales of current stock of hardware was shown by your reporters or your magazine. You were *careless* of the consequences of your story.
2. That C128 sales will undoubtedly be badly affected by the lack of a disk drive that is of any use. A computer by itself is useless. The 1570 drive is useless.

Your magazine has declined in my estimation. You have caused a "bludner".
G Willis

You are in the minority in wanting APC to fail to publish news and Bench-tests of the latest products. The magazine prides itself on 'scooping' tests and will not be swayed by considerations of "dropping sales of current stock of hardware". The fact that the products tested may not yet be available through retail outlets is of no consequence; the function of the magazine is to bring news to the readers first, so that better informed purchasing decisions can be made (with advance knowledge of forthcoming products).

Your implication of "careless reporting", in view of APC's editorial policy as stated above, is false — Ed.

Modern solution

With reference to "Standard Links", P Hickman's letter in the October 1985 issue of *APC*: While I have not tried it, I imagine that a modem could be used as an interface between the computer and the cassette. A far bigger problem would be the software needed for each computer to write the file in a format which the others would recognise, so that the data could be sorted out and stored in the proper form and in a known area of the memory when read in. This would amount to rewriting parts of each operating system, necessarily in machine language.

I have overcome the problem of tape compatibility in software, by direct access to the cassette ports on my Amstrad and Micro-Bee, and writing/reading my text files with just one header and then as a continuous stream of bytes from/to a specified area of memory. This approach would not be suitable for individual data items.
P Lukes

BLUDNERS

We unfortunately left out details of the graphics characters in the listing of Nighthawk for the Spectrum in September's Programs. The graphics and corresponding letters are given in Fig 1; the details of where they should appear are as follows.
Line 130: should have " A" and "A" instead of the spaces shown.
Line 172: should have "A" instead of the last printed space.
Line 195: should have "A " instead of the three spaces shown.
Lines 216 and 217: should have "B" instead of all the single spaces.
Line 266: a$=" " should be "EC ", and b$=" " should be "DFG".
Lines 272-275: should have "H" instead of " " at the end

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IBM

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Hercules Graphics Board	$714
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Not listed	call

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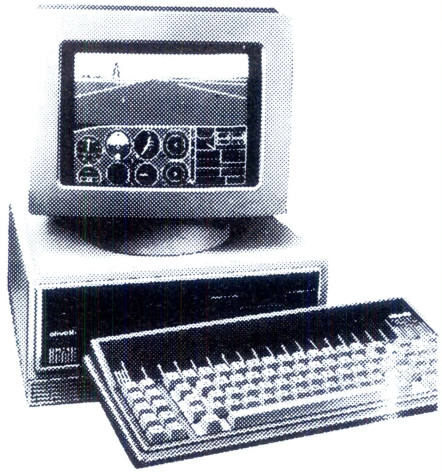
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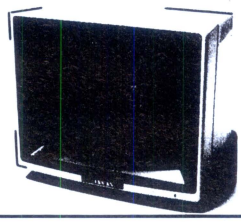
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BLUDNERS

of each line.
Line 292: . . . BRIGHT 1;" " . . . shouldbe . . . BRIGHT 1;"I". . .
Line 293: . . . AT tpy + 1,tpx; INK 3;" ". . . should be . . . AT tpy + 1,tpx; INK 3;"JKL". . .

In the BBC Turtlegraphic program some characters were printed incorrectly. The character à should be @, é should be {, è should be }. These changes should be made in lines 140, 1340 and 1720 of the main program, and lines 100 and 110 of the second program.

In October's Programs Graphics Utilities Monitor contains one error. Those of you with Basic 1 should change line 3270 to read 3270 PROCoscli("DIR"+e$).

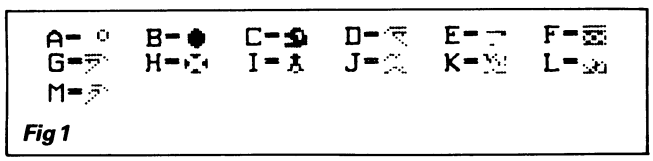


Fig 1

In the Free Memory Display utility in TJ's Workshop, *APC* October, there were a few errors.

The program as listed gave only the figure for memory of the program itself, not the variables used in the program. To modify the program so that the true value is printed, change the two numbers 18 and 19 after 229 to 2 and 3 respectively.
Line 210 should then read:
210 DATA 115,56,165, 6,229,2,133,112,165,7, 229,3,133,113,160,19

The checksum in line 100 becomes 13875.

This change makes the program use the address at 2,3 which points to the top of the variables. The program only works in mode seven.

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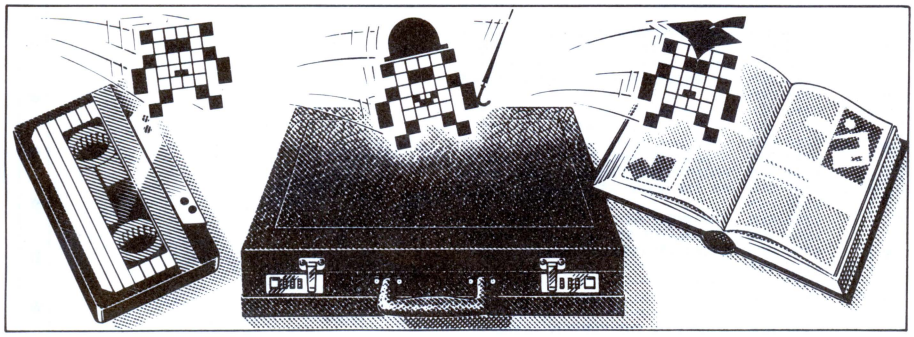
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PROGRAMS



APC selects the best of readers' programs. For details on submitting your own, see the end of this section.

This month we've had a difficult time selecting programs. The standard of the programs submitted goes up every month, but we would still like to see more original and carefully written, structured and documented programs. This month there's somethingthat should give Spectrum owners a pleasant surprise.

The power and ease of use of office technology finally arrives for the Spectrum with Spectrum Spreadsheet! This spreadsheet has all the functions and facilities a home user could want: complete formulae entry; printout of the spreadsheet; loading and saving often-used spreadsheets; a help facility, and many others.

Amstrad Amsquill is a powerful, fully featured word processor for the Amstrad CPC464, which would take little modification to work on the CPC664 or CPC6128. It has as many facilities as Amsword, although it is slower as it is written in Basic. For the Commodore 64, there is a utility to help debug programs. You can trace, step or walk through any Basic program you have written. The program uses a small text window to keep the tracing separate from the normal screen.

For the Memotech range of computers, there is a renumbering utility.

- ***Games***
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Commodore 64 Trace/Walk/Step

by Alexander Sassoon

MICROTEX 666

Still keying in programs? Forget it! This program is available for telesoftware downloading on Microtex 666 (page *66614#.)

This program provides an invaluable set of utilities for Commodore 64 owners. Their use is described in REM statements within the program. The machine code data is input using letters to make it more compact and to reduce the strain of typing.

The checksum at the end of each line should ensure that you type in the data correctly.

```
1000 REM ********************************
1010 REM *                              *
1020 REM *      TRACE, STEP & WALK      *
1030 REM *                              *
1040 REM *   PROGRAM DEBUGGING AIDS     *
1050 REM *                              *
1060 REM *      FOR COMMODORE 64        *
1070 REM *                              *
1080 REM *    BY ALEXANDER SASSOON      *
1090 REM *                              *
1100 REM ********************************
1110 REM
1120 REM  USE THE FOLLOWING COMMANDS
1130 REM  BEFORE RUNNING YOUR BASIC
```


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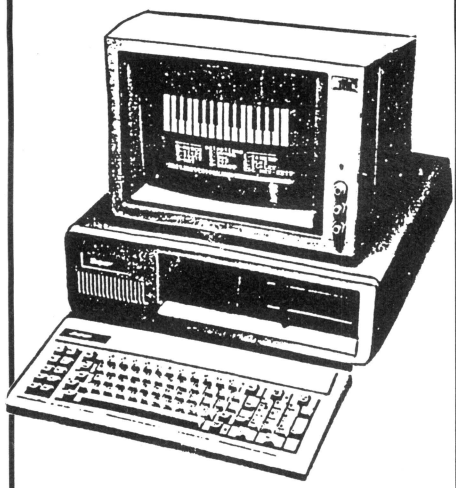
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```
1140 REM  PROGRAM.
1150 REM
1160 REM  EACH COMMAND REMAINS EFFECTIVE
1170 REM  EVERY TIME A PROGRAM IS RUN
1180 REM  UNTIL REPLACED OR CANCELLED
1190 REM  BY ENTERING A FURTHER COMMAND.
1200 REM
1210 REM  ------------------------------
1220 REM              *TRACE
1230 REM  ------------------------------
1240 REM  STANDARD TRACE UTILITY WHICH
1250 REM  PRINTS THE PROGRAM LINE NUMBER
1260 REM  AS THE LINE IS EXECUTED.
1270 REM
1280 REM  THE RUNNING OF THE PROGRAM MAY
1290 REM  BE PAUSED BY HOLDING DOWN THE
1300 REM  SHIFT OR COMMODORE LOGO KEY.
1310 REM
1320 REM  ------------------------------
1330 REM              *STEP
1340 REM  ------------------------------
1350 REM  DISPLAYS THE CURRENT LINE
1360 REM  NUMBER IN A WINDOW AT THE
1370 REM  TOP RIGHT-HAND CORNER OF
1380 REM  THE SCREEN.
1390 REM
1400 REM  PRESS THE SHIFT KEY TO EXECUTE
1410 REM  EACH LINE OF THE PROGRAM.
1420 REM  HOLD DOWN THE SHIFT KEY TO JOG
1430 REM  THROUGH THE PROGRAM AT A SLOW
1440 REM  PACE.
1450 REM
1460 REM  HOLD DOWN THE COMMODORE LOGO
1470 REM  KEY TO SPRINT THROUGH YOUR
1480 REM  PROGRAM AT ALMOST FULL SPEED.
1490 REM
1500 REM  ------------------------------
1510 REM              *WALK
1520 REM  ------------------------------
1530 REM  ACTUALLY LISTS THE CURRENT
1540 REM  PROGRAM LINE IN A WINDOW AT
1550 REM  THE BOTTOM OF THE SCREEN.
1560 REM
1570 REM  USE THE SHIFT AND COMMODORE
1580 REM  LOGO KEYS TO EXECUTE EACH LINE
1590 REM  IN THE SAME WAY AS FOR THE
1600 REM  *STEP COMMAND.
1610 REM
1620 REM  A PROGRAM LINE OF 80 OR MORE
1630 REM  CHARACTERS WILL CAUSE THE
1640 REM  SCREEN TO SCROLL DOWN A LINE.
1650 REM
1660 REM  ------------------------------
1670 REM              *OFF
1680 REM  ------------------------------
1690 REM  SWITCHES OFF THE PROGRAMMING
1700 REM  AIDS, ALLOWING YOUR PROGRAM TO
1710 REM  RUN NORMALLY AT FULL SPEED.
1720 REM
1730 REM  ------------------------------
1740 REM  A LINE RANGE MAY BE SPECIFIED
1750 REM  AFTER *TRACE, *STEP OR *WALK
1760 REM  SO THAT THE UTILITY OPERATES
1770 REM  ON ONLY PART OF THE PROGRAM.
1780 REM
1790 REM  THE LINE RANGE USES EXACTLY
1800 REM  THE SAME SYNTAX AS THE 'LIST'
1810 REM  COMMAND.
1820 REM
1830 REM  EXAMPLES:-
1840 REM
1850 REM  *TRACE 100-340
1860 REM     (THE TRACE UTILITY WILL
1870 REM     OPERATE ONLY WHILE LINES
1880 REM     100 TO 340 INCLUSIVE ARE
1890 REM     BEING EXECUTED.
1900 REM     ALL THE OTHER LINES WILL
1910 REM     BE EXECUTED NORMALLY)
1920 REM  *TRACE 3000-
1930 REM  *TRACE -20
1940 REM  *TRACE 10
1950 REM  *TRACE
1960 REM
1970 REM  ALL FOUR COMMANDS MAY ALSO
1980 REM  BE USED WITHIN YOUR PROGRAM.
1990 REM
2000 REM
2010 REM ******************************
2020 REM *  READ IN MACHINE CODE DATA  *
2030 REM ******************************
2040 REM  THE MACHINE CODE IS LOCATED
2050 REM  IN UNUSED MEMORY BETWEEN
2060 REM  ADDRESSES $C350 AND $C4F8.
2070 REM  THIS LEAVES THE FULL 38911
2080 REM  BYTES FREE FOR BASIC PROGRAMS.
2090 REM
2100 PRINT CHR$(147)
2110 PRINT " READING IN MACHINE CODE - PLEASE WAIT"
2120 PRINT
2130 FOR LINE=0 TO 42
2140 SUM=0
2150 FOR WRD=0 TO 4
2160 READ MCODE$
2170 N1 = (ASC(MCODE$)-65)*16 + ASC(MID$(MCODE$,2))-65
2180 N2 = (ASC(MID$(MCODE$,3))-65)*16 + ASC(MID$(MCODE$,4))-65
2190 IF N1>255 OR N2>255 OR N1<0 OR N2<0 THEN 2220
2200 POKE 50000 + LINE*10 + WRD*2, N1
2210 POKE 50001 + LINE*10 + WRD*2, N2
2220 SUM = SUM + (10-WRD*2)*N1 + (9-WRD*2)*N2
2230 NEXT WRD
2240 MOD = SUM - INT(SUM/97)*97
```

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```
2250 READ CHECK$
2260 IF MOD <> VAL(CHECK$) THEN PRINT "PLEASE CHECK LINE" 2730+LINE*10 :ERR=1
2270 NEXT LINE
2280 IF ERR THEN END
2290 REM
2300 REM
2310 REM ******************************
2320 REM *   INITIALISE NEW COMMANDS   *
2330 REM ******************************
2340 SYS 50000
2350 PRINT "DEBUGGING AIDS INITIALISED"
2360 REM
2370 REM
2380 REM ******************************
2390 REM *  SAVE IN MACHINE CODE FORM  *
2400 REM ******************************
2410 REM  THE MACHINE CODE SAVED BY THIS
2420 REM  SECTION CAN BE LOADED WITHOUT
2430 REM  DESTROYING ANY BASIC PROGRAM
2440 REM  ALREADY IN MEMORY.
2450 REM
2460 REM  TO LOAD AND INITIALISE THE
2470 REM  UTILITIES ADD THE FOLLOWING
2480 REM  LINES TO YOUR PROGRAM:-
2490 REM
2500 REM      1 IF K THEN SYS 50000 :END
2510 REM      2 K=1 :LOAD
2520 REM
2530 REM  THESE LINES SHOULD BE REMOVED
2540 REM  AFTER THE MACHINE CODE HAS
2550 REM  BEEN LOADED.
2560 REM
2570 PRINT :INPUT "SAVE MACHINE CODE VERSION"; ANSWER$
2580 IF ANSWER$ <> "YES" AND ANSWER$ <> "Y" THEN END
2590 INPUT "DISK OR TAPE"; DEVICE$
2600 POKE 820,1
2610 IF LEFT$(DEVICE$,1) = "D" THEN POKE 820,8
2620 POKE 821,PEEK(45):POKE 822,PEEK(46)
2630 POKE 43,80  :POKE 44,195
2640 POKE 45,249 :POKE 46,196
2650 SAVE "TRACE/STEP/WALK", PEEK(820),3
2660 POKE 43,1 :POKE 44,8
2670 POKE 45,PEEK(821):POKE 46,PEEK(822)
2680 REM
2690 REM
2700 REM ******************************
2710 REM * COMPRESSED MACHINE CODE DATA*
2720 REM ******************************
2730 DATA KJGM,INAI,ADKJ,MDIN,AJAD,16
2740 DATA GAEP,EGEG,AAFE,FCEB,EDEF,84
2750 DATA AAKJ,AAFH,EBEM,ELAA,KFAC,40
2760 DATA NAHN,CAHD,AAAI,MJKM,PAAE,96
2770 DATA CIEM,OHKH,CIKC,AAIG,JOCA,81
2780 DATA HDAA,NNFL,MDPA,BAOI,LMFL,71
2790 DATA MDNA,PKOG,JOOI,OABA,JAOO,49
2800 DATA EMAI,KPCA,HDAA,OILN,FLMD,71
2810 DATA PAAG,CAPP,KODI,LAPE,KGJO,82
2820 DATA IGAC,PAML,CAHJ,AAJA,AGPA,69
2830 DATA AEMJ,KLNA,NNCA,GLKJ,KFBE,72
2840 DATA INAH,MEKF,BFIN,ADME,CAHJ,89
2850 DATA AAPA,AMMJ,KLNA,MHCA,HDAA,61
2860 DATA CAGL,KJNA,LPKF,BEIN,APME,1
2870 DATA KEBF,AFBF,NAAC,KAPK,IMAL,8
2880 DATA MECA,HJAA,EMOH,KHKF,DJKG,62
2890 DATA DKMJ,ABNA,AHOA,PPNA,ADEM,48
2900 DATA HAMD,INPC,MDIO,PGMD,OAAA,88
2910 DATA NAAC,MJAA,JAOP,OAPK,NAAC,69
2920 DATA MJAA,PAAC,LAOF,KEAC,IINA,12
2930 DATA BIKJ,FLCA,EHKL,CAMJ,LNKJ,34
2940 DATA FNCA,EHKL,CADP,KLKF,NDMJ,54
2950 DATA CBEM,ODME,PIKC,COLF,MGJN,20
2960 DATA AAAC,MKNA,PIII,NAEB,KCAH,20
2970 DATA KJKA,JNCA,AEKN,IGAC,JNCA,82
2980 DATA NIMK,NAPC,KACC,IEMH,CAAM,64
2990 DATA OFCA,MJLN,KCCO,LNAA,ACJF,54
3000 DATA MGMK,NAPI,KFMF,MJDP,PAJB,24
3010 DATA KNIN,ACMJ,ACPA,PHMJ,ABNA,63
3020 DATA OPKC,MAKA,PPII,NAPN,MKNA,53
3030 DATA PIPA,OHKA,HIKJ,CAJJ,GPAH,95
3040 DATA KNIG,ACJJ,GPNL,IINA,PCKA,30
3050 DATA CIKJ,EAJJ,GPAH,IINA,PKKC,21
3060 DATA BHCA,AMOF,KFDJ,IFBE,KFDK,10
3070 DATA IFBF,CABD,KGKA,ABIE,APKJ,35
3080 DATA MCIN,AAAD,KJME,INAB,ADIN,21
3090 DATA CHAD,KJNI,INCG,ADEM,NHKG,12
3100 DATA KJIL,INAA,ADKJ,ODIN,ABAD,60
3110 DATA KJMK,INCG,ADKJ,PBIN,CHAD,55
3120 DATA NAIA,MJAN,PAAD,EMMK,PBKJ,90
3130 DATA AAPA,PJJA,AHMJ,CHLA,ADCA,42
3140 DATA NHKK,KNIN,ACCJ,ADNA,PJEM,9
3150 DATA HAMD,AAAA,AAAA,AAAA,AAAA,62
3160 REM
3170 REM  IF THE PROGRAM REPORTS ERRORS
3180 REM  IN ALL THE DATA LINES THEN
3190 REM  CHECK LINES 2130 TO 2260.
3200 END
```



Spectrum Spreadsheet

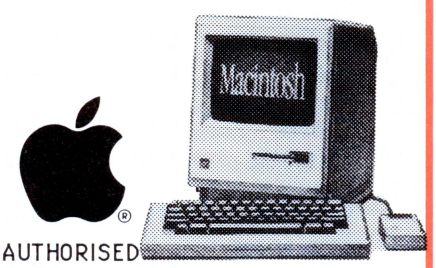
by Paul Buckland

This is a 16 column by 30 row spreadsheet. Approximately 140 formulae of up to 64 characters in length may be entered and can be applied to any of the numeric cells in the spreadsheet. All inputs including those for formulae

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are validated and the only error message which may appear is concerned with tape loading. The commands are as follows:

Symbol shift Q — quits when in input mode.

5,6,7,8 — these move the cursor (invisible) around the screen and the whole sheet.

E — data entry mode. Type in the data and press return. The cursor will move down one cell and wait for more data to be entered. This continues until the bottom of the sheet is reached or you quit. If you press ENTER only, then the cell will be left blank. If you press Symbol-shift-O, the column A (text labels) will be displayed on the screen. Symbol-shift-J allows you to move the cursor to another cell.

A — alter data mode. This allows you to make a single entry or change the value held in a cell. Symbol-shift-O also works in this mode.

F — allows you to enter a formula in the form of an arithmetic expression. An example formula would be B5+B6/B7*B8−B9, where B5 is the cell at row 5 and column B. This would assign the value of this expression to the cell the cursor is currently on. No answer is given if the result would be greater than 999999.99. Whenever the complete spreadsheet is recalculated, this formula is re-evaluated and the new result stored in the correct cell.

D — deletes the formula for the cell the cursor is on.

S — shows the formula for the cell the cursor is on.

L — lists all the formulae to the screen or a printer.

R — recalculates the spreadsheet after new data has been entered.

O — displays column A onscreen when it would normally be offscreen.

J — is used to move the cursor straight to a given cell. It is often the most convenient way of moving the cursor as the cursor is invisible.

M — puts or removes the months of the year at the top of the spreadsheet.

N — puts or removes a line on the same row as the cursor.

P — prints out part of the sheet or does a screen dump to a ZX printer.

X — loads a spreadsheet from tape. Pressing enter loads the first one found.

Z — saves a spreadsheet to tape. It is saved in two parts under a chosen name.

C — clears the entire sheet and starts again.

K — prints a list of the keys and their functions.

If an error should occur while using the spreadsheet, type GOTO help to restart without losing any data. Lines 2754, 2770, 2840, 2850, 2960 and 2961 can be changed to allow the spreadsheet to use microdrives. When you have typed in the program, GOTO9999 will save and verify the program.

```
  20 REM * SPREADSHEET
  40 REM * PAUL E BUCKLAND
  41 REM *
  45 REM * STARTED :10.01.84
  50 REM * COMPLETED :03.11.84
  70 REM * AMENDED 15.7.85
  80 CLS
 150 PRINT AT 0,10; PAPER 1; INK 7; BRIGHT 1;"SPREAD SHEET";AT 1,15;"BY";AT 2,8;
" PAUL E BUCKLAND"
 160 GO SUB 3100
 180 GO SUB 500
 182 GO TO 220
 185 FOR n=1 TO 250: NEXT n
 190 PRINT AT 20,0;"
    ": RETURN
 220 PRINT AT 19,0;"  Mode: Cursor
 230 LET i$=INKEY$
 240 IF i$="" THEN  GO TO 230
 250 LET oy=cy
 270 IF i$="8" AND sx<(cols-9) THEN  LET cx=cx+10: LET sx=sx+10: IF cx>23 THEN
LET x=x+10: LET cx=23: GO SUB 500: GO TO 200
 280 IF i$="5" AND sx>4 THEN  LET cx=cx-10: LET sx=sx-10: IF cx<3 THEN  LET cx=3
: LET x=x-10: GO SUB 500: GO TO 200
 290 IF i$="6" AND sy<>rows THEN  LET cy=cy+1: LET sy=sy+1: IF cy>18 THEN  LET c
y=18: LET y=y+1: GO SUB 500: GO TO 200
 300 IF i$="7" AND sy<>1 THEN  LET cy=cy-1: LET sy=sy-1: IF cy<1+(4 AND sy<>cy)
THEN  LET cy=1+(4 AND sy<>cy): LET y=y-1: GO SUB 500: GO TO 200
 310 PRINT  PAPER 7; OVER 1;AT oy,2;"                                    "; PAPER 7; O
VER 1; BRIGHT 1;AT cy,cx-1;"          "
 325 IF i$="S" THEN  GO SUB 1178
 330 IF i$="P" THEN  GO SUB 3850
 340 IF i$="R" THEN  GO SUB 1540: GO SUB 500
 345 IF i$="E" THEN  GO SUB 930: GO SUB 500: LET flag=0
 350 IF i$="A" THEN  GO SUB 1830: GO SUB 500
 360 IF i$="D" THEN  GO SUB 650
 370 IF i$="X" THEN  GO SUB 2900: GO SUB 500
 390 IF i$="J" THEN  GO SUB 1280: GO SUB 500
 400 IF i$="N" THEN  GO SUB 5000: GO SUB 190: GO SUB 500
 410 IF i$="K" THEN  GO SUB 8500: GO SUB 500
 420 IF i$="C" THEN  GO SUB 8000
 425 IF i$="O" THEN  GO SUB 840: PAUSE 1: PAUSE 0: LET flag=0: GO SUB 500
 430 IF i$="Z" THEN  GO SUB 2700: GO SUB 500
 435 IF i$="F" THEN  GO SUB 2000: GO SUB 500
 440 IF i$="L" THEN  GO SUB 725: GO SUB 500
 460 IF i$="M" THEN  GO SUB 5100: GO SUB 190: GO SUB 500
 480 GO TO 200
 520 PRINT  INVERSE 1;AT 0,0;f$(rows+1,x TO x+31)
 530 POKE 65441,x
```


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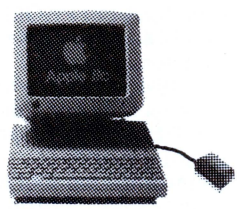
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```
  540 POKE 65404,0
  550 POKE 65418,4
  560 RANDOMIZE USR USR "a"
  570 POKE 65404,y+3
  580 POKE 65418,14
  590 RANDOMIZE USR USR "a"
  630 PRINT AT cy,cx-1; PAPER 7; BRIGHT 1; OVER 1;"
  640 RETURN
  650 IF sx<14 OR sy<5 THEN  RETURN
  655 PRINT AT 19,8;"Delete Formula"
  656 GO SUB 190
  657 GO SUB 1160
 658 IF NOT po THEN  GO SUB 190: PRINT AT 20,0;"No formula present to delete": G
O TO 710
 660 BEEP .1,10: GO SUB 190: PRINT AT 20,0;"Are you sure to delete ? Y or N"
 661 LET g$=INKEY$
 662 IF g$="N" THEN  GO TO 710
 663 IF g$<>"Y" THEN  GO TO 661
 680 IF po THEN  LET a$(1,po TO )=a$(1,po+5+len2 TO ): GO SUB 190: PRINT AT 20,0
;"Deleted": LET end=end-len2-5
 710 GO SUB 185
 720 RETURN
 725 IF a$(1,1)=" " THEN  BEEP .1,10: GO SUB 190: PRINT AT 20,0;"No formulae pre
sent": GO SUB 185: RETURN
 726 PRINT AT 19,8;"List Formulae": GO SUB 190: PRINT AT 20,0;"Print to Screen,
Printer or QuitPress S, P or Q"
 727 LET g$=INKEY$
 728 IF g$="P" THEN  LET printer=1
 729 IF g$="S" THEN  LET printer=0
 730 IF g$="Q" THEN  GO SUB 190: RETURN
 731 IF g$<>"P" AND g$<>"S" THEN  GO TO 727
 735 LET n=0
 737 CLS
 740 LET po=1
 750 LET len=VAL a$(1,po+3 TO po+4)
 754 IF printer THEN  LPRINT a$(1,po TO po+2);"=";a$(1,po+5 TO po+4+len)'
 755 IF NOT printer THEN  PRINT a$(1,po TO po+2);"=";a$(1,po+5 TO po+4+len)'
 756 LET n=n+1+(1 AND len>31)+(1 AND len>63)
 780 LET po=po+5+len
 790 IF po>=end THEN  GO TO 801
 795 IF n>18 AND NOT printer THEN  INPUT "": LET n=0: GO SUB 803
 800 GO TO 750
 801 IF printer  THEN  CLS : RETURN
 803 INPUT "": PRINT )1;"Press any key to continue": PAUSE 1: PAUSE 0
 804 CLS : INPUT "": RETURN
 840 PRINT AT 19,8;"Show Column 'A'"
 850 LET yc=0
 855 IF flag=1 THEN  LET flag=0: GO SUB 500: RETURN
 860 LET xpt=2+(10 AND cx=3)
 870 FOR r=y+4 TO y+17
 890 LET yc=yc+1
 900 IF r>4 THEN  PRINT AT yc+4,xpt;f$(r,3 TO 13)
 910 NEXT r
 911 LET flag=1
 920 RETURN
 960 IF f$(sy,sx)="_" THEN  BEEP .1,10: RETURN
 970 PRINT AT 19,8;"Data Entry"
1001 LET len=10
1004 FOR q=sy TO rows
1005 IF q=4 OR f$(sy,sx)="_" THEN  GO TO 1110
1006 LET m$=""+("Enter Text " AND (sx<14 OR sy<4))+("Enter Number " AND sx>=14 A
ND sy>4): LET low=48-(16 AND (sx<14 OR sy<4)): LET hi=57+(107 AND (sx<14 OR sy<4
))
1007 GO SUB 9000
1010 IF g$=";" THEN  GO SUB 850: GO TO 1000
1020 IF g$="<=" THEN  GO TO 1140
1030 IF g$="" THEN  GO TO 1090
1040 IF g$(1)="^" THEN  GO SUB 1300: GO SUB 500: GO TO 1000
1080 IF hi=57 THEN  GO SUB 8800: GO TO 1090
1085 LET f$(q,sx TO sx+8)="": LET f$(q,sx+(9-LEN g$) TO sx+8)=g$
1090 PRINT  PAPER 7; BRIGHT 1;AT cy,cx-1;f$(q,sx-1 TO sx+8)
1100 IF sy=rows THEN  GO TO 1145
1110 LET cy=cy+(1 AND cy<19): LET sy=sy+1: IF cy>18 THEN  LET cy=18: LET y=sy-17
: GO SUB 500: IF flag=1 THEN  LET flag=0: GO SUB 850
1120 PRINT  PAPER 7;AT cy-1,cx-1;f$(q,sx-1 TO sx+8); PAPER 7; BRIGHT 1;AT cy,cx-
1;f$(q+1,sx-1 TO sx+8)
1130 NEXT q
1145 LET i$=""
1155 RETURN
1160 LET po=1
1166 IF po>end THEN  LET po=0: RETURN
1167 LET len2=VAL a$(1,po+3 TO po+4)
1170 LET xx=((CODE a$(1,po)-64)*10+4)-10: LET xy=VAL a$(1,po+1 TO po+2)
1171 IF xx<>sx OR xy<>sy THEN  LET po=po+5+len2: GO TO 1166
1175 RETURN
1178 IF sx<14 OR sy<5 THEN  RETURN
1179 PRINT AT 19,8;"Show Formula": GO SUB 190: GO SUB 1160
1180 IF po THEN  PRINT AT 20,0;a$(1,po+5 TO po+4+len2)
1182 IF NOT po THEN  PRINT AT 20,0;"No formula present to show": GO SUB 185: RET
URN
1200 RETURN
1290 PRINT AT 19,8;"Cursor Jump"
1300 LET m$="Column Letter (A TO "+CHR$ (col+64)+")"
1302 LET len=2: LET hi=64+col: LET low=64
1303 GO SUB 9000
1304 IF g$=";" OR g$="^" THEN  GO TO 1303
1306 IF g$="" THEN  LET jx=1: GO TO 1350
1310 IF g$="<=" THEN  RETURN
1340 LET jx=CODE g$-64: IF jx<1 OR jx>col THEN  GO TO 1280
1350 LET sx=jx*10-6
1360 IF jx*10-4>x+31 THEN  LET cx=23: LET x=(jx*10+1)-30: GO TO 1411
1370 IF jx*10<x THEN  LET cx=3: LET x=jx-9+(9*jx): GO TO 1411
1380 LET cx=(jx-9+(jx*9)+3)-x
1411 LET m$="Row No (1 TO "+STR$ rows+")    ": LET hi=57: LET low=48: LET len=3
1412 GO SUB 9000
1430 IF g$=";" OR g$="^" THEN  GO TO 1303
1435 IF g$="" THEN  LET jy=1: GO TO 1460
1440 IF g$="<=" THEN  RETURN
1450 LET jy=VAL g$: IF jy<1 OR jy>rows THEN  GO TO 1411
1460 LET q=jy: LET io=sy: LET sy=jy
```


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```
1470 IF jy>y+17 THEN  LET cy=18: LET y=jy-17: RETURN
1480 IF jy<(y+4) THEN  LET cy=1+(4 AND jy>4): LET y=jy-(4 AND jy>4): RETURN
1490 LET cy=cy-(io-jy)
1500 RETURN
1540 IF a$(1,1)=" " THEN  GO TO 725
1541 PRINT AT 19,8;"Re-Calculating Sheet"
1545 LET dbz=0
1550 LET po=1
1555 LET xx=((CODE a$(1,po)-64)*10+4)-10: LET xy=VAL a$(1,po+1 TO po+2): LET len
=VAL a$(1,po+3 TO po+4): LET s$=a$(1,po+5 TO po+4+len)
1560 LET po=po+5+len
1570 GO SUB 2100
1611 IF dbz THEN  GO TO 1630
1620 LET g$=STR$ VAL c$: GO SUB 8805
1630 IF po>=end THEN  RETURN
1700 GO TO 1555
1860 IF f$(sy,sx)="_" THEN  BEEP .1,10: RETURN
1870 PRINT AT 19,8;"Alter Data"
1871 LET len=10
1885 LET m$=""+("Enter Text " AND (sx<14 OR sy<4))+("Enter Number " AND sx>=14 A
ND sy>4): LET low=48-(16 AND (sx<14 OR sy<4)): LET hi=57+(107 AND (sx<14 OR sy<4
))
1888 GO SUB 9000
1889 IF g$="<=" OR g$="" THEN  RETURN
1890 IF g$="^" THEN  GO TO 1888
1900 IF g$=";" THEN  GO SUB 850: LET flag=0: GO TO 1880
1910 LET q=sx+1
1950 IF hi=57 THEN  GO SUB 8800: GO TO 1970
1960 LET f$(sy,sx TO sx+8)="": LET f$(sy,sx+(9-LEN g$) TO sx+8)=g$
1970 PRINT  PAPER 7; BRIGHT 1;AT cy,cx;f$(sy,sx TO sx+8)
1990 RETURN
2025 IF sx<14 OR sy<5 OR f$(sy,sx)="_" THEN  RETURN
2030 PRINT AT 19,8;"Formula Entry"
2035 LET dbz=0
2036 GO SUB 190
2040 GO SUB 2400
2041 IF LEN s$+end>alen THEN  GO SUB 190: PRINT AT 20,0;"No more room for formul
a": GO SUB 185: RETURN
2045 IF i$="<=" THEN  GO SUB 190: RETURN
2046 GO SUB 1160
2048 IF po THEN  LET a$(1,po TO )=a$(1,po+5+len2 TO ): LET end=end-len2-5
2050 LET a$(1,end+1 TO end+1+4+len)=CHR$ (64+(sx+6)/10)+STR$ sy+(" " AND sy<10)+
STR$ (len-1)+(" " AND len<10)+s$
2051 LET end=end+4+len
2052 LET xy=sy: LET xx=sx
2055 LET po=end
2056 GO SUB 1570
2085 RETURN
2120 LET a=1
2125 LET c$=""
2130 LET si=((CODE s$(a)-64)*10+4)-10
2140 LET sj=VAL s$(a+1 TO a+2)
2150 LET a=a+3
2155 IF a>LEN s$ THEN  LET x$="": GO TO 2170
2160 LET x$=s$(a)
2170 LET c$=c$+"VAL f$("+STR$ VAL "sj"+","+STR$ VAL "si"+" TO "+STR$ VAL "si+8"+
")"
2175 IF f$(sj,si)="_" THEN  LET dbz=1: RETURN
2180 IF x$="" THEN  RETURN
2185 IF x$="/" THEN  GO SUB 2356
2190 LET c$=c$+x$
2200 LET a=a+1
2210 GO TO 2130
2356 LET si=((CODE s$(a+1)-64)*10+4)-10
2357 LET sj=VAL s$(a+2 TO a+3)
2358 IF f$(sj,si)="_" THEN  LET dbz=1: RETURN
2359 IF VAL f$(sj,si TO si+8)=0 THEN  LET dbz=1
2366 RETURN
2400 LET sp=0: LET s$=""
2401 LET len=1
2405 PRINT  FLASH 1; PAPER 5;AT 20,0;">"
2406 PAUSE 1: PAUSE 0
2410 LET i$=INKEY$
2415 IF i$="" THEN  GO TO 2410
2416 IF i$="<=" THEN  RETURN
2417 IF i$=CHR$ 12 AND len<>1 THEN  LET s$=s$( TO LEN s$-1): PRINT AT 20,1;s$;"
": LET len=len-1: GO SUB 2520: GO TO 2470
2425 IF i$>CHR$ (col+64) OR i$<"B" THEN  GO TO 2410
2427 GO SUB 2590
2432 PAUSE 1: PAUSE 0
2435 LET i$=INKEY$
2436 IF i$="" THEN  GO TO 2435
2437 IF i$="<=" THEN  RETURN
2440 IF i$=CHR$ 12 THEN  LET s$=s$( TO LEN s$-1): PRINT AT 20,1;s$;" ": LET len=
len-1: GO TO 2406
2445 IF i$>"9" OR i$<"1" THEN  GO TO 2435
2450 GO SUB 2590
2452 PAUSE 1: PAUSE 0
2454 LET i$=INKEY$
2455 IF i$="" THEN  GO TO 2454
2456 IF i$="<=" THEN  RETURN
2457 IF i$=CHR$ 12 THEN  LET s$=s$( TO LEN s$-1): PRINT AT 20,1;s$;" ": LET len=
len-1: GO TO 2432
2458 IF i$="+" OR i$="-" OR i$="*" OR i$="/" OR i$=CHR$ 13 THEN  LET s$=s$+" ":
LET len=len+1: GO TO 2467
2460 IF i$>"9" OR i$<"0" THEN  GO TO 2454
2465 GO SUB 2590
2467 LET num=VAL s$(len-2 TO )
2468 IF num<5 OR num>rows THEN  GO SUB 2600: GO TO 2410
2469 IF i$="+" OR i$="-" OR i$="*" OR i$="/" OR i$=CHR$ 13 THEN  GO TO 2490
2470 IF sp THEN  LET sp=0: GO TO 2452
2471 PAUSE 1: PAUSE 0
2472 LET i$=INKEY$
2474 IF i$="" THEN  GO TO 2472
2476 IF i$="<=" THEN  RETURN
2480 IF i$=CHR$ 12 THEN  LET s$=s$( TO LEN s$-1): PRINT AT 20,1;s$;" ": LET len=
len-1: GO TO 2452
2490 IF i$=CHR$ 13 THEN  GO SUB 190: RETURN
2491 IF len=64 THEN  GO TO 2472
2495 IF i$<>"-" AND i$<>"+" AND i$<>"/" AND i$<>"*" THEN  GO TO 2472
2500 GO SUB 2590
2510 GO TO 2406
```

```
2520 IF s$(LEN s$)=" " THEN  LET len=len-1: LET s$=s$( TO LEN s$-1): LET sp=1
2530 RETURN
2590 LET s$=s$+i$
2591 LET len=len+1
2592 PRINT AT 20,1;s$
2595 RETURN
2600 GO SUB 190: PRINT AT 20,0;s$(len-3 TO );" is not a numeric box ": GO SUB 18
5: PRINT AT 20,1; FLASH 1; PAPER 5;AT 20,0;">"
2610 LET s$=s$( TO len-4)
2615 PRINT AT 20,1;s$
2620 LET len=len-3
2630 RETURN
2720 PRINT AT 19,8;"Save Sheet"
2730 LET m$="Enter Filename "
2731 LET len=9: LET hi=164: LET low=32
2732 GO SUB 9000
2741 IF g$="" OR g$="=" OR g$="^" THEN  GO TO 2732
2750 IF g$="<=" THEN  RETURN
2751 LET f$(rows+1,1 TO 4)=STR$ end
2754 SAVE "1"+g$ DATA f$()
2770 SAVE "2"+g$ DATA a$()
2775 BEEP .1,10: PRINT AT 20,0;"Verify Data ?  Press Y or N"
2780 LET i$=INKEY$
2790 IF i$="N" THEN  GO SUB 190: GO TO 2875
2795 IF i$<>"Y" THEN  GO TO 2780
2796 GO SUB 190: PRINT AT 20,0;"Verifying Data"
2840 PRINT AT 20,15;: VERIFY "1"+g$ DATA f$()
2850 PRINT AT 20,15;: VERIFY "2"+g$ DATA a$()
2870 BEEP .1,10: GO SUB 190: PRINT AT 20,0;"Verified": GO SUB 185
2875 LET f$(31,1 TO 4)="    ": LET i$=""
2880 RETURN
2920 PRINT AT 19,8;"Load Sheet"
2930 LET m$="Enter Filename "
2931 LET hi=164: LET low=32: LET len=9
2932 GO SUB 9000
2941 IF g$="<=" THEN  RETURN
2945 IF g$="=" OR g$="^" THEN  GO TO 2932
2960 PRINT AT 20,15;: LOAD ("1"  AND g$<>"")+g$ DATA f$()
2961 PRINT AT 20,15;: LOAD ("2" AND g$<>"")+g$ DATA a$()
2965 LET end=VAL f$(rows+1,1 TO 4): LET f$(rows+1,1 TO 4)="    "
3010 GO SUB 190
3011 RETURN
3100 LET le=0: LET end=0
3109 LET oy=1: LET help=3790
3111 LET jx=1: LET jy=1
3113 LET sx=4: LET sy=1
3115 LET cx=3: LET cy=1
3116 LET y=1: LET x=1
3119 LET flag=0
3120 POKE 23658,8
3190 LET col=16: LET alen=9000: LET cols=163: LET rows=30
3200 POKE 65410,cols: POKE 65453,cols
3210 PRINT AT 8,10; PAPER 1; BRIGHT 1; INK 7;"PLEASE WAIT"
3250 DIM f$(rows+1,cols)
3270 DIM a$(1,alen)
3280 LET f$(rows+1,1 TO 3)="   "
3290 FOR n=4 TO cols STEP 10
3300 LET f$(rows+1,n TO n+9)="   "+CHR$ VAL "((n+6)/10)+64"+"      "
3310 NEXT n
3340 FOR n=1 TO 3: LET f$(n)="": NEXT n
3360 LET f$(5)=""
3365 FOR n=13 TO cols STEP 10
3370 LET f$(5,n TO )="     00.00"
3390 NEXT n
3400 FOR n=3 TO cols STEP 10: LET f$(4,n TO )="_________"
3410 NEXT n
3420 FOR n=5 TO rows
3430 LET f$(n,1 TO 3)=STR$ n: LET f$(n,3 TO )=" "+f$(5,4 TO )
3435 LET f$(n,13)="¦"
3440 NEXT n
3460 RETURN
3810 PAPER 7: BORDER 7: INK 0: FLASH 0: BRIGHT 0: CLS : LET flag=0: POKE 23658,8
: GO TO 180
3850 PRINT AT 19,8;"Print Sheet"
3860 BEEP .1,10: GO SUB 190: PRINT AT 20,0;"Print Screen, Part sheet or QuitPres
s S P or Q"
3865 LET g$=INKEY$
3870 IF g$="S" THEN  GO SUB 4060: RETURN
3880 IF g$="Q" THEN  GO SUB 190: RETURN
3890 IF g$<>"P" THEN  GO TO 3865
3901 GO SUB 190
3902 LET len=2: LET hi=col+64: LET low=64
3903 LET m$="Start Column. (A TO "+CHR$ hi+")"
3904 GO SUB 6000
3905 IF g$="<=" THEN  RETURN
3906 IF CODE g$-64<1 OR CODE g$-64>col THEN  GO TO 3904
3907 LET sc=CODE g$-64
3908 LET m$="Last Column. ("+CHR$ (sc+64)+" TO "+CHR$ (col+64)+" )"
3909 GO SUB 6000
3910 IF g$="<=" THEN  RETURN
3911 IF CODE g$-64<sc OR CODE g$-64>col THEN  GO TO 3909
3912 LET lc=CODE g$-64: LET len=3: LET hi=57: LET low=48
3913 LET m$="Start Row. (1 TO "+STR$ rows+")"
3914 GO SUB 6000
3915 IF g$="<=" THEN  RETURN
3916 IF VAL g$<1 OR VAL g$>rows THEN  GO TO 3914
3917 LET sr=VAL g$
3918 LET m$="Last Row. ("+STR$ sr+" TO "+STR$ rows+")"
3919 GO SUB 6000
3920 IF g$="<=" THEN  RETURN
3921 IF VAL g$<sr OR VAL g$>rows THEN  GO TO 3918
3922 LET lr=VAL g$
3924 PRINT AT 21,0;CHR$ (sc+64);" To ";CHR$ (lc+64);" , ";sr;" To ";lr;"  OK? Pr
ess Y/N"
3925 LET g$=INKEY$
3926 IF g$="N" THEN  GO TO 3900
3927 IF g$<>"Y" THEN  GO TO 3925
3928 BEEP .1,10
3929 GO SUB 190
3931 LET sc=(sc-1)*10+4
3932 LET lc=lc*10+3
```


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PROGRAMS

```
3933 PRINT AT 20,0;"Press Q to quit printing"
3934 LPRINT : LPRINT "        SPREADSHEET DUMP        "
3935 LPRINT "_____________________________": LPRINT : LPRINT
3937 FOR m=sc TO lc STEP 30
3939 LET to=m+28+((lc-28)-m AND m+28>lc)
3940 LPRINT : LPRINT  INVERSE 1;TAB 3;f$(31,m TO to)
3950 FOR n=sr TO lr
3960 IF INKEY$="Q" THEN  GO SUB 190: RETURN
3970 IF n>4 THEN  LPRINT  INVERSE 1;n;
3971 IF n<10 THEN  LPRINT "■";
3972 IF n<5 THEN  LPRINT "■";
3980 LPRINT TAB 3;f$(n,m TO to)
4000 NEXT n
4010 NEXT m
4020 LPRINT : LPRINT : LPRINT
4030 GO SUB 190
4040 RETURN
4060 GO SUB 190
4065 LPRINT "            SCREEN DUMP           ": LPRINT "_____________________
_______": LPRINT : LPRINT : COPY
4070 LPRINT : LPRINT : RETURN
5000 GO SUB 190
5001 IF sy=4 THEN  BEEP .1,10: RETURN
5010 BEEP .1,10: PRINT AT 20,0;"Put, Remove Line or Quit ?      Press P, R or Q"
5015 LET g$=INKEY$
5020 IF g$="R" THEN  GO SUB 5050: RETURN
5025 IF g$="Q" THEN  RETURN
5030 IF g$<>"P" THEN  GO TO 5015
5040 FOR n=3 TO cols STEP 10: LET f$(sy,n TO )="__________": NEXT n: LET f$(sy,1
3)=":": RETURN
5050 IF sy<4  THEN  LET f$(sy)=""
5060 IF sy>4 THEN  FOR n=13 TO cols STEP 10: LET f$(sy,n TO )="     00.00": NEXT
 n: LET f$(sy,3 TO 13)="          :"
5080 RETURN
5100 GO SUB 190
5107 BEEP .1,10: PRINT AT 20,0;"Put, Remove Month or Quit ?      Press P, R or Q"
5110 LET g$=INKEY$
5120 IF g$="R" THEN  LET f$(1,14 TO 133)="": RETURN
5125 IF g$="Q" THEN  RETURN
5130 IF g$<>"P" THEN  GO TO 5110
5135 RESTORE 9597
5140 FOR n=14 TO 124 STEP 10: READ g$: LET f$(1,n TO n+9)="": LET f$(1,n+(9-LEN
g$) TO n+9)=g$: NEXT n
5150 RETURN
6000 GO SUB 9000
6010 IF g$=";" OR g$="" OR g$="^" THEN  GO TO 6000
6020 RETURN
8000 BEEP .1,10
8005 GO SUB 190: PRINT AT 20,0;"Are you sure to clear the sheet Press Y or N"
8010 LET g$=INKEY$
8020 IF g$="N" THEN  GO SUB 190: RETURN
8030 IF g$<>"Y" THEN  GO TO 8010
8040 CLS : GO SUB 3100: GO SUB 500: RETURN
8500 CLS : PRINT "Key   Function"
8510 PRINT '"R   Re-calculate sheet"'"E   Enter data"'"A   Alter data"'"F   Ente
r a formula"
8520 PRINT "C   Clear sheet"'"M   Put in months"'"N   Put line"'"O   Show column
 A"'"D   Delete a formula"'"L   List formulae"'"J   Cursor jump"
8525 PRINT "P   Printer options"'"X   Load"'"Z   Save"
8530 PRINT ''"Press any key to continue": PAUSE 1: PAUSE 0: RETURN
8800 IF g$(LEN g$)="-" OR g$( TO LEN g$)="-." THEN  LET g$="-0"
8801 LET xy=sy: LET xx=sx
8805 LET g$="0"+g$: LET g$=STR$ VAL g$
8806 IF VAL g$>999999 THEN  RETURN
8807 LET ppos=0: FOR n=1 TO LEN g$: IF g$(n)="." THEN  LET ppos=n
8810 NEXT n
8813 IF ppos<>0 THEN  LET g$=STR$ (INT ((VAL g$*100)+.5)/100)
8815 IF ppos=0 THEN  LET g$=g$+".00"
8820 IF ppos THEN  LET g$=g$+"00"( TO 2-(LEN g$-ppos))
8825 LET f$(xy,xx TO xx+8)="    00.00"
8830 LET f$(xy,xx+(9-LEN g$) TO xx+8)=g$
8840 RETURN
9000 GO SUB 190: BEEP .1,10: LET le=1: LET fs=0: LET s$=""
9003 LET len2=len: IF m$(7)="N" THEN  LET len=len-3
9004 PRINT AT 21,0;m$+"[ ";AT 21,LEN m$+len2;"]"
9005 LET e$=INKEY$
9006 IF e$="" THEN  GO TO 9005
9012 IF e$="<=" THEN  LET g$=e$: GO TO 9060
9013 IF e$="^" OR e$=";" THEN  LET g$=e$: GO TO 9060
9014 IF e$=("." AND fs=0 AND le<8 AND m$(7)="N") THEN  LET fs=fs+1: LET len=LEN
s$+4: GO TO 9025
9018 IF e$="-" AND le=1 THEN  GO TO 9025
9019 IF e$<>CHR$ 13 AND e$<>CHR$ 12 AND (CODE e$<low OR CODE e$>hi) THEN  GO TO
9005
9020 IF e$=CHR$ 13 THEN  GO TO 9050
9022 IF LEN s$>0 AND e$=CHR$ 12  THEN  IF s$(LEN s$)="." THEN  LET fs=0: LET len
=len2-3
9023 IF le>1 AND e$=CHR$ 12 THEN  LET le=le-1: LET s$=s$(1 TO LEN s$-1): GO TO 9
030
9024 IF e$=CHR$ 12 THEN  LET e$="": GO TO 9030
9025 IF le<len THEN  LET s$=s$+e$: LET le=le+1
9030 BEEP .005,10: PRINT AT 21,0;m$+"["+s$;: IF LEN s$<>len2-1 THEN  PRINT " "
9040 GO TO 9005
9050 LET g$=s$
9060 GO SUB 190
9070 LET len=len2
9075 RETURN
9597 DATA "JANUARY","FEBRUARY","MARCH","APRIL","MAY","JUNE","JULY","AUGUST","SEP
TEMBER","OCTOBER","NOVEMBER","DECEMBER"
9800 PAPER 7: INK 0: BORDER 7: CLS
9820 CLS : PRINT AT 8,10; PAPER 1; BRIGHT 1; INK 7;"PLEASE WAIT"
9825 LET x=0: RESTORE 9840
9830 FOR n=USR "a" TO USR "a"+138
9835 READ c$: POKE n,VAL c$: LET x=x+VAL c$: NEXT n
9836 IF x<>13569 THEN  CLS : PRINT "Error in data": STOP
9837 GO TO 80
9840 DATA "197","229","213","33","75","92","94","35","86","235","203","110","32"
,"91","203","118","40","78","203","126","40","74","126","254","198","32","69","1
75"
9850 DATA "50","60","92","17","8","0","25","62","4","254","0","40","8","17","0",
"0","25","61","195","125","255","6","0","14","0","197","229","62","20","215","62
```

```
","1","215","126","215","35","126","215","62","20","215"
9860 DATA "62","0","215","17","1","0","25","235","1","30","0","205","60","32","2
25","17","0","0","237","90","193","16","217","209","225","193","201","35","94","
35","86","25","35","195","98","255","203","118","40","18","203"
9870 DATA "126","40","7","17","19","0","25","195","98","255","17","6","0","25","
195","98","255","35","203","126","40","251","17","6","0","25","195","98","255"
9999 CLEAR : SAVE "SPREAD" LINE 9800: BEEP 1,20: VERIFY ""
```

Amstrad Amsquill

by Justin Moffitt

All the commands for this superb word processor are given below, before the listing. The second listing is a utility to transform program files which have been saved in ASCII format to the format used by Amsquill. These programs should have been saved with ',A' after the usual SAVE command. It cannot handle very large programs which may have to be split up.

Loading And Saving The Program

Amsquill is a long program and therefore must be typed in carefully. The program may be saved with the following line;
SPEED WRITE 1:SAVE "AMSQUILL 1.0" [ENTER]
The program is saved at super fast speed, loading is simple, press the [CTRL] & small [ENTER], you will see RUN" come up on the screen, start you tape and loading starts.

Features

Amsquill operates an Epson FX-80 printer and a cassette or disc drive. The program can be made to work with tapes if you have a disc system by adding !TAPE to all the loading and saving options.

Amsquill allows use of left and right margins, block movements and word wrapping. For the forgetful among us there is a help page.

Margin Setting

Two margins can be set, that is a left and a right magin. The margins are preset to column 1 and column 80. Thus you have 80 columns of text on screen. Everything considers the set margins including delete, insert and blocks.

Blocks

Amsquill can delete, clear, copy and change the case of any block of text. The blocks are from the left to right margins and from the top and bottom markers that you set.

Cursor Movement

The cursor can be moved in a variety of ways, to the start and end of lines, by words and of course by characters. All movements are made by the cursor cluster on the keyboard.
NOTE:A joystick may not be used to move the cursor.

Controlling The Printer

There are a variety of things that you can do with a printer as listed.

Keys:-
On Off

A	P	**Proportional**
B	O	Elite
C	N	**Double strike**
D	M	**Emphasised**
E	L	*Italics*
F	K	Underline
G	J	Condensed
H	I	Enlarged
Q		Form Feed

These codes may be mixed on one line. Only the part of the line typed on is printed, so remember not to type over 40 characters in enlarged mode.

The Control Keys

Key	Used alone	With [SHIFT]	With [CTRL]
Esc	Calls the main menu.		
Tab	Centres line.		
Caps Lock	Makes all leters that you type capital. Eg. abc becomes ABC Pressing this again will turn the feature off again.		Makes every key act as if it were being pressed along with [SHIFT]. Pressing these keys again will turn the feature off again.
Copy	Clears file if prompt is answered by Y for Yes.		
Del	Deletes character under cursor.		Deletes a full line of the text file.
Clr	Inserts space at cursor.		Inserts a line of spaces at the cursor.
A	a	A	Clear line to cursor.
B	b	B	Delete marked block of text.
C	c	C	Set right margin.
D	d	D	Clear line from cursor.

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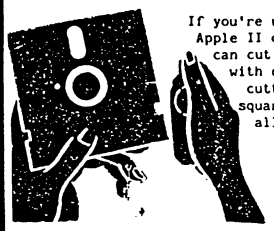
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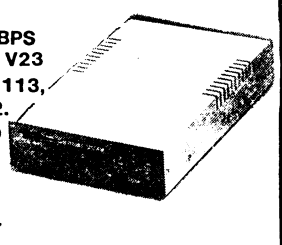
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```
E   e                   E                   Right justify.
F   f                   F                   Convert marked block to
                                            lower case.
G   g                   G                   Clear marked block.
H   h                   H                   Convert marked block to
                                            upper case.
I   i                   I
J   j                   J                   Set start of block
                                            marker
K   k                   K                   Clear block markers.
L   l                   L                   Set end of block
                                            marker.
M   m                   M
N   n                   N                   Copy marked block to
                                            cursor.
O   o                   O                   Scroll down line.
P   p                   P                   Scroll up line.
Q   q                   Q                   Left justify.
R   r                   R                   Prints CR character,
                                            this character tells
                                            Amsquill where to
                                            end a program line.
S   s                   S                   Clears whole line.
T   t                   T                   Control character lock
                                            on/off. Capital letters
                                            will print graphics,
                                            which act as control
                                            characters.
U   u                   U                   Call HELP page.
V   v                   V
W   w                   W                   Centre line of text.
X   x                   X                   Clear the set margins.
Y   y                   Y                   Word wrap on/off.
Z   z                   Z                   Set left margin.
```

Main Menu Options

Amsquill has a large main menu, when the keys is pressed Amsquill will do what is called a main function.

Key	Notes
1	Returns to text.
2	Save file. The file is saved under the name that you gave it at the start of the program.
3	Load file. Here you must input a file name this is just like save. Read errors can occour.
4	Merge two files. Here the file from tape is added onto the end of the file in memory.
5	List text to printer (Epson Fx-80) as explained Page 01.
6	Change colours to any two seperate colours as "Master Colour Chart"
7	Save the program to tape/disc, it also clears the text file.
8	Exit program. Here the program is not lost, but allows errors to be corrected.

Garbage Collection

Amsquill like many other programs for the Amstrad stops for garbage collection about every 100 lines typed in. This is not a problem as you can still type during the few seconds of stillness.

Adding To Amsquill

Amsquill is a long program and cannot really be added to, there are only three main features missing, search and replace, search and delete and highlight. These are easily added using INSTR but the program then becomes too long for memory.

```
10 REM
20 REM       Amsquill 1.0
30 REM
40 REM (C)1985 Justin Moffitt
50 REM
60 REM Editor
70 INK 0,13:BORDER 13:INK 1,26:CALL &BFF9,&C9,&1CED,&CF00:SYMBOL AFTER 127:SYMBO
L 128,255,129,129,129,129,129,129,129,255:SYMBOL 170,0,3,51,99,254,96,48,0
80 SPEED KEY 10,1:KEY DEF 6,1,13,13,13:KEY DEF 16,1,233,233,237:KEY DEF 38,1,109
,77,169:KEY DEF 66,1,168,168,168:KEY DEF 68,1,23,23,23:KEY DEF 70,1,169,169,170:
KEY DEF 79,1,232,232,236
90 MODE 2:LOCATE 1,1:PRINT CHR$(150)STRING$(17,CHR$(154))CHR$(156)" "CHR$(150)ST
RING$(38,CHR$(154))CHR$(156)" "CHR$(150)STRING$(17,CHR$(154))CHR$(156)
100 LOCATE 1,2:PRINT CHR$(149)" A M S Q U I L L "CHR$(149)" "CHR$(149)SPC(38)CHR
$(149)" "CHR$(149)SPC(17)CHR$(149)
110 LOCATE 1,3:PRINT CHR$(147)STRING$(17,CHR$(154))CHR$(153)" "CHR$(147)STRING$(
38,CHR$(154))CHR$(153)" "CHR$(147)STRING$(17,CHR$(154))CHR$(153)
120 WINDOW #1,1,80,6,21:IF file=0 THEN 2300 ELSE 2330
130 LOCATE 23,2:PRINT SPACE$(8)"Line:"SPACE$(5)"Column:  ":LOCATE 1,5:PRINT "...
.....1.........2.........3.........4.........5.........6.........7.........8":L
OCATE 64,2:PRINT SPACE$(15):LOCATE 64,2:PRINT I$
140 g$="OFF":h$="OFF":j$="OFF":k$="OFF":l%=1:c%=1:r%=1:lm%=1:rm%=80:ctrl=0:wrap=
0:cloc=0:sloc=0:POKE 46311,0:POKE 46312,0
150 LOCATE 1,23:PRINT STRING$(20,"_"):LOCATE 31,23:PRINT STRING$(20,"_"):LOCATE
61,23:PRINT STRING$(20,"_")
160 LOCATE 1,24:PRINT CHR$(24)" CONTROL LOCK : "g$" ":LOCATE 31,24:PRINT "   WOR
D WRAP : "h$"  ":LOCATE 61,24:PRINT "  Press CTRL and U  ";
170 PRINT " SHIFTED LOCK : "j$" ";:LOCATE 31,25:PRINT "   CAPS LOCK : "k$"  ";:L
OCATE 61,25:PRINT "       for HELP       "CHR$(24);
180 LOCATE lm%,22:PRINT CHR$(246):LOCATE rm%,22:PRINT CHR$(247)
190 IF ret=1 THEN 2470 ELSE LOCATE 36,2:PRINT l%:LOCATE 48,2:PRINT c%
200 LOCATE #1,c%,r%:PRINT #1,CHR$(24)MID$(text$(l%),c%,1)CHR$(24)
210 LOCATE 1,1:PRINT CHR$(21):a$="":WHILE a$="":a$=INKEY$:WEND:PRINT CHR$(6):LOC
ATE #1,c%,r%:PRINT #1,MID$(text$(l%),c%,1)
220 IF ctrl=1 THEN 2430
230 IF a$>CHR$(31) AND a$<CHR$(127) THEN 2200
240 IF a$=CHR$(13) OR a$=CHR$(241) OR a$=CHR$(245) THEN 1940
250 IF a$=CHR$(168) THEN 2460
260 IF a$=CHR$(224) THEN LOCATE 23,2:PRINT "   Clear present text file (Y/N)?":a
$="":WHILE a$<>"Y" AND a$<>"N":a$=INKEY$:a$=UPPER$(a$):WEND:IF a$="Y" THEN 2290
ELSE LOCATE 23,2:PRINT SPACE$(8)"LINE:      Column:"SPACE$(11):GOTO 190
270 IF a$=CHR$(246) THEN 1880
280 IF a$=CHR$(247) THEN 1820
```

```
290 IF a$=CHR$(240) OR a$=CHR$(244) THEN 2100
300 IF a$=CHR$(242) THEN 2130
310 IF a$=CHR$(243) THEN 2170
320 IF a$=CHR$(250) THEN c%=lm%:GOTO 190
330 IF a$=CHR$(251) THEN c%=rm%:GOTO 190
340 IF a$=CHR$(248) THEN l%=l%-r%+1:r%=1:c%=lm%:GOTO 190
350 IF a$=CHR$(249) THEN l%=l%+15-r%:r%=15:c%=rm%:GOTO 190
360 IF l%=tb% OR l%=bb% THEN 190
370 IF tb%>0 OR bb%>0 THEN 460
380 a=ASC(a$)
390 ON a GOTO 1650,1100,1690,1640,1560,1210,1180,1230,180,1490,1320,1430,180,990
,720,640,1560,470,1660,660,750,180,1750,1710,690,1670
400 IF a$=CHR$(169) THEN 480
410 IF a$=CHR$(170) THEN 550
420 IF a$=CHR$(232) THEN 1740
430 IF a$=CHR$(233) THEN 1720
440 IF a$=CHR$(236) THEN 580
450 IF a$=CHR$(237) THEN 510 ELSE GOTO 190
460 IF a$=CHR$(3) OR a$=CHR$(24) OR a$=CHR$(26) THEN 190 ELSE 380
470 a$=CHR$(170):GOTO 2200
480 IF cloc=0 THEN cloc=1:k$="ON ":POKE 46312,255:GOTO 500
490 cloc=0:k$="OFF":POKE 46312,0
500 LOCATE 46,25:PRINT CHR$(24)+k$+CHR$(24);:GOTO 190
510 FOR f=200 TO l%+1 STEP -1:MID$(text$(f),lm%,rm%-lm%+1)=MID$(text$(f-1),lm%):
NEXT:MID$(text$(l%),lm%)=SPACE$(rm%-lm%+1):WINDOW #2,lm%,rm%,r%+6,21:PRINT #2,CH
R$(11):LOCATE #1,1,r%:PRINT #1,text$(l%)text$(l%+1);:LOCATE 1,21:PRINT SPACE$(80
);
520 IF l%<=tb% AND l%<200 THEN tb%=tb%+1
530 IF l%<=bb% AND l%<200 THEN bb%=bb%+1
540 GOTO 190
550 IF sloc=0 THEN sloc=1:j$="ON ":POKE 46311,255:GOTO 570
560 sloc=0:j$="OFF":POKE 46311,0
570 LOCATE 17,25:PRINT CHR$(24)j$CHR$(24);:GOTO 190
580 FOR f=l% TO 199:MID$(text$(f),lm%,rm%-lm%+1)=MID$(text$(f+1),lm%):NEXT:MID$(
text$(200),lm%)=SPACE$(rm%-lm%+1):WINDOW #2,lm%,rm%,r%+6,21:LOCATE #2,1,21-r%:PR
INT #2:LOCATE #1,1,r%:PRINT #1,text$(l%):LOCATE #1,1,15:PRINT #1,text$(l%-r%+15)
590 IF l%=tb% THEN tb%=0
600 IF l%=bb% THEN bb%=0
610 IF l%<tb% THEN tb%=tb%-1
620 IF l%<bb% THEN bb%=bb%-1
630 GOTO 190
640 IF (l%-r%)+16=201 THEN 190
650 LOCATE #1,1,16:PRINT #1,CHR$(10):LOCATE #1,1,15:PRINT #1,text$(l%-r%+16):l%=
l%+1:GOTO 190
660 IF ctrl=0 THEN ctrl=1:g$="ON ":GOTO 680
670 ctrl=0:g$="OFF"
680 LOCATE 17,24:PRINT CHR$(24)g$CHR$(24):GOTO 190
690 IF wrap=0 THEN wrap=1:h$="ON ":GOTO 710
700 wrap=0:h$="OFF"
710 LOCATE 46,24:PRINT CHR$(24)h$CHR$(24):GOTO 190
720 IF l%-r%=0 THEN 190
730 LOCATE #1,1,1:PRINT #1,CHR$(11):LOCATE #1,1,1:PRINT #1,text$(l%-r%):l%=l%-1
740 LOCATE 1,21:PRINT SPACE$(80):GOTO 190
750 LOCATE 23,2:PRINT "         Amsquill HELP page.          ":WINDOW #2,1,80,4,22
:CLS #2
760 g=l%-r%+1
770 WINDOW SWAP 2,0:PRINT STRING$(20,"_")SPC(10)STRING$(20,"_")SPC(10)STRING$(20
,"_")SPC(10)
780 LOCATE 1,2:PRINT CHR$(24)+"       BLOCKS       ":LOCATE 31,2:PRINT " CONTROL
 CHARACTERS ":LOCATE 61,2:PRINT "      SCROLLING     "CHR$(24)
790 LOCATE 1,4:PRINT "J. Set top marker.  "SPC(10)CHR$(135)"     Enlarged     "C
HR$(136)SPC(10)"O. Scroll down line.";
800 PRINT "L. Set end marker.  "SPC(10)CHR$(134)"    Condensed     "CHR$(137)SPC
(10)"P. Scroll up line."
810 PRINT "K. Reset markers.   "SPC(10)CHR$(133)"    Underline     "CHR$(138)SPC
(10)STRING$(20,"_");
820 PRINT "G. Clear block.     "SPC(10)CHR$(132)"     Italics      "CHR$(139)SPC
(10)CHR$(24)"     FORMATTING     "CHR$(24);
830 PRINT "H. Block to upper.  "SPC(10)CHR$(131)"    Emphasised    "CHR$(140)
840 PRINT "F. Block to lower.  "SPC(10)CHR$(130)"  Double strike   "CHR$(141)SPC
(10)"Q. Left justify."
850 PRINT "N. Copy block.      "SPC(10)CHR$(129)"      Elite       "CHR$(142)SPC
(10)"E. Right justify."
860 PRINT "B. Delete block.    "SPC(10)CHR$(128)"   Proportional   "CHR$(143)SPC
(10)"W. Centre line."
870 PRINT STRING$(20,"_")SPC(10)CHR$(144)"     Form feed     "SPC(10)STRING$(20,
"_");
880 PRINT CHR$(24)"    LINE EDITING    "CHR$(24)SPC(10)"T. Ctrl lock on/off."SPC
(10)CHR$(24)"      WORD WRAP     "CHR$(24);
890 PRINT SPC(30)STRING$(20,"_")
900 PRINT "d. Delete line.     "SPC(10)CHR$(24)"       MARGINS       "CHR$(24)SPC
(10)"Y. Word wrap on/off.";
910 PRINT "c. Insert line.     "SPC(40)STRING$(20,"_");
920 PRINT "S. Clear line.      "SPC(10)"Z. Set left margin. "SPC(10)CHR$(24)"
   MAIN MENU     "CHR$(24);
930 PRINT "A. Clear to start.  "SPC(10)"C. Set right margin."
940 PRINT "D. Clear to end.    "SPC(10)"X. Reset margins.   "SPC(10)"e. Call mai
n menu."
950 WINDOW SWAP 0,2:a$="":WHILE a$="":a$=INKEY$:WEND
960 CLS #2:FOR f=g TO g+14:LOCATE #1,1,f-g+1:PRINT #1,text$(f);:NEXT
970 LOCATE 23,2:PRINT "        Line:     Column:  ":LOCATE 1,5:PRINT ".........1
.........2.........3.........4.........5.........6.........7.........8"
980 LOCATE lm%,22:PRINT CHR$(246):LOCATE rm%,22:PRINT CHR$(247):GOTO 190
990 IF tb%=0 OR bb%=0 THEN 190
1000 h=l%+bb%-tb%:IF h>200 THEN h=201
1010 IF h=tb% THEN 190
1020 IF h>tb% THEN IF h<bb% THEN 190
1030 IF l%>tb% THEN IF l%<bb% THEN 190
1040 MID$(text$(l%),lm%,rm%-lm%+1)=tb$+MID$(text$(tb%),lm%+1):MID$(text$(h),lm%)
=MID$(text$(bb%),lm%,rm%-lm%)+bb$
1050 FOR f=l%+1 TO h-1:MID$(text$(f),lm%,rm%-lm%+1)=MID$(text$(tb%+f-l%),lm%):NE
XT
1060 MID$(text$(tb%),lm%,1)=CHR$(245):MID$(text$(bb%),rm%,1)=CHR$(244)
1070 h=r%+bb%-tb%+1:IF h>15 THEN h=15
1080 g=r%-1:IF g<1 THEN g=1
1090 FOR f=g TO h:LOCATE #1,lm%,f:PRINT #1,MID$(text$(l%-r%+f),lm%,rm%-lm%+1):NE
XT:GOTO 190
1100 IF tb%=0 OR bb%=0 THEN 190
1110 FOR f=tb% TO 200-(bb%-tb%):MID$(text$(f),lm%,rm%-lm%+1)=MID$(text$(f+bb%-tb
%+1),lm%):NEXT:FOR f=201-(bb%-tb%+1) TO 200:MID$(text$(f),lm%)=SPACE$(rm%-lm%+1)
:NEXT
```


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```
1120 tb$=MID$(text$(tb%),lm%,1):bb$=MID$(text$(bb%),rm%,1):MID$(text$(tb%),lm%,1
)=CHR$(245):MID$(text$(bb%),rm%,1)=CHR$(244)
1130 FOR f=1 TO 15:IF 1%-r%+f=tb% THEN 1170 ELSE NEXT
1140 IF tb%<1%-r%+1 THEN 1160
1150 GOTO 190
1160 f=1
1170 FOR g=f TO 15:LOCATE #1,lm%,g:PRINT #1,MID$(text$(1%-r%+g),lm%,rm%-lm%+1):N
EXT:GOTO 190
1180 IF tb%=0 OR bb%=0 THEN 190
1190 MID$(text$(tb%),lm%+1)=SPACE$(rm%-lm%):MID$(text$(bb%),lm%)=SPACE$(rm%-lm%)
1200 tb$=" ":bb$=" ":FOR f=tb%+1 TO bb%-1:MID$(text$(f),lm%)=SPACE$(rm%-lm%+1):N
EXT:GOTO 1250
1210 IF tb%=0 OR bb%=0 THEN 190
1220 tb$=LOWER$(tb$):bb$=LOWER$(bb$):FOR f=tb% TO bb%:MID$(text$(f),lm%)=LOWER$(
MID$(text$(f),lm%,rm%-lm%+1)):NEXT:GOTO 1250
1230 IF tb%=0 OR bb%=0 THEN 190
1240 tb$=UPPER$(tb$):bb$=UPPER$(bb$):FOR f=tb% TO bb%:MID$(text$(f),lm%)=UPPER$(
MID$(text$(f),lm%,rm%-lm%+1)):NEXT
1250 FOR f=1 TO 15:IF 1%-r%+f=tb% THEN 1290 ELSE NEXT
1260 'IF tb%<1%-r%+1 THEN 1280
1270 GOTO 190
1280 f=1
1290 FOR g=1 TO 15:IF 1%-r%+g=bb% THEN 1310 ELSE NEXT
1300 g=15
1310 FOR h=f TO g:LOCATE #1,1,h:PRINT #1,text$(1%-r%+h):NEXT:GOTO 190
1320 IF bb%=0 AND tb%=0 THEN 190
1330 IF tb%>0 THEN 1360
1340 IF bb%>0 THEN 1380
1350 GOTO 1400
1360 MID$(text$(tb%),lm%,1)=tb$:FOR f=1 TO 15:IF 1%-r%+f=tb% THEN 1410 ELSE NEXT
1370 GOTO 1340
1380 MID$(text$(bb%),rm%,1)=bb$:FOR g=1 TO 15:IF 1%-r%+g=bb% THEN 1420 ELSE NEXT
1390 GOTO 1350
1400 bb%=0:tb%=0:tb$="":bb$="":GOTO 190
1410 LOCATE #1,lm%,f:PRINT #1,tb$:GOTO 1340
1420 LOCATE #1,rm%,g:PRINT #1,bb$:GOTO 1350
1430 IF tb%>1% THEN 190
1440 IF bb%>0 THEN 1460
1450 bb%=1%:bb$=MID$(text$(1%),rm%,1):LOCATE #1,rm%,r%:PRINT #1,CHR$(244):MID$(t
ext$(1%),rm%,1)=CHR$(244):GOTO 190
1460 FOR f=1 TO 15 STEP 1:IF 1%-r%+f=bb% THEN 1480 ELSE NEXT
1470 MID$(text$(bb%),rm%,1)=bb$:GOTO 1450
1480 LOCATE #1,rm%,f:PRINT #1,bb$:MID$(text$(1%-r%+f),rm%,1)=bb$:GOTO 1450
1490 IF bb%=0 THEN 1510
1500 IF bb%<1% THEN 190
1510 IF tb%>0 THEN 1530
1520 tb%=1%:tb$=MID$(text$(1%),lm%,1):LOCATE #1,lm%,r%:PRINT #1,CHR$(245):MID$(t
ext$(1%),lm%,1)=CHR$(245):GOTO 190
1530 FOR f=1 TO 15 STEP 1:IF 1%-r%+f=tb% THEN 1550 ELSE NEXT
1540 MID$(text$(tb%),lm%,1)=tb$:GOTO 1520
1550 LOCATE #1,lm%,f:PRINT #1,tb$:MID$(text$(1%-r%+f),lm%,1)=tb$:GOTO 1520
1560 IF MID$(text$(1%),lm%,rm%-lm%)=SPACE$(rm%-lm%) THEN 190
1570 FOR f=lm% TO rm%:IF MID$(text$(1%),f,1)=" " THEN NEXT ELSE 1580
1580 FOR g=rm% TO lm% STEP -1:IF MID$(text$(1%),g,1)=" " THEN NEXT ELSE 1590
1590 h=g-f+1:IF h=rm%-lm%+1 THEN 190
1600 IF a$=CHR$(17) THEN 1630
1610 cen$=MID$(text$(1%),f,h):MID$(text$(1%),f,h)=SPACE$(rm%-lm%):h=rm%-LEN(cen$
):MID$(text$(1%),h+1,LEN(cen$))=cen$:c%=rm%+1:LOCATE #1,1,r%:PRINT #1,text$(1%)
1620 IF c%>rm% THEN 1810 ELSE 190
1630 cen$=MID$(text$(1%),f,h):MID$(text$(1%),f,h)=SPACE$(rm%-lm%):MID$(text$(1%)
,lm%,LEN(cen$))=cen$:c%=lm%+LEN(cen$):LOCATE #1,1,r%:PRINT #1,text$(1%):GOTO 162
0
1640 MID$(text$(1%),c%)=SPACE$(rm%-c%+1):LOCATE #1,1,r%:PRINT #1,text$(1%):GOTO
190
1650 MID$(text$(1%),lm%)=SPACE$(c%-lm%+1):LOCATE #1,1,r%:PRINT #1,text$(1%):GOTO
 190
1660 MID$(text$(1%),lm%)=SPACE$(rm%-lm%+1):LOCATE #1,1,r%:PRINT #1,text$(1%):GOT
O 190
1670 IF c%=rm% THEN 190
1680 LOCATE lm%,22:PRINT " ":lm%=c%:GOTO 180
1690 IF c%=lm% THEN 190
1700 LOCATE rm%,22:PRINT " ":rm%=c%:GOTO 180

1710 LOCATE 1,22:PRINT SPACE$(80):lm%=1:rm%=80:GOTO 180
1720 IF MID$(text$(1%),rm%,1)=" " THEN 1730 ELSE 190
1730 g=rm%-c%:MID$(text$(1%),c%+1,g)=MID$(text$(1%),c%):MID$(text$(1%),c%)=" ":L
OCATE #1,1,r%:PRINT #1,text$(1%):GOTO 190
1740 g=rm%-c%:MID$(text$(1%),c%,g)=MID$(text$(1%),c%+1):MID$(text$(1%),rm%,1)="
":LOCATE #1,1,r%:PRINT #1,text$(1%):GOTO 190
1750 IF MID$(text$(1%),lm%,rm%-lm%)=SPACE$(rm%-lm%) THEN 190
1760 FOR f=lm% TO rm%:IF MID$(text$(1%),f,1)=" " THEN NEXT ELSE 1770
1770 FOR g=rm% TO lm% STEP -1:IF MID$(text$(1%),g,1)=" " THEN NEXT ELSE 1780
1780 h=g-f+1:IF h>rm%-lm%-1 THEN 190
1790 cen$=MID$(text$(1%),f,h):MID$(text$(1%),f,h)=SPACE$(rm%-lm%):h=((lm%+rm%)/2
)-(LEN(cen$)/2):MID$(text$(1%),h,LEN(cen$))=cen$:c%=h+LEN(cen$):LOCATE #1,1,r%:P
RINT #1,text$(1%)
1800 IF c%>rm% THEN 1810 ELSE 190
1810 a$=CHR$(13):GOTO 1940
1820 FOR f=c%+1 TO rm%:IF MID$(text$(1%),f,1)=" " THEN 1830 ELSE NEXT:GOTO 1840
1830 c%=f:GOTO 190
1840 c%=lm%-1:l%=1%+1:r%=r%+1:IF 1%=251 THEN 1870
1850 IF r%>15 THEN 1860 ELSE 1820
1860 LOCATE #1,1,16:PRINT #1,CHR$(10):LOCATE #1,1,15:PRINT #1,text$(1%):r%=15:GO
TO 1820
1870 1%=200:r%=r%-1:c%=rm%:GOTO 190
1880 FOR f=c%-1 TO lm% STEP -1:IF MID$(text$(1%),f,1)=" " THEN 1890 ELSE NEXT:GO
TO 1900
1890 c%=f:GOTO 190
1900 c%=rm%+1:l%=1%-1:r%=r%-1:IF 1%=0 THEN 1930
1910 IF r%<1 THEN 1920 ELSE 1880
1920 LOCATE #1,1,1:PRINT #1,CHR$(11):LOCATE #1,1,1:PRINT #1,text$(1%):r%=1:LOCAT
E 1,21:PRINT SPACE$(80):GOTO 1880
1930 r%=1:l%=1:c%=lm%:GOTO 190
1940 IF a$=CHR$(13) THEN c%=lm%
1950 IF 1%=200 THEN 190
1960 1%=1%+1:r%=r%+1:IF r%>15 THEN 2080
1970 IF lw=1 THEN 1990
1980 IF lw=1 THEN 2160 ELSE 190
1990 LOCATE #1,lm%,r%:PRINT #1,CHR$(24)MID$(text$(1%),lm%,1)CHR$(24)
2000 a$="":WHILE a$="":a$=INKEY$:WEND
```

```
2010 IF a$>CHR$(32) AND a$<CHR$(127) THEN 2030
2020 lw=0:GOTO 1980
2030 FOR f=rm% TO lm% STEP -1:IF MID$(text$(l%-1),f,1)=" " THEN 2040 ELSE NEXT
2040 IF f=lm% OR f=lm%-1 OR f=rm% THEN 1980
2050 f=f+1:MID$(text$(l%),lm%)=MID$(text$(l%-1),f,rm%+1-f):MID$(text$(l%-1),f)=S
PACE$(rm%+1-f)
2060 LOCATE #1,1,r%-1:PRINT #1,text$(l%-1)text$(l%);
2070 c%=lm%+(rm%+1-f):GOTO 1980
2080 LOCATE #1,1,16:PRINT #1,CHR$(10):LOCATE #1,1,15:PRINT #1,text$(l%):r%=15
2090 IF lw=1 THEN 1970 ELSE 190
2100 IF l%=1 THEN 190
2110 l%=l%-1:r%=r%-1:IF r%<1 THEN 2120 ELSE 190
2120 LOCATE #1,1,1:PRINT #1,CHR$(11):LOCATE #1,1,1:PRINT #1,text$(l%):r%=1:LOCAT
E 1,21:PRINT SPACE$(80):GOTO 190
2130 IF l%=1 AND c%=lm% THEN 190
2140 c%=c%-1:IF c%=lm%-1 THEN 2150 ELSE 190
2150 c%=rm%:GOTO 2110
2160 lw=0:GOTO 220
2170 IF l%=200 AND c%=rm% THEN 190
2180 c%=c%+1:IF c%=rm%+1 THEN 2190 ELSE 190
2190 a$=CHR$(13):GOTO 1940
2200 IF MID$(text$(l%),c%,1)=CHR$(245) OR MID$(text$(l%),c%,1)=CHR$(244) THEN 22
60
2210 MID$(text$(l%),c%,1)=a$:LOCATE #1,c%,r%:PRINT #1,a$
2220 a$=CHR$(13):c%=c%+1:IF c%=rm%+1 THEN 2230 ELSE 190
2230 IF wrap=1 THEN lw=1
2240 IF l%<200 THEN c%=rm%:GOTO 1940
2250 c%=rm%:GOTO 190
2260 IF MID$(text$(l%),c%,1)=CHR$(245) THEN 2280
2270 bb$=a$:GOTO 2220
2280 tb$=a$:GOTO 2220
2290 file=0:WINDOW #2,1,80,5,25:CLS #2
2300 CLEAR:CALL &BFF9,&C9,&1CED,&CF00
2310 l=2:c=34:le=15:LOCATE 23,2:PRINT "Filename ?"SPC(24):GOSUB 2340:IF i$="" TH
EN 2310
2320 file=1:DIM text$(201):FOR f=1 TO 201:text$(f)=SPACE$(80):NEXT:GOTO 130
2330 FOR f=1 TO 15:LOCATE #1,1,f:PRINT #1,text$(f):NEXT:GOTO 130
2340 i$="":POKE 46311,0:POKE 46312,255:FOR g=1 TO le+2:LOCATE c,l:PRINT "_"
2350 a$="":WHILE a$="":a$=INKEY$:WEND
2360 IF a$=CHR$(13) THEN 2420
2370 IF a$=CHR$(232) THEN 2400
2380 IF g=le+1 OR a$>CHR$(126) OR a$<CHR$(32) THEN 2350
2390 LOCATE c,l:PRINT a$;"_":c=c+1:i$=i$+a$:NEXT
2400 IF g=1 THEN 2350
2410 LOCATE c-1,l:PRINT "_ ":g=g-1:c=c-1:i$=LEFT$(i$,g-1):GOTO 2350
2420 LOCATE c,l:PRINT " ":RETURN
2430 IF ASC(a$)>64 AND ASC(a$)<82 THEN 2440 ELSE 230
2440 h=ASC(a$)+63:a$=CHR$(h):GOTO 2200
2450 REM Prints Main Menu
2460 ret=1:GOTO 1320
2470 ret=0:SPEED WRITE 1
2480 MODE 1:POKE 46311,0:LOCATE 14,2:PRINT CHR$(150)STRING$(12,CHR$(154))CHR$(15
6):LOCATE 14,3:PRINT CHR$(149)"AMSQUILL 1.0"CHR$(149):LOCATE 14,4:PRINT CHR$(147
)STRING$(12,CHR$(154))CHR$(153)
2490 LOCATE 1,7:PRINT "1"+STRING$(22,".")"Return to editing":PRINT "2"STRING$(22
,".")"Save text to tape":PRINT "3"STRING$(20,".")"Load text from tape":PRINT "4"
STRING$(19,".")"Merge text from tape"
2500 PRINT "5"STRING$(19,".")"List text to printer":PRINT "6"STRING$(25,".")"Cha
nge colours":PRINT "7"STRING$(27,".")"Save program":PRINT "8"STRING$(26,".")"Exi
t to Basic"
2510 WINDOW #7,1,40,24,24:CLS #7:PRINT #7,SPC(12)"Press key  (1-8)"
2520 a$="":WHILE a$<CHR$(49) OR a$>CHR$(56):a$=INKEY$:WEND:a=VAL(a$):ON a GOTO 9
0,2530,2560,2640,2710,2800,2620,2630
2530 IF file=0 THEN 2510
2540 PRINT #7,"Please wait a moment":WINDOW #6,1,1,1,1:l%=0:c%=0:a$="":r%=0:tb$=
"":bb$="":tb%=0:bb%=0:rm%=0:lm%=0:ctrl=0:wrap=0:cloc=0:sloc=0:g$="":h$="":PRINT
#6,FRE(""):FOR f=200 TO 1 STEP -1:IF text$(f)=SPACE$(80) THEN NEXT
2550 IF file=0 THEN 2510 ELSE WINDOW SWAP 0,7:OPENOUT i$:FOR g=1 TO f:PRINT #9,t
ext$(g):NEXT g:CLOSEOUT:WINDOW SWAP 7,0:GOTO 2510
2560 CLEAR:WINDOW SWAP 0,7
2570 PRINT "Filename ?":le=15:l=1:c=12:GOSUB 2340:IF i$="" THEN 2570
2580 OPENIN i$:file=1:DIM text$(201):FOR f=1 TO 201:text$(f)=SPACE$(80):NEXT:f=1
2590 LINE INPUT #9,text$(f):IF EOF=-1 THEN 2610
2600 f=f+1:GOTO 2590
2610 CLOSEIN:WINDOW SWAP 7,0:GOTO 2510
2620 CLEAR:WINDOW SWAP 0,7:SAVE "AMSQUILL 1.0":WINDOW SWAP 7,0:GOTO 2510
2630 KEY DEF 16,1,16,16,16:KEY DEF 65,1,50,34,126:KEY DEF 66,1,252,252,252:KEY D
EF 70,1,253,253,254:KEY DEF 79,1,127,127,127:MODE 2:END
2640 IF file=0 THEN 2510
2650 FOR f=200 TO 1 STEP -1:IF text$(f)=SPACE$(80) THEN NEXT
2660 f=f+1:WINDOW SWAP 0,7:PRINT "Merging first file found on tape":OPENIN ""
2670 LINE INPUT #9,text$(f):IF EOF=-1 OR f=250 THEN 2700
2680 IF EOF=-1 OR f=200 THEN 2700
2690 f=f+1:GOTO 2670
2700 CLOSEIN:WINDOW SWAP 7,0:GOTO 2510
2710 WIDTH 255
2720 CLS #7:PRINT #7,"Starting line ?":le=3:l=24:c=17:GOSUB 2830:i=VAL(u$):IF i<
0 OR i>250 THEN 2720 ELSE s=i
2730 CLS #7:PRINT #7,"Ending line   ?":le=3:l=24:c=17:GOSUB 2830:i=VAL(u$):IF i<
s OR i>200 THEN 2730 ELSE e=i
2740 CLS #7:PRINT #7,"Page length   ?":le=2:l=24:c=17:GOSUB 2830:i=VAL(u$):IF i<
66 THEN 2740 ELSE p=i
2750 CLS #7:PRINT #7,"Copies        ?":le=2:l=24:c=17:GOSUB 2830:i=VAL(u$):IF i<
1 THEN 2750 ELSE o=i
2760 CLS #7:PRINT #7,"Please wait while printing text file.":PRINT #8,CHR$(27)CH
R$(64);CHR$(27)"C"CHR$(p);
2770 FOR j=1 TO o:FOR f=s TO e:FOR h=80 TO 1 STEP -1:IF MID$(text$(f),h,1)=CHR$(
32) THEN NEXT
2780 FOR g=1 TO h:a$=MID$(text$(f),g,1):IF a$>CHR$(127) THEN 2920
2790 PRINT #8,a$;:NEXT:PRINT #8,CHR$(13);:NEXT:NEXT:GOTO 2510
2800 CLS #7:PRINT #7,"Background colour ?":le=2:l=24:c=21:GOSUB 2830:i=VAL(u$):I
F i<0 OR i>26 THEN 2800
2810 a=-1:CLS #7:PRINT #7,"Foreground colour ?":le=2:l=24:c=21:GOSUB 2830:a=VAL(
u$):IF a<0 OR a>26 OR a=i THEN 2810
2820 BORDER i:INK 0,i:INK 1,a:GOTO 2510
2830 u$="":POKE 46311,0:FOR g=1 TO le+2:LOCATE c,l:PRINT "_"
2840 a$="":WHILE a$="":a$=INKEY$:WEND
2850 IF a$=CHR$(13) THEN 2910
2860 IF a$=CHR$(232) THEN 2890
2870 IF g=le+1 OR a$>CHR$(57) OR a$<CHR$(48) THEN 2840
2880 LOCATE c,l:PRINT a$;"_":c=c+1:u$=u$+a$:NEXT
```




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```
2890 IF g=1 THEN 2840
2900 LOCATE c-1,1:PRINT "_ ":g=g-1:c=c-1:u$=LEFT$(u$,g-1):GOTO 2840
2910 LOCATE c,1:PRINT " ":RETURN
2920 IF a$=CHR$(170) THEN a$=" ":GOTO 2790
2930 IF a$=CHR$(135) THEN PRINT #8," "CHR$(27)"W"CHR$(1);:GOTO 2790
2940 IF a$=CHR$(136) THEN PRINT #8,CHR$(27)"W"CHR$(0);
2950 IF a$=CHR$(134) THEN PRINT #8," "CHR$(15);:GOTO 2790
2960 IF a$=CHR$(137) THEN PRINT #8,CHR$(18);
2970 IF a$=CHR$(133) THEN PRINT #8," "CHR$(27)"-"CHR$(1);:GOTO 2790
2980 IF a$=CHR$(138) THEN PRINT #8,CHR$(27)"-"CHR$(0);
2990 IF a$=CHR$(132) THEN PRINT #8,CHR$(27)"4";
3000 IF a$=CHR$(139) THEN PRINT #8,CHR$(27)"5";
3010 IF a$=CHR$(131) THEN PRINT #8,CHR$(27)"E";
3020 IF a$=CHR$(140) THEN PRINT #8,CHR$(27)"F";
3030 IF a$=CHR$(130) THEN PRINT #8,CHR$(27)"G";
3040 IF a$=CHR$(141) THEN PRINT #8,CHR$(27)"H";
3050 IF a$=CHR$(129) THEN PRINT #8," "CHR$(27)"M";:GOTO 2790
3060 IF a$=CHR$(142) THEN PRINT #8,CHR$(27)"P";
3070 IF a$=CHR$(128) THEN PRINT #8,CHR$(27)"p"CHR$(1);
3080 IF a$=CHR$(143) THEN PRINT #8,CHR$(27)"p"CHR$(0);
3090 IF a$=CHR$(144) THEN PRINT #8,CHR$(12);
3100 a$=" ":GOTO 2790
```

```
10 REM
20 REM      Amsquill Edit
30 REM
40 REM (C)1985 Justin Moffitt
50 REM
90 REM Reset the Caps Lock Key
100 KEY DEF 70,1,0,0,0
110 SPEED WRITE 1
120 REM Make Up Screen Display
130 MODE 1:INK 0,13:INK 1,26:BORDER 13:PAPER 0:PEN 1
140 LOCATE 14,2:PRINT CHR$(150)STRING$(12,CHR$(154))CHR$(156):LOCATE 14,3:PRINT
CHR$(149)"AMSQUILL 1.0"CHR$(149):LOCATE 14,4:PRINT CHR$(147)STRING$(12,CHR$(154)
)CHR$(153)
150 LOCATE 1,12:PRINT "1"STRING$(16,".")"Load ASCII program file":PRINT "2"STRIN
G$(13,".")"Load Amsquill program file"
160 LOCATE 1,24:PRINT SPACE$(11)"Press key (1 or 2)"SPACE$(11):CLEAR:a$="":WHILE
 a$<>"1" AND a$<>"2":a$=INKEY$:WEND
170 ON VAL(a$) GOTO 190,320
180 REM Load ASCII file
190 WINDOW 1,40,24,24:CLS:l=1:c=12:le=15:PRINT "Filename ?":GOSUB 430:IF i$="" T
HEN 190
200 f=1:OPENIN i$
210 DIM text$(200)
220 IF EOF=-1 OR f=200 THEN GOTO 290
230 LINE INPUT #9,a$
240 IF LEN(a$)=79 THEN text$(f)=a$+CHR$(170):f=f+1:GOTO 220
250 IF LEN(a$)>79 THEN 270
260 a$=a$+CHR$(170)+SPACE$(79-LEN(a$)):text$(f)=a$:f=f+1:GOTO 220
270 text$(f)=MID$(a$,1,80):a$=MID$(a$,81)
280 f=f+1:GOTO 240
290 CLOSEIN:OPENOUT i$:FOR g=1 TO f-1:PRINT #9,text$(g):NEXT:CLOSEOUT:WINDOW 1,4
0,1,25
300 GOTO 160
310 REM Load Amsquill file
320 WINDOW 1,40,24,24:CLS:DIM b$(200):DIM text$(200)
330 l=1:c=12:le=15:PRINT "Filename ?":GOSUB 430:IF i$="" THEN 330 ELSE a$=""
340 OPENIN i$
350 FOR f=1 TO 200:IF EOF=-1 THEN 370
360 LINE INPUT #9,text$(f):NEXT
370 CLOSEOUT:f=f+1
380 FOR g=1 TO f
390 FOR h=1 TO 80:IF MID$(text$(g),h,1)=CHR$(170) THEN 410 ELSE NEXT
400 a$=a$+text$(g):g=g+1:IF g=f+1 THEN 420 ELSE GOTO 390
410 a$=a$+MID$(text$(g),1,h-1):b$(g)=a$:a$="":NEXT
420 OPENOUT i$:FOR f=1 TO 200:PRINT #9,b$(f):NEXT:CLOSEOUT:WINDOW 1,40,1,25:GOTO
 130
430 REM Input filename
440 i$="":POKE 46311,0:POKE 46312,255:FOR g=1 TO le+2:LOCATE c,l:PRINT "_"
450 a$="":WHILE a$="":a$=INKEY$:WEND
460 IF a$=CHR$(13) THEN 540
470 IF a$=CHR$(127) THEN 520
480 IF g=le+1 THEN 450
490 IF a$>CHR$(126) THEN 450
500 IF a$<CHR$(32) THEN 450
510 LOCATE c,l:PRINT a$;"_":c=c+1:i$=i$+a$:NEXT g
520 IF g=1 THEN 450
530 LOCATE c-1,l:PRINT "_ ":g=g-1:c=c-1:i$=LEFT$(i$,g-1):GOTO 450
540 LOCATE c,l:PRINT " ":RETURN
```

APC is interested in programs written in any of the major programming languages for all home and small business micros. When submitting programs please include a cassette or disk version of your program, brief but comprehensive documentation and a listing on plain white paper — typed if you have no printer. Please ensure that the software itself, the documentation and the listing are all marked with your name, address, program title, machine (along with any minimum requirements) and — if possible — a daytime phone number. All programs should be fully debugged and your own original, unpublished work. We prefer to receive programs with a maximum 80-column width printed in emphasised typeface. Please keep a copy of everything. Programs are paid for at the rate of $20 per page of published listing. Send your contributions to APC programs, 77 Glenhuntly Road, Elwood, Victoria 3184.

A grandmaster plays blindfold against a strong West German computer program. The contest is observed by Kevin O'Connell.

I once had to describe to someone who knew nothing at all about computers, but a great deal about chess, how a computer 'sees' a position on the board. I used the analogy of the human master playing a game blindfold. Exhibitions of blindfold play are very rare, especially by players of the first rank. However, the challenger to the world title, Garry Kasparov, recently gave a display of blindfold simultaneous play against nine very strong West German players and the strongest West German computer program.

Without sight of any chessboard, Kasparov crashed through the opposition, scoring eight wins and two draws. In case you think that is no great achievement, just try playing one game without a board and set and see how long it is before you lose track of the position of all the pieces.

White: Kasparov. Balck: Mephisto. Opening: Spanish Opening

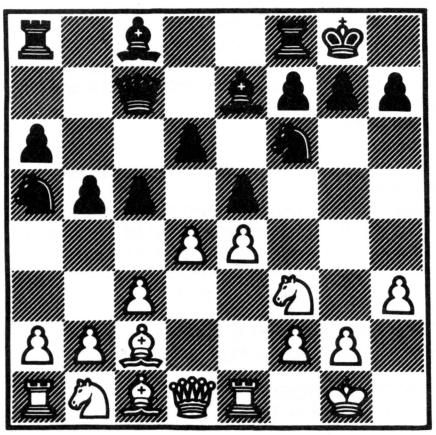
1	e2–e4	e7–e5
2	Ng1–f3	Nb8–c6
3	Bf1–b5	

(This is the Spanish Opening, invented by the Iberian cleric Ruy Lopez in the 16th century.)

3	. . .	a7–a6
4	Bb5–a4	Ng8–f6
5	0–0	Bf8–e7

(Black cannot win a pawn with 5 . . . Nf6xe4 (the Open Variation) — White can regain the pawn comfortably with 6 Rfl–e1 or 6 Qd1–e2 or 6 d2-d4 b7–b5 7 Ba4–b3 d7–d5 8 d4xe5 (the main line).)

6	Rf1–e1	b7–b5
7	Ba4–b3	d7–d6
8	c2–c3	0–0



A variation of Closed Spanish

9	h2–h3	

(The starting point for the main variation of the Closed Spanish.)

9	. . .	Nc6–a5
10	Bb3–c2	c7–c5
11	d2–d4	Qd8–c7

(This position has been seen in master level play many thousands of times.)

12	d4–d5	

(This, however, is a rarity, but an excellent move to play against a computer, as it guarantees that the centre will remain closed and that it will be extremely difficult for Black to formulate a plan, while White mounts a steady and progressive attack on the king-side. Because of the points I have just mentioned, allied with the provenance of this opening, players sometimes refer to these variations as 'The Spanish Inquisition'.)

12	. . .	Bc8–d7
13	b2–b3	Qc7–b6

(13 . . . Na5–b7 14 c3–c4 b5–b4 was played by a human, the Yugoslav grandmaster Matanovic, against Kasparov in a tournament at Banja Luka in 1979. Matanovic drew that game, but Kasparov is now a much stronger player than he was six years ago and Mephisto is nowhere near as good as Matanovic.)

14	Nb1–d2	Rf8–c8
15	Nd2–f1	

(This knight manoeuvre is always an important part of White's plan in this line — it is headed for g3 and then f5.)

15	. . .	h7–h6
16	Bc1–e3	Qb6–d8
17	Qd1–d2	Nf6–h7
18	Nf1–g3	Ra8–b8

(All Black's pieces are developed, but what can they do? Where is the plan?)

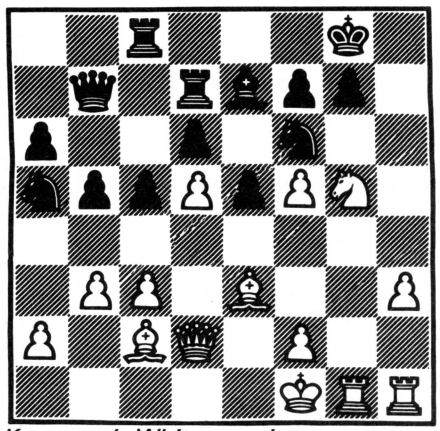
19	Ng3–f5	Bd7xf5
20	e4xf5	Nh7–f6
21	g2–g4	

(The commencement of the type of pawn storm that has been seen on countless occasions in this opening.)

21	. . .	Nf6–h7
22	Kg1–g2	

(It is very easy to formulate a plan for White here — move the rooks to h1 and g1, get the king out of the way and charge forward with the king-side pawns. Of course it is even easier when you are one of the two best players in the world. Black's plan? — to survive!)

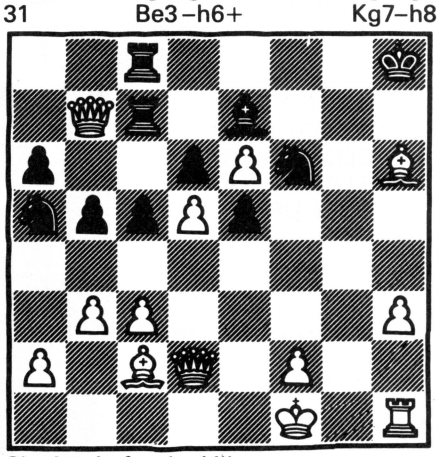
22	. . .	Rb8–b7
23	Re1–h1	Nh7–f6
24	Ra1–g1	Qd8–b6
25	Kg2–f1	Rb7–d7
26	g4–g5	h6xg5
27	Nf3xg5	Qb6–b7



Kasparov's White army!

(Now Black has a lot of pieces on the queen-side, but Kasparov has his entire army pointing at Black's king.)

28	Ng5–e6!	f7xe6
29	f5xe6	Rd7–c7
30	Rg1xg7+!	Kg8xg7
31	Be3–h6+	Kg7–h8



Closing in for the kill

32	Bh6–g7+!!	

(Now Black will have a vast amount of extra material, but the next world champion has all he needs.)

32	. . .	Kh8xg7

(If 32 . . . Kh8–g8 then 33 Qd2–h6 and mate next move.)

33	Qd2–g5+	Kg7–f8
34	Qg5–h6+	Kf8–e8
35	Bc2–g6+	Ke8–d8
36	Qh6–h8+	Black resigns

(It is mate in two moves: 36. . .Be7 –f8 37 Qh8xf8+ Nf6–e8 38 Qf8xe8.)

BENCHMARKS

A list of Benchmarks used when evaluating micros is given below. An explanation can be found in the February '84 issue.

```
100 REM Benchmark 1
110 PRINT "S"
120 FOR K=1 TO 1000
130 NEXT K
140 PRINT "E"
150 END
```

```
100 REM Benchmark 2
110 PRINT "S"
120 K=0
130 K=K+1
140 IF K<1000 THEN 130
150 PRINT "E"
160 END
```

```
100 REM Benchmark 3
110 PRINT "S"
120 K=0
130 K=K+1
140 A=K/K*K+K-K
150 IF K <1000 THEN 130
160 PRINT "E"
170 END
```

```
100 REM Benchmark 4
110 PRINT "S"
120 K=0
130 K=K+1
140 A=K/2*3+4-5
150 K<1000 THEN 130
160 PRINT "E"
170 END
```

```
100 REM Benchmark 5
110 PRINT "S"
120 K=0
130 K=K+1
140 A=K/2*3+4-5
150 GOSUB 190
160 IF K<1000 THEN 130
170 PRINT "E"
180 END
190 RETURN
```

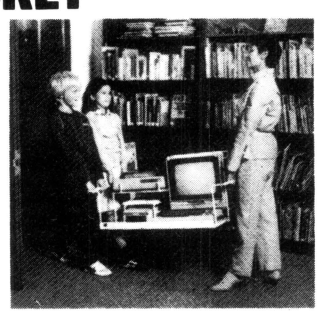
```
100 REM Benchmark 6
110 PRINT "S"
120 K=0
130 DIM M(5)
140 K=K+1
150 A=K/2*3+4-5
160 GOSUB220
170 FORL=1 TO 5
180 NEXTL
190 IF K<1000 THEN 140
200 PRINT "E"
210 END
220 RETURN
```

```
100 REM Benchmark 7
110 PRINT "S"
120 K=0
130 DIM M(5)
140 K=K+1
150 A=K/2*3+4-5
160 GOSUB 230
170 FOR L=1 TO 5
180 M(L)=A
190 NEXTL
200 If K<1000 THEN 140
210 PRINT "E"
220 END
230 RETURN
```

```
100 REM Benchmark 8
110 PRINT "S"
120 K=0
130 K=K+1
140 A=K^2
150 B=LOG(K)
160 C=SIN(K)
170 IF K<1000 THEN 130
180 PRINT "E"
190 END
```

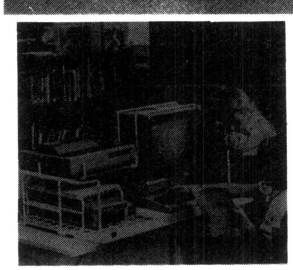

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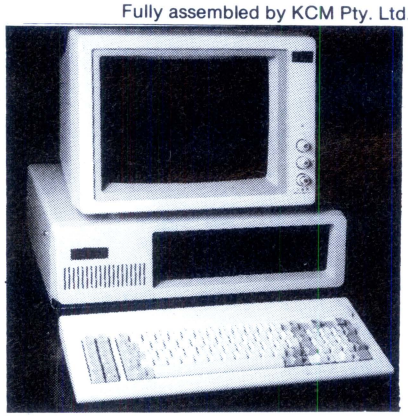
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Assuming no coins are cut, what is the least number of coins that there must have been. (Note that a triangular array contains 1, 3, 6, 10, 15, and so on, coins, a square array contains 1, 4, 9, 16, and so on).

Solutions on post cards only (not backs of envelopes) to *APC* Prize Puzzle, December Lazing Around, *Australian Personal Computer*, 2nd floor, 215 Clarence Street, Sydney 2000. Entries to arrive not later than 20 December 1985.

September Prize Puzzle

There was a fairly good response to the 'roll of cloth' problem — over fifty entries received.

The required solution was that the roll of cloth was 2531 inches — or 70 yards 11 inches long.

The winning entry came from D Cook of Shepparton, Victoria. Congratulations Mr Cook.

Quickie

Suppose we take the word 'QUICKIE' and sort its characters into alphabetical sequence, we would get 'CEIIKQU'. If we did the same with the word 'LAZING' we would get the character string 'AGILNZ'.

Suppose we could make a character string, in this manner from every word in the standard dictionary. It would certainly make a useful anagram dictionary. If we then sorted all the character strings into alphabetical sequence, clearly, the first entry in the resulting list would be 'A' (the indefinite article). What would be the second? And what would be the last?

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CHIP CHAT

Idiot-proof: perhaps Apple is going too far in its efforts to make its products easy to use. For example, if you wait too long before feeding your original into the LaserWriter, the beast springs into action on its own. It prints out a nice document telling you how to feed it. Step one, wait for the yellow light; step two, insert your paper; step three, 'repeat steps one and two until your document is completed'. Step 4, throw this instruction sheet in the bin?

Beady Reds: two managers at one of the few Russian factories making micros are reported to have written in anger to a national paper. The cause of that anger? Only that their accountants are still doing their calculations on an abacus.

What a carry-on! Apparently British software house Micro Arts software, was almost completely ignored' by the computer press when SCUM Manifesto, Carry On Computing, Data, and Minimal were first launched.

We've now seen it (it's now available on Prestel, the poms' copy of Viatel) and can see why it was ignored. We can't make head nor tail of it.

There is apparently a text generation program. We got a story about how a cow forced a woman 'to bend over and put her head into a bucket of boiling water, and hold it there until thoroughly boiled — the husband was then made to add a string of pork sausages . . .' all under the title of 'COW BOILS HEAD'.

Text Engine + Word Banks (runs on 48k Spectrum) 'produces streams of poetry or text from sets of words and sentence structures held in the Word Banks'.

We'll ask Martin (Word) Banks to do an intelligent column on it. We're off to boil our heads.

Memo from Marketing

To: Sales Manager, Banana Personal Computers (Sales) Pty Ltd
Re: New thrust into corporate markets, and so on

As confidential as you can get

Well, yes, it's all very fine for you to get up onto the chairman's knee, figuratively speaking thank God, and talk the poor old soul into backing a direct sales force.

The cost in Commodore and jacket-hangers for the rear windows of same is bad enough, but let that pass. The old man has been a car buff since Mercedes and Benz were boys, so that was bound to go through on the nod.

But selling to the Top 1000, assuming that that is some Murdoch-style list of cash-rich corporations? Do you realise what your brand-new, Brut-sodden sales force is going to find when it carries its luxurious Slither-tex attache case over the threshold? At least three crew-cutted IBM clones ensconced in reception, all spec sheets and co-respondent shoes, queuing up to give the board the sales pitch. And behind them in the queue will be the freshly-polished Compaq salesmen, not to mention the sharkskin suits and fedoras of the Olivetti heavies, all aiming at department heads that the IBM boys couldn't be bothered to devour.

There may even be some poor sod from the local Apricot dealer trying to talk the receptionist into a lift pass and pretending that the Magnum under his arm is a computer, honestly.

And all of them, as far as the direct sales pecking order goes, could wood-pecker your YTS graduates deep into the parquet.

You, me, the world and his wife, and even the chairman in his lucid intervals know that the chinless yuppies on the boards and the power-crazed mainframe milkers in the DP departments of our. 'leaner, fitter, great companies' would not touch our machines with the proverbial. The same cast of characters knows that the BPC line is faster, has prettier pictures on the screen, and runs IBM PC software that IBM hasn't even heard of. Or so, at least, those loonies in R&D inform me.

So why aren't the money-men in their thousands swarming all over us with eyeballs and cheque books akimbo? Honestly, mate, only the terminally naive would even bring up that question at a board meeting — and that the chairman did just proves that our share price has nothing to do with business acumen. What these big-company bozos require is a nice, simple checksheet from the same IBM salesman who has been doorstepping them for the last mine months, spectacles gleaming in the corporate floodlights. You know the kind of thing: Please leave one mainframe (large), three of those office automation system thingies (batteries included), forty-eight type-writers (various), and perhaps a couple of dozen of those personal computer things (networked).

The DP manager just ticks the boxes, the chairman's hand is lifted limply to place his thumbprint on the dotted line, and the form is stuck in a milk bottle outside HQ. Next thing, the whole damn shooting match is an IBM closed shop and another little red flag goes into IBM's battle map.

Now, fighting IBM at its own game — particularly when it is throwing PCs in with its office systems, and making the milk-bottle scenario easier by putting the clapped out things in the same division as typewriters — is a fast route to the knacker's.

So, although the pain may be intense, we have to stick with those hundreds of price-cutting cowboys you appointed as dealers last year, and hope they can stay awake long enough to con the small businessman into sticking a BPC on his blotter, next to the bailiff's letters and the well-thumbed copy of the Sun with the hard words underlined.

It's hard, God knows, to depend on this simian crew for our BMWs this year, but the Cavalier Armada would have us all back on Tebbit's two wheels before the quarter is out.

Will you be at the boadroom cocktail soiree? Before the chairman's ambulance comes to take him home, we must discuss this further.

Yours on four wheels, just.
James

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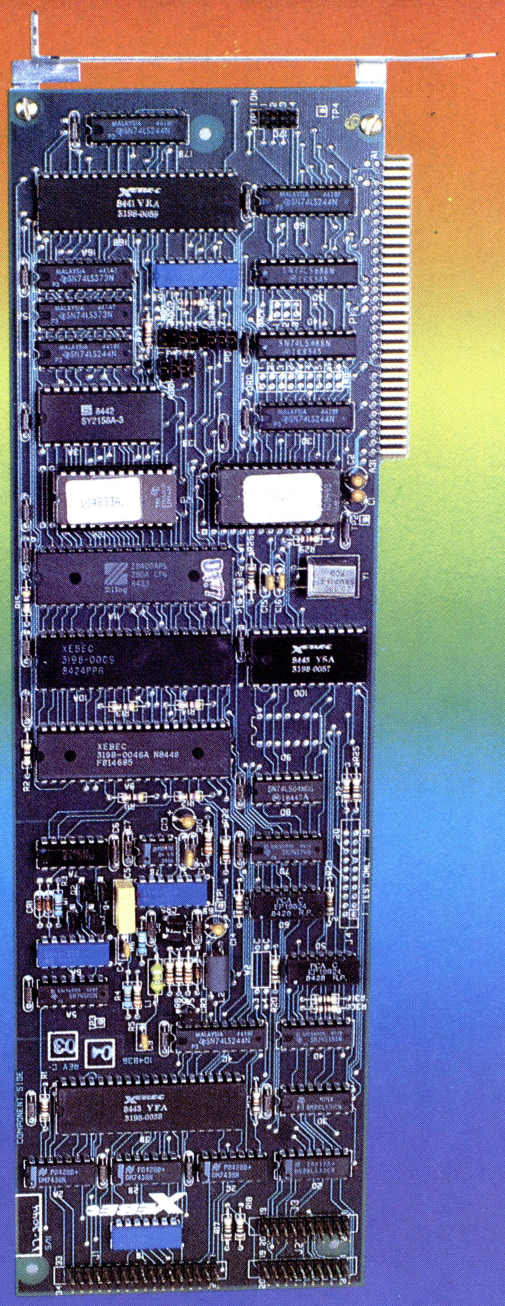
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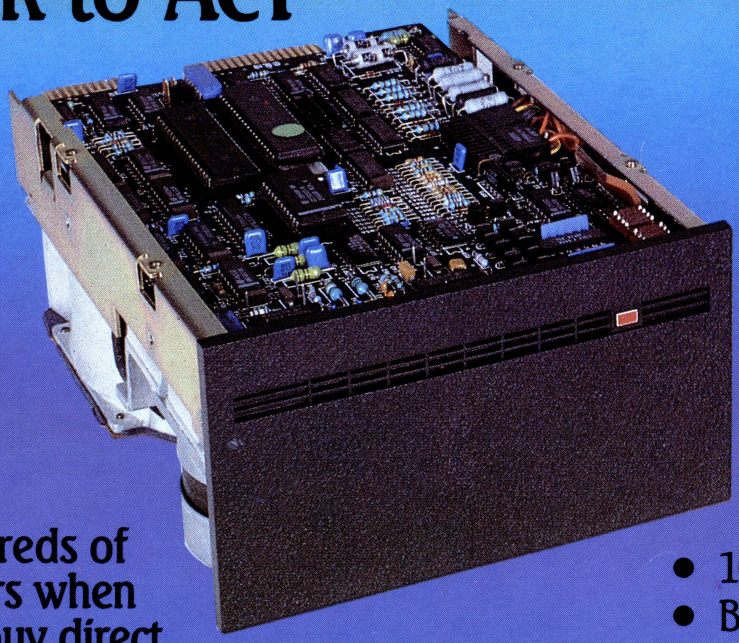
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