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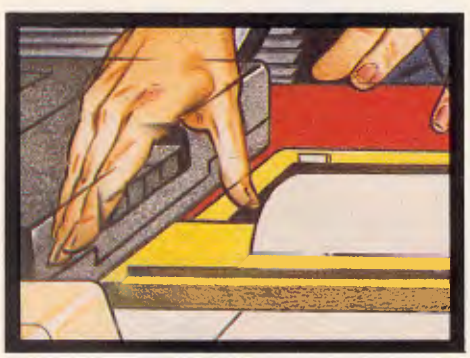

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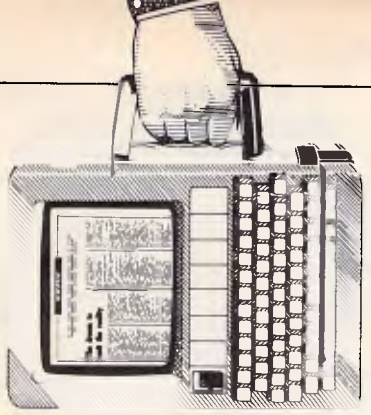

Sun, sea, French cuisine, a conference here and there: sounds great, doesn't it? Not so. In this month's news round-up, Guy Kewney reports on his visit to Comdex Europe in Nice.

Not a Nice town

The idea of holding Comdex Europe on the French Mediterranean, combined with an International Business Software conference, in sunny June, sounded so good, I expected that Comdex Europe might, after all, become an exhibition worth travelling to.

The way I looked at it, Nice was a popular (but possibly expensive) resort which businessmen would gladly seek an excuse to visit. And the software conference would attract new exhibitors, new visitors, and therefore the show would have lots of delegates, paying lots of money, and making the exhibitors happier than they were when Comdex Europe was held in the winter in Amsterdam.

You can tell I'd never been to Nice before.

I didn't like Nice within half an hour of landing, but an 85 Franc (roughly $20) taxi fare for a three kilometre journey wasn't all.

There was the fact that it proved virtually impossible to get a taxi from the exhibition centre once you were there.

There was the 'reception' organised by the 'depute-Maire' of Nice, where we were invited for 6.30, and were not permitted to have a drink, even of plain water, until 7.15, when this official finally deigned to show up.

There were the vice girls, or 'filles de luxe', who accosted you in the evening with promises of sexual bliss for 'Mille Francs'.

There was the blatant exploitationism of the locals, who viewed you with all the sympathy and understanding of a vulture for a carcass, and stripped you of money with the same kindness that a mugger shows to the victim. As one American delegate said sadly: 'After paying $125 per head for a meal in France, the one thing you should expect is good cooking, not just a rip-off.'

I'll spare you the details of my own eating experience, with attendant medical expenses, because the symptoms are still too fresh in my own mind for me to want to write about them. Suffice to say that I only had one meal during three days in Nice.

Some of the locals seemed to be under the impression that organised crime ran the town. Organised crime is welcome to it, because, judged by the quality of the exhibition, I am under no temptation to return.

The show, as you must have guessed from the amount of space devoted to the travelogue, was not much to write home about.

Before it started, the organisers promised 10,000 visitors. In writing. They also promised that IBM would participate.

IBM did participate — in the software conference, by sending two executives. They weren't the executives specified in the programme — no, they (possibly afraid of Gaddafi) stayed at home, and sent their flunkies. Nice, well-informed, interesting guys, of course. And after the show, the 10,000 turned out to be a 'typographical error' and 4000 people turned up 'as we said.'

Exhibitors weren't impressed. The man from Tallgrass said: 'Typographical errors don't get transmitted down voice calls, and that figure (10,000) was what we were told to expect. We know, because we told them that 4000 would be a total disaster.'

The fact of the matter is that an 'international' computer conference in Europe is a dream. There is no 'pan-European' market, there are no 'supra-national' suppliers, and even the biggest European shows are really for the benefit of the local market.

Hannover Fair is enormous, but the visitors are German. Scicob is vast, almost as big as Hannover in some places, but the visitors are French. And Compec is pretty big, in London, and the UK computer industry is what buys the tickets there. It's held in London, after all, and in English. What do you expect?

I chaired two sessions at the software conference. One featured an IBM senior executive talking about

In nightmares, people have suggested a magic computer keyboard to me, where it doesn't say 'qwerty', and so on, but every key has its own, computer-generated legend on it. At the touch of a bug, they all change.

This keyboard is that nightmare come to life. Every keycap has a little LCD embedded in it, and the computer can tell it what it should look like.

My own computers do such horrible things to ordinary keyboards that I dare not imagine what they'd do to these innocent liquid crystals. It's only available in Asia, thank goodness, but would anybody who buys one, let me know how long it is before your system reports a 'write-protect error' addressing the keyboard.

Guy Kewney

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network strategies, and attracted a huge audience of over 40 people. The other featured five database designers and distributors talking about profitable ways of selling software, and attracted 15 people. I'm told the average session attracted seven people, and one session chairman confessed to having delivered his prepared paper to an audience of two — the translators.

I left Sheldon Adelson, the owner of Interface, cornered by three heavy-looking gentlemen in the exhibition building. They were urging him to pay extra for the office facilities in the building, extra for the restaurant, extra for the lounges, extra for the security, and so on.

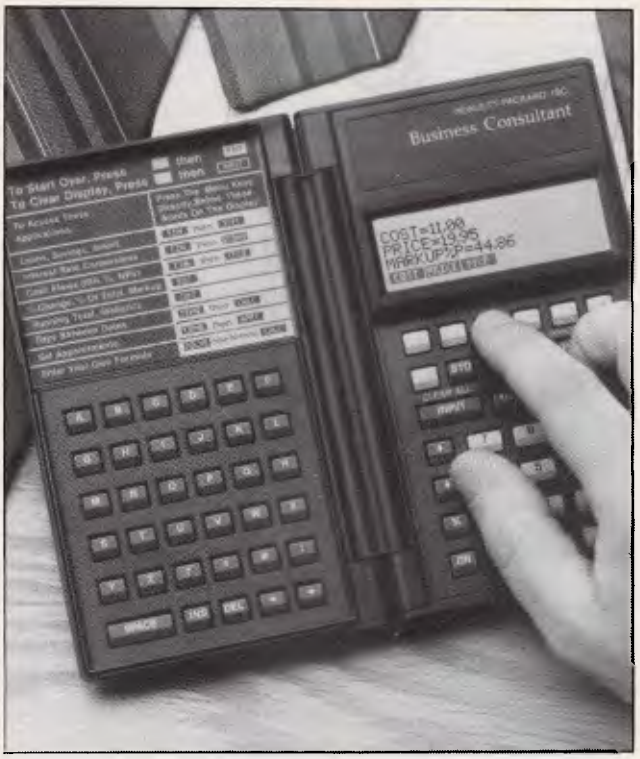
Adelson has dealt with people of this stripe before. 'Tell them,' he said, 'that I'm putting Nice on the international trade show venue of Europe. I'll make Nice the Las Vegas of Europe. I'll bring the big industries — shipping, skiing, golfing —all of them, to Nice. I'll bring the big buyers of Europe.' And he said to the press, later, that next year's show was already booked up.

If Interface Group organises another Comdex Europe in Nice, feel free to go, with the excuse of the show, in order to enjoy what Nice has to offer.

That, I suppose, might be possible. If you are into gambling, there are casinos, and Monaco is an hour's drive away. There must be some entertainment, but since my hotel distributed a guide to Paris, not Nice, it's hard to be sure. I certainly didn't see any big signs saying 'Frank Sinatra Live!' or 'Tom Jones Sings!' the way you do in Las Vegas, where Comdex has its successful venue each year. But then I did spend two days in bed with hypodermic needles attached . . .

On second thoughts, let's be honest. If Interface Group does organise another Comdex Europe in Nice, my candid advice is: don't go. There isn't even any sand on the beach.

Guy Kewney



For people who find Polish notation or Boolean albebra beyond comprehension, Hewlett-Packard has just released the Business Consultant — the first in a new line of calculators capable of solving user-defined equations without the need for programming.

The calculator, aimed at the business professional, has a simplified user interface, algebraic data entry and built-in programs for finance, general business, statistics, summing and number lists, mathematics and time/appointments.

A new feature incorporated into the calculator is the formula solver capability which uses the calculator's menus and soft (variable function) keys to solve user-created equations.

Users may enter equations in words such as "profit= (price — variable costs) x units — fixed cost" using alphabetic keys. Then, using the numeric keys to type in the known values, users can solve any variable in the equation.

The Business Consultant has 1.2k RAM, 64k ROM, separate alphabetic and numeric keyboards and 4x23 LCD display. It is powered by three N-cell alkaline batteries.

A cordless battery-powered thermal HP printer will also be available later this year, which communicates with the calculator via an infra-red light beam.

Eight application booklets are available which provide instruction and application ideas. Called the Consultant Series, they are available for direct sales, business finance, marketing, manufacturing, small business, personal investment, real estate and banking applications.

The Business Consultant is expected to retail for approximately $362 and the printer is expected to cost approximately $1700.

For further details telephone (02) 888 4444.

A cure for A Mess DOS

I think I have a cure for anybody who believes in Father Christmas, fairies, or Star Wars. Just spend a week learning the basic commands for the DOS for the IBM PC. Apart from the fact that you'll be cured of your credulity, you will be very angry. Mucking about with A Mess DOS like MS-DOS makes you very, very angry.

The simple truth is that MS-DOS is a program, and probably not a lot worse than many a program we have to load into our machines from time to time. It has bugs, it does things which aren't explained, and the manual says it does things which it doesn't do.

But from the operating system, we expect rather better.

One reason I have no hope for Digital Research's GEM mouse is simple — the essential program we call A Mess DOS, sabotages it.

You can try to protect the user from the operating system by building what programmers call a 'shell' around it. It takes your commands and feeds them through to MS-DOS. GEM is such a shell. Xtree, Dosamatic, and so on, all try to do the same thing.

The trouble is, whenever things go wrong, A Mess DOS kills the shell! Which is, of course, exactly when you really need the shell.

I've spent a couple of weeks playing with DOS shells. What a mess! Every time you do something you shouldn't (which is what beginners are doing all the time) the whole thing falls to pieces.

And it is, God help us all, Microsoft's own programs which cause most of the misery. Microsoft, which

wrote A Mess DOS, screws it up more often than anybody else.

Xitan's imported shell, Xtree, lets you look at the disk from a nice, logical viewpoint, and sort it out. It even lets you run programs on the disk: you just type the letter X, and it suddenly shows you that filename as if you'd typed it in yourself. Highlight FORMAT, for example, type X, and there it is, FORMAT, just waiting for you to hit RETURN. I did.

'Strike any key to format c:' said the machine.

I turned the power off. I try not to be a wimp but there are some experiments I'm just not brave enough to try; formatting all 10Mbytes of programs and data on my hard disk — which is what happens when you format c: — is something along those lines. And I admit that pressing Control-Alt-Delete might *not* be 'any key' and *might* have worked by restarting the computer; but I still wasn't going to try. Try it and tell me, if you like. If it formats your hard disk, I'll report the fact to other readers and you can feel virtuous. Me, I turned the power off. What can I tell you? That I lost two hours' worth of typing which I hadn't saved? Why should you care?

I found another Microsoft program buried in the Windows directory. It was called something blatantly self-explanatory, like ST or PQ. I wonder what that does, I thought, and executed it.

It logged onto drive A and spun the disk for a bit, then told me that there was an error.

Abort, Retry, Ignore?

There certainly was an error — there was no disk in drive A. Why should there be? But until I put a disk (any disk) in drive A, the system wouldn't abort. It kept trying to read drive A and asking whether I wanted to abort.

Oh, and as soon as you get the Abort Retry Ignore message, the shell is dead. It's non re-entrant.

Look, I'm not a raw, ignorant beginner. I've been using MS-DOS for a couple of years. I even know how to delete a directory.

The latest DOS (PC-DOS) manual actually tells you how to do this. It has an index, which says Directory, remove. I suspect most beginners are still looking for Directory, delete, or Directory, erase, and feeling stupid.

The command is RD, or RMDIR, and if you know that, you can find it in most A Mess DOS manuals.

For example, in the Olivetti M24 MS-DOS *User Guide*, if you look under Commands, you will find DEL. There is no index, so I have no idea why you might look under DEL if you were a beginner.

Let us assume you did, because you enjoy reading manuals, and have got to Chapter Six, page 34. The previous pages, naturally, you have memorised.

There, on page 34, you will be told the DEL pathname. Pathname, it says, is 'the specification of the file(s) to be deleted (excluding the drive to delete files in the default drive, excluding the directory path to delete file(s) in the current directory).'

Even I can tell that there's a simple proofreading error there. Whether the beginner would spot it, I wonder. The language is reminiscent of the worst of medical insurance claim forms, whereby the above-mentioned (hereinafter referred to as omitted) claimant (but not as in section 3.2.2, par 5.1) may (providing agreement is reached as laid down in the Act, section 6, see below) . . .

The thing goes on like this for two pages, recommending helpful tricks like 'alternatively, enter a path ending in a directory'. Of course, you understand this instinctively.

Finally, it adds:

'Remarks — to delete an actual directory (as opposed to all the files that a directory contains) you must use the RMDIR command.'

The manual has no index. That appears to be the only reference in the whole book to RMDIR. And it doesn't mention the fact that if you use RMDIR on a directory, it won't work! Firstly, you have to delete all the files in the directory.

Now, the manual for A Mess DOS is full of helpful hints. You can, it keeps telling you, create a file by using the COPY command. Just type COPY CON FRED, end with control-Z, and you've created a file.

Well, yes, very useful it is, too. I do it all the time. And with this method, I have also created files and discovered they don't exist. No explanation, they just don't exist.

What has happened is simple: I've tried to COPY CON FRED when there already is a directory called FRED. You can't create a file called FRED when there's a directory called FRED.

Show me, in any A Mess DOS manual, where it says this. And then show me how I find the place. And finally, show me where the computer itself, the operating system, when running, tells me it doesn't work.

No, it doesn't tell me. On the contrary, it says it has worked. You copy CON FRED, and after your control-z nothing happens. Then you have the wit to type RETURN, and it bursts into life, and says '1 file(s) copied.'

Gosh, you think, I'm clever to type RETURN.

It lies. FRED the directory exists, but FRED the file is

In the year since Digital Research discovered that faults on the 80286 chip (the one in the IBM AT) had sabotaged its wonderful Concurrent DOS operating system, the world has changed again, and everybody is doing extended memory in a horrible, convoluted manner called EMS.

Concurrent DOS XM uses the full 16Mbytes of memory which the 80286 can address. Microsoft DOS only addresses 640k, with the option of EMS to feed data slowly in and out of the other 15Mbytes.

But today's Concurrent has to live with this new standard because an awful lot of people have installed it. So, it allows you to use 8Mbytes and supports Lotus Intel Microsoft EMS (extended memory system), too.

Complex? A nightmare? Yes. Worth it?

It's hard to say, until we have a chance to try it out for a few weeks and compare it with DOS. But the picture shows somebody running Lotus 1-2-3, dBaseIII and a system status monitor in concurrent, separate windows.

Guy Kewney

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C&MA MBS 0023/R

a figment of the disk controller's imagination. TYPE FRED and you'll be told 'File not found.'

My various copies of A Mess DOS have told me on occasions:

'Write protect error writing to device PRN' — on the printer. The printer is device PRN. And I've been faced with a completely dead computer at least once a week, with various machines and various versions of A Mess DOS, simply because the DOS has decided that drive A is an illegal drive, or write-protected, or full, or illegal interrupt, or just beep.

Sober, no-nonsense computer scientists are writing to newspapers these days, and saying: 'Even if Star Wars is only 95 per cent effective, it's worth going ahead with it.'

This is fantasy. The idea of Star Wars is to make nuclear war impossible. If the Enemy can't launch missiles, we don't have to have any ourselves, and disarmament can follow.

But, and forgive me if I'm being simple: surely if the Enemy can get five per cent of his missiles through, all Star Wars does is guarantee that the Enemy is going to build 20 times as many missiles . . .?

You may say it's just a feeble attempt at humour to suggest that the main control computers are going to send a directive to the laser satellite, and the satellite is going to say 'File not found' — but I'm afraid it isn't funny.

There's a difference between the software for A Mess DOS and the stuff which will be written for Star Wars. The difference is that A Mess DOS is very, very much more reliable than Star Wars software will be.

Just think: A Mess DOS is now up to version 3.2. It has been tested daily by users — millions of users — for over four years, and yet even today, it still doesn't do what the manual says it does.

How many test runs are we going to give Star Wars? Sorry? Oh, we're going to simulate it, are we? On what? Computers? What kind of computers?

I'm sure the answer is on the disk somewhere, if only I could remember what filename I gave it.

Guy Kewney

Apricot losses

The UK computer manufacturer, Apricot, has lost all its glorious machines, 180 of its staff, and £15m in the last financial year. The staff losses now are reaching embarrassing levels for a 'successful' computer company, and Apricot's pretensions to being a serious contender in world terms are now, I'm afraid, exposed for the absurd posturing they always were.

The company has launched an IBM-compatible, the Xen1, which is expensive. Apricot reckons it is 10 per cent below IBM's prices, all things considered.

The company has written off all the F series micros, and wrote off the Portable last year. Now it is ending the bread-and-butter range, the Xi, and hopes to sell off most of its sticks by the end of September.

That market, Apricot says, 'has become a commodity market.' Instead, the company is going to go into business systems.

There's an American company, Altos, which has done pretty well in the space between the micro market and the mini market, selling 80286-chip machines with Xenix operating systems and multiple users.

Apricot obviously reckons this is a good idea. It has a multi-user Xen, which is 'faster than IBM's AT' and includes a few new facilities. It now has an IBM-sized 5¼in disk, instead of the 3½in disk which Apricot has always promoted as the way of the future, and which IBM has put on its lap-held portable, the Convertible.

Can Apricot really, and truly, suddenly become big, profitable and powerful by moving up-market?

Here's my own opinion: the immediate effect of the new machine is to render the old Xen obsolete. Theoretically, there is still a market for the old Apricot-compatible Xen, but only for a couple of months, as people stock up on their extra machines: 'I have four Apricot Xi machines and I need another one for the sales manager,' and so on.

At the moment, people wanting an AT machine can go to pretty reputable suppliers like Tandon (distributed in this country, incidentally, by the same firm as Apricot), Kaypro, Zenith, Olivetti, and so on, and buy a very similar sounding machine to the Apricot. Or they can go to less reputable sounding organisations like Hoki-Koki Computers, Control-Alt-Deli, Can-Can Computers, and a similarly named 'cheap and cheerful' group of suppliers of Far Eastern clones. These people charge less than half the price of the Apricot Xen. Some of them take themselves very seriously; others regard their business as a vast entertainment.

But who can honestly say that buying from Apricot, now, is a safer option? Prove it. 'Well, you ought to bear

Novatech Controls has released MetraByte's new COM-485 board which aldlows IBM PC, PC/XT, PC/AT and compatibles to be networked over the RS-485 bus. Unlike the RS-422 bus which allows multiple receivers but only a isngle transmitter on a bus, the RS-485 allows multiple transmitters and receivers to operate over a 2-wire bus, thus allowing a 'party-line' network to be created.

Novatech claim the COM-485 allows up to 32 different driver/receiver stations to communicate at 56 kilo Baud (though standard IBM communications software limits the speed to 19.2 kilo baud these limitations, according to Novatech, are easily overcome).

The COM-485 can be set up as a COM1: or COM2: standard serial interface port, or can be set at any other base address/interrupt level combination. A single write to the base address + 7 (hex 3FF at COM1: or hex 2FF at COM2:) controls the enabling/disabling of the transmitter and receiver section of the board. The board is based on the industry standard 8250 peripheral interface adapter chip.

The COM-485 board retails for $411.

For further information contact Novatech Controls (03) 645 2377 or (02) 758 1122.

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· Most of the above graphics from PrintMaster and Art Gallery I.

Printers supported on the IBM PC version:
Blue Chip; Citizen MSP-10, and MSP-20; C.Itoh Prowriter 8510, and Prowriter Jr.; Data Products SPG 8010-2, 8012, 8021, 8022, 8051, 8052, 8071 and 8072; EPSON FX, JX, LX, RX, LQ-1500, and MX with Graftrax; HP Think Jet; IBM Color Dot Matrix, Compact Thermal, Graphics Printer and ProPrinter; IDS Prism; Mannesmann Tally MT 85 and 86; NEC P2/P3 Pinwriter, 8023A and 8027; MPI Sprinter; Okidata 82A/83A with Okigraph 1, 84 (Step II), 92, 93, 182, 183, 192, 193, and Okimate 10 and 20; Panasonic KX-P 1090, 1091, 1092, and EP-1505; Star Gemini 10 and 15; Tandy CGP 220, DMP 105, 130, 200, 400 420, 430, 500, 2100, 2100P and 2200; TI 855; Toshiba 1340, 1350, 1351 and P351; Smith Corona D300.

Printers supported on the Apple version:
Apple Imagewriter and Scribe; C Itoh Prowriter 8510; EPSON FX-80/100, RX-80/100, and MX-80 with Graftrax; Okidata 92 and 93; Star Gemini 10 and 15; Grappler +.

Printers supported on the Atari version:
C.Itoh Prowriter 8510; EPSON FX, RX, LQ-1500, and MX with Graftrax; IBM Graphics Printer; Okidata 82A/83A with Okigraph 1, 84 (Step II), 92 and 93; Star Gemini 10 and 15; Toshiba 1340, 1350, 1351, and P351.

Printers supported on the Commodore version:
C. Itoh Prowriter 8510 and Prowriter Jr.; Commodore VIC-1525 and MPS-801/803; EPSDN FX, RX, and MX with Graftrax; Okidata 92, 93, 192 and Okimate 10; Star Gemini 10 and 15.

Printers supported on the CP/M version:
C.Itoh Prowriter 8510 and Prowriter Jr.; EPSON FX, RX, LQ-1500, and MX with Graftrax; IBM Graphics Printer; Okidata 82/83A with Okigraph 1, 92 and 93; Star Gemini 10 and 15; Tandy DMP 105, 130, 430, 2100, 2100P, and 2200; Toshiba 1340, 1350, 1351, and P351.

Comparison Chart

Programs / Features	PrintMaster	The Print Shop Apple Commodore	The Print Shop IBM
Mixing fonts on one page	✓	NO	NO
Upper and lower case	✓	NO	✓
Preview of Design layout	✓	NO	✓
Calendar	✓	NO	NO
Hercules card (IBM only)	✓	NO	NO

Prices and Availability

IBM-PC	Print Master	$84.95
IBM-PC	Art Gallery I	$49.95
IBM-JX	Print Master	$89.95
IBM-JX	Art Gallery	$54.95
Apple II/IIe/IIc	Print Master	$59.95
Apple II/IIe/IIe	Art Gallery I	$45.00
Commodore 64/128	Print Master	$49.95
Commodore 64/128	Art Gallery I	$39.95
CP/M	Print Master	$49.95
CP/M	Art Gallery	$39.95
Atari-ST	Print Master	$59.95
Atari-ST	Art Gallery	$49.95

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in mind that we still have £5.6 million in the bank,' said the manging director, Brian Androlia. 'It's not the end of the world, you know, we're still a stable company.'

I think that from having attempted to be number two to IBM, Apricot has decided to be number two to Altos. I don't rate its chances of hurting other people in that market, even though it's hoping to get a machine based on the super-powerful Intel 80386 chip.

For a start, Apricot has never really impressed me with its ability to build a better machine, given the same technology, as its rivals. On paper, yes. In practice, the Apricots have always been slower, and the company has always refused to acknowledge the problem.

Some UK analysts have predicted that there will be further cuts at Apricot before the end of the year. No information available to me suggests that they are wrong.

Guy Kewney

If it works, it could be useful

The problem with most communications packages is that it's very hard to suddenly stop them in midtalk and dip into your word processor, or read disk directories, or whatever.

A RAM-resident 'pop-up' package has been launched by Lattice to meet this requirement.

With products like Cross-Talk, of course, it's pretty easy to issue the command 'RUN' and get into a DOS shell. This looks as though you have a naked computer, and you can do DIR, and COPY, and even run other programs. But once you are running something else, you can't just pop back into Cross-Talk — you have to close down the second program, get back to DOS, and type EXIT.

Lattice is better known for its languages: its C compiler is the accepted standard in the micro industry.

Its comms program is something of an innovation, costs around $260 and is called Side-Talk. Fagan Microprocessor Systems, Australian distributor of Lattice products, has no details on a likely availability date. Anxious readers could call Lattice directly in the States on (312) 858 7950.

Guy Kewney

Tip for the top

Ben Rosen, venerable American financial guru, has done wonders for his greying image by investing so much time and money peddling the Paradox database around the world. It seems, after all, that the database is succeeding.

Ben Rosen is a partner in a financial consultancy called Sevin Rosen, and his previous triumphs were the launch of Compaq (fastest ever into Fortune 500 lists) and Lotus (biggest software publisher in the world). 'Ah, but that was years ago,' his detractors said.

So Ben found Ansa software, and showed all his contacts around the world what wonderful stuff it was, and now, he says, it is 'on its way to becoming the next major software company.'

Rosen's detractors in the US are a bitter lot. I've been told of companies who hoped to get mentioned in his newsletter (he's since sold it) and who claim that the interview included a request for founding shareholding. And certainly, when he ran the newsletter, he was always going to be vulnerable to that type of accusation — of favouring companies he owned with better newsletter coverage.

Now Ansa is turning over sums of $1m per month and more, and Softsel (a giant American distributor) has it in the top ten of software sales, in its 'Hot List'.

Guy Kewney

Brand X

ComputerLand Corporation, obviously not content with selling IBM PCs, has introduced its own private label modular computer system that can assume either IBM PC/XT or IBM PC/AT compatible configurations, with the choice of customised options.

The ComputerLand Business Computing System (BCS), the first PC to bear the ComputerLand name, will be available exclusively through the ComputerLand network and is expected in Australia later this year.

Designed and procured through its subsidiary private label supplier, GreatWest Technology Ltd, the basic system module consists of the usual chassis, power supply and a keyboard. But ComputerLand can fit the BCS with either an Intel 8088-2 dual speed processor or an Intel 80286-2 processor.

The BC88 Business Computer System including the chassis, keyboard, and power supply is expected to retail at $US1495. The suggested retail price for the comparable BC286 Business Computing System is $US2895. The final selling price will depend on what mass storage devices and monitor the end user decides to include with the system.

"This computer has been designed to be both affordable and flexible," said ComputerLand President, Ken Waters. "But, the system won't compete on price alone. Because the ComputerLand BCS can be adapted or extended to meet a customer's present and future needs, it offers price

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flexibility and price performance," he added.

dBase Mac

America's ninth largest software house has recognised the following being amassed by the Apple Macintosh and are about to release a Macintosh version of the world's leading database.

Ashton Tate, the author of dBase II, dBase III and dBase III Plus, is set to announce dBase Mac in September as the first of two products currently being developed for the serious Macintosh user. The release of a Macintosh variety of the world's leading PC database application would appear to signify the ever-growing market the Macintosh is attracting and the importance with which its steady introduction in business environments is being viewed.

Ashton Tate is also developing a high powered spreadsheet application with business graphics and database in an attempt to challenge the grip Microsoft has on the market with its Excel. Ashton Tate's 'Glass' is planned for release in the second quarter of the 1987 financial year and is believed to follow the established mouse interface of existing Macintosh software.

dBase Mac is believed to also follow the standard Macintosh user interface and be a completely menu driven application capable of reading and transferring both ASCII and IBM dBase files.

Despite the recent appointment of Keith van Klink as managing director of its Australian operation, Ashton Tate is not planning to commence direct marketing in Australia as it does in the US. In what can only be seen as a serious assault on a traditional Microsoft stronghold, Ashton Tate has appointed Imagineering as the Australian distributor of dBase Mac.

The appointment of Australia's largest and most successful PC software distribution company is a direct snub to Software Corporation of Australia (SCA) whose shares have recently tumbled from its floating price of $0.20 to a record low of $0.06 each.

An Ashton Tate spokesperson said the company had selected Imagineering for dBase Mac as it "wanted to ensure the product was handled by a company with the strength and resources to ensure it obtained and kept a high profile. Imagineering has proved itself to be extremely aggressive in the marketing of products in Australia and we feel that it is the best positioned company to ensure the success of dBase Mac."

Ashton Tate also said dBase Mac was aimed at the business market and provided developers with an in-built advanced programming language.

END

'Yes . . . but, apart from your score of 29, 111, 083, 276, on "Alien Attack", what other qualifications have you?'

Bondwell 8

The race of the portables continues. This latest entry places the emphasis on price/performance. Ian Davies takes a look.

There's no doubt about it, the age of the truly portable computer is upon us. The whole thing started with Adam Osborne and the spate of 'luggables' which followed. Credit where credit's due — the luggables were a far easier way of moving a machine between office and home than the traditional 'three-piece' configuration. Most significantly, you could lug out to the car with computer and briefcase in a single trip, with a far smaller risk of the keyboard sliding off the top of the system unit and rolling down the stairs.

Since the first 80 X 25 LCD appeared, many manufacturers have been coming out with ultra-portable MS-DOS machines, most about the size of typewriters or briefcases (July *APC*). Although many of these contain an impressive array of facilities, such as hard disks, they often require a 240 volt supply. Moreover, you end up paying significantly more for the portable which can be misplaced under a pile of papers than you would for an Asian compatible which occupies your entire desk.

Thus there are two factors which seem to be important in an ultra-portable — size and price.

The size issue should not be down played. If you're thinking about an ultra-portable, then somehow you need to justify not buying a (cheaper) desk top machine. Possibly you travel often, have a regular need for computing power in the strangest places, or perhaps you're a believer in the 'electronic office'. Either way, there's a big difference between flipping open your briefcase to reveal much needed computing power to a neuron-bound meeting, and constantly being seen stalking the corridors with what is obviously a computer stuck under your arm. One is cool and froody — the other may indicate a lack of confidence in your own brain.

Like many people, I have a credit card size calculator which I carry in my top pocket. Most of the time I never know it's there. But when the going gets tough, out it comes and makes itself useful. MS-DOS portable machines are gradually attaining the same level of convenience.

As far as cost goes, you can pay more for an ultra-portable than you would for a desk top, often two or three times as much. Unless you know that most of your usage is going to be 'on the road', why pay more for an inferior interface? Let's face it, these machines have small keyboards, little expansion capability, obscure displays, and generally just don't feel like '$4000 worth', as something that occupies your entire desk.

Enter the Bondwell model 8. This is yet another LCD ultra-portable PC, but with two differences. Firstly, it's smaller than most — it can fit in a briefcase with room left over for a banana and a sandwich. Secondly, it's relatively cheap — $2200 for a usable configuration.

Overview

The Bondwell is presented in a typical grey 'clam-shell' case, with the display lifting to reveal a keyboard underneath. Physically, it measures 28.4cm X 7.8cm X 31cm — similar dimensions to the new IBM machine, except 20cm shorter. Weighing in at 5.5kg (12 lbs), the Bondwell doesn't strain the relationship, and is in fact half the weight of the IBM offering.

The unit is battery driven, providing six hours running time between charges, and includes a 3.5in 720k disk drive. This is similar to the IBM machine, except the IBM has two drives. Ports adorn the case in every direction smoothly hidden behind discrete flaps, and I'll be taking a closer look at some of them later. A handle on the rear of the unit can be convinced to fold out, allowing the machine to be carried like a small briefcase.

The display is an optionally back-lit device, giving poor resolution, definition and contrast customary with this type of machine. There is a lot of difference in the LCD displays currently being sold, and the Bondwell is definitely not one of the best. Double the price and you're sure to find several machines with superior displays. However, the display is usable.

One of the most interesting aspects is the narrow viewing angle available. If you attempt to look at the screen above the perpendicular, the entire thing disappears. The same thing happens approximately 45 degrees below perpendicular. The display tilt is adjustable through 180 degrees, although after about 120 degrees, it goes into 'oh-my-gosh-I-think-I've-broken-it' mode. In fact you haven't. It's just a clever simulation, and the display really can be tilted through 180 degrees, even if a little precariously through the last 60.

The keyboard has 76 keys, providing all the necessary IBM PC equivalents. There are 10 function keys and a slightly misplaced ESCape key which run along the top of the board. A cursor diamond in the top right corner provides cursor control, and can be combined with the shift key to produce the 'corner' functions on a normal pad, that is, home, end, page up and page down. Additionally, a second pad is located in the alphabet portion of the keyboard, similar to the old 'Silent-700' approach. This pad can be either a numeric or cursor pad, although I found the keyboard quite usable without recourse to either.

The keyboard is by no means a

The Bondwell 8's keyboard is typically (of lap tops) cramped

standard PC or AT layout, but there's no way it can be given the dimensions. All told, it's a very usable keyboard and the space saving schemes employed seem to work quite well. I still prefer my M24 keyboard, but then it doesn't fit in my briefcase (the keyboard doesn't — the M24 certainly doesn't).

The Bondwell has very few options, and no scope for internal expansion whatsoever. However, it does come pretty much fully configured, with all the ports you might ever need (as well as one or two you probably won't), and 512k of RAM. The RAM is not battery backed when the power is off, although 32 bytes of Real Time Clock memory does retain its contents. It's a pity that Bondwell didn't provide a standby mode so that RAM disks and the like could sit around unmolested, however, experience shows that RAM disks are very bad places to put anything of *any* importance, so maybe they're just saving the users from themselves. If you're really desperate, the RTC battery backed portion is memory mapped up at A0000, and not all 32 bytes are actually used by the RTC, so you might be able to hoard away a few lingering bytes.

Hardware

Getting into the Bondwell is a small challenge. Four obviously placed screws on the bottom of the case are easily removed, after which a great deal of hunting reveals two additional screws secreted behind the carry handle on the rear. With all six screws removed, the case clips apart to unveil a PCB holding all of the components occupying three quarters of the bottom half. The quarter which is not covered by PCB holds the batteries (whose height fills the Bondwell), and a vertically mounted power supply board. This board contains a readily accessible fuse, so that when the inevitable happens, it is a relatively easy job to replace. Compare this with the IBM PC, in which a blown fuse means sending the sealed power supply off to the service centre.

The top half of the case contains the keyboard, power LED, speaker and LCD display. Three all-too-short cables run between the two halves, meaning that it is not really possible to get fully inside without first disconnecting the cables.

The Bondwell model 8 runs an 80C88 processor at 4.77 MHz. This provides about the same performance as a desk top IBM PC, and is the same processor running at the same speed as used in the IBM lap top. The 80C88 is simply a CMOS version of the usual 8088, and thus draws only a fraction of the power. It's a pity Bondwell didn't opt for an 8086 or higher speed 8088, but I guess people with a briefcase full of MS-DOS can't expect desk top performance as well.

The 512k of RAM is implemented through a bank of 16 chips, meaning that the memory is not parity checked. I wonder about the use of parity checked memory anyway. The older micros never used to have parity checking, and we got along just fine. Using a single parity bit, you still stand a 50 per cent chance of missing an error when it occurs. Even if you do get hit by a passing magnetic monopole and the parity checking detects it, generally the machine just crashes anyway. So where's the value in that?

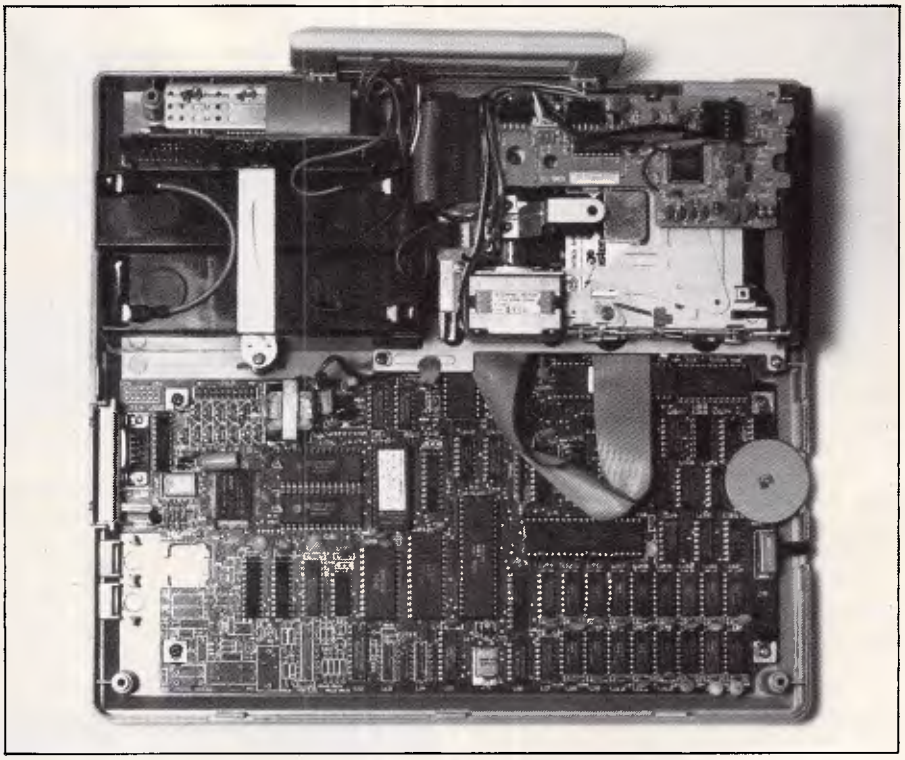
'The display is an optionally back-lit device, giving poor resolution, definition and contrast customary with this type of machine.'

The inevitable speaker is mounted underneath the top of the casing and provides a clear and readily audible tone.

Two Yuasa six volt three amp rechargeable batteries rigged in series provide 12 volts to a 3.5in internal disk drive, and run through a regulator to the circuit board. These batteries provide about six hours of running time (depending on disk usage) before a recharge is required. The regulator has only a very small heat sink, but this seems to be sufficient since the power to the disk bypasses it. Like all rechargeable batteries, these have to be treated correctly, that is, 'exercised' periodically by fully discharging and recharging them. Their capacity can be significantly shortened by leaving them either fully charged or fully discharged for extended periods. A recharge takes about 12 hours through the DC adapter provided, and so fits in well with an average working day. Naturally, it is possible to continue using the machine while the recharge is taking place.

A power light is strategically located on the outside of the case being visible both when the display is shut, and also when the machine is in use. This light starts flashing when the batteries are low, thereby giving ample time to save work and start hunting for an SEC outlet. Bondwell recommends disconnecting the charger as soon as the batteries are full, but as there is no way of actually knowing this, it would be safest to put it on for an overnight charge and simply remember to unplug it in the morning.

Since the charger outputs 13.8 volts DC through a relatively standard jack, the internationally jet-setting computerist should have no trouble finding 110 volt



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plug packs with similar outputs.

Bondwell itself is based in Hong Kong with manufacturing arms in mainland China and an aggressive marketing organisation tackling the entire world, especially America and the UK. Bondwell has been in operation for over 10 years, and is also the name behind the Spectravideo machine. Although the machine is manufactured in Hong Kong, almost all of the components are exclusively Japanese. The processor is fabricated by OKI under licence from Intel, and the display is driven by a rather interesting 100 pin chip by Yamaha with a Microsoft copyright on it. Several of the chips also have Bondwell copyright stickers, one of which is the 8k BIOS ROM. A handful of American chips such as RCA and TI are also included, but these tend to be SSI or MSI — all the big chips are Japanese. There is no space for an 8087 numeric co-processor, but this shouldn't discourage most users, as it seems the majority of 8087s around town simply are not used anyway.

The 3.5in disk drive is produced by Epson, and runs a Mitsubishi controller chip. The drive is shock mounted, although one must wonder how much good shock mounting actually does when the machine takes the 'big fall'. The drive is situated at the rear of the unit, over the circuit board, with the opening to the right hand side. The drive 'in use' light is situated on the drive casing, which means that it is virtually invisible during normal use. The drive includes a low power 'standby' mode, and provides 720k of storage.

The batteries reside next to the drive, also at the rear of the unit. They extend from the bottom right up to the top of the case, thus being the single most bulky component. In fact, the batteries are also responsible for most of the weight, with the disk drive adding a few pounds, and the rest of the machine weighing almost nothing.

The LCD is an 80 X 25 display with a viewing area of 22.4cm X 7cm. It supports the full IBM PC compatible character set and five graphics modes. Full character attributes including flashing and reverse video are provided. The LCD itself is carefully constructed to discourage prying reviewers, so I am not able to tell you anything interesting about it. The LCD is, however, a back-lit 'high contrast' job, like most of the LCDs around at the moment. The back light can be turned on or off, as the mood takes you, and the contrast is variable through a small wheel on the side of the case. I found myself with the contrast permanently on full, as anything else caused the display to just mist away.

The quality of the LCD is not tremendous. Let's face it, none of them are. Its refresh time is really quite good, its character set is fine, and it runs graphics software with no problems. The difficulty is in finding a good viewing angle and then sticking to it. Any deviation from the optimal viewing angle and the display starts to disappear. Even at the optimal viewing angle, it is sometimes possible to lose track of the cursor. You can most definitely find lap tops with better LCD displays, but you may have to pay two or three times as much for them.

The display adapter circuitry supports full colour, with elementary 'gray-scaling' for the LCD. Additionally, the Bondwell provides two ports for external monitors. An RGBI port mounted on the left side offers a standard IBM 9 pin 'D' type connection to a colour or monochrome monitor, with full colour and graphics. Additionally, a NTSC composite port exists — little use in Australia, although some people do have NTSC monitors.

The back-light, which is unnecessary in direct sunlight anyway, must be switched off to prevent interference when running through an RGB monitor.

The LCD panel is connected to the rest of the unit through a normal piece of 20 core ribbon cable. While this may not be as high-tech as folding PCBs, it's probably more reliable, and significantly easier to fix when it finally wears out.

Ports

The Bondwell is pretty much littered with ports. In addition to the two external monitor ports mentioned above, the DC power input and various switches and knobs scattered about, the machine also has a small flap at the rear through which the major interfaces are accessible.

The serial port is implemented through a 82C50A, a CMOS version of the usual 8250s found in IBM PCs. I suspect that it does not generate true RS232C levels, due to the single 12 volt power supply, however, whatever it does generate is sufficient to drive an M24 reliably at 9600 baud. Most devices don't stick religiously to the RS232C voltages, and don't require other devices to either. However, running lower voltages can cause problems. Sendata modems are one of my favorites simply because they run happily on TTL levels, but TTL levels are far from good enough to drive most equipment. To illustrate this, try buying an RS232C adapter for a Commodore 64 and then see how much gear it will actually talk to with any degree of success. Bondwell's voltage range seems quite sufficient.

I ran quite a lot of communications software on the Bondwell and it all seemed fine. In fact, the only nasty thing to be said about the serial port is that it's one of those silly 9 pin things. I know many vendors are now producing 9 pin serial ports, and some have even thought that 15 is a good idea, however, the age old standard is 25 pin. True, only 9 of the 25 are actually used for anything, but that's the standard. Bondwell can supply 9 pin to 25 pin adapters, and many electronics and computer shops also sell them.

A Centronics parallel printer interface

The 3.5in disk drive is accessed from the side

is also provided. While Centronics has always had a fixed standard on the printer end of the cable, the computer end has always been open to interpretation. This stabilised somewhat when IBM decided to use yet another 25 pin 'D' type. Bondwell, however, has gone for a 15 pin 'D' type. Understandable when the rear of the machine is so small, but annoying nevertheless. You may have slightly more trouble finding a 15 pin to Centronics cable, but Bondwell can also supply these. Using a 15 pin to 25 pin adaptor cable into a normal IBM compatible printer cable may cause one or two problems, as most of those adaptors probably do an RS232C conversion, instead of a Centronics conversion. Probably the best bet is to simply buy the right thing from Bondwell. Incidentally, the manual includes pinouts for all of the ports, so you can make your own cables if you want to save a few dollars.

The last of the major interfaces is for an external disk drive. This drive can either be a 5.25in or 3.5in device, and is connected via a 25 pin 'D' type. Once again, another departure from the standards, but hardly one to worry about. The 5.25in drive provides an easy way of loading IBM PC software packages which are not yet available in the 3.5in format.

In the American versions of the machine, Bondwell includes a built-in 300 bps modem. Due to Telecom regulations, this option is not available on the Australian version, and that corner of the board remains unpopulated. This is a real pity, as a built-in modem would mean just sidling up to a telephone socket for that daily transmission back to the office. Without the built-in modem, remote users also have to carry a modem or acoustic coupler, which are not very bulky, but are still another package to worry about. Additionally, since Bondwell does not follow the sometimes used convention of outputting 5 volts through the RS-232C port (no spare pins), the remote user must also carry a power supply for the modem. Since the Bondwell has no expansion slots, it is not possible to insert your own internal modem.

Software

The Bondwell 8 comes complete with a single 3.5in MS-DOS diskette. This contains MS-DOS 2.11 plus a few utilities.

The MS-DOS is full featured, including the linker and GW-Basic. Interestingly, the Microsoft Macro Assembler is also on the disk, although no documentation

comes with it.

A set-up utility provides a full-screen interface to the Mode command for RS-232C port configuration and screen modes.

Additionally, a communications facility called Modem8 is supplied. This is a rather rough and ready menu-based dumb terminal emulator with file transfer capability. The file transfer uses the Ward Christensen protocol, for which I had no matching software on the M24. It also appears to have a bug in transferring files larger than 16k.

In order to move some software between my M24 and the Bondwell, it was necessary to first write two small Basic programs which communicated slowly but surely. This allowed Modem8 to be moved to the M24, so that files could be sent more efficiently between the two machines. It was at this point that the 16k bug in Modem8 appeared, so the same Basic programs (swapped around), were used to transfer Carbon Copy and CrossTalk from the M24 to the Bondwell. With these in place, various bits of software could be moved onto the Bondwell for testing.

Although Modem8 is a nice little give-away, anyone who is planning to do any serious communications or file transfers with this machine should really plan to buy one of the better comms packages, or pick up a copy of PC-Talk off a handy BBS.

The Bondwell finds itself in an interesting position, like many other machines. It is an IBM compatible, but since it uses the new 3.5in disk drive, you cannot automatically run any IBM software on it. True, many software vendors are now producing their products in 3.5in format, and the manual includes a list of these (Lotus, dBase, WordStar, to name a few). Communicating software into a 3.5in format works fine, except for copy protected packages, and except for the games and UCSD P-system software which use their own disk formats. Attaching a 5.25in disk drive to the system is the only reliable way of getting full access to all the IBM software, at least until all the vendors catch up with the new disk format.

Due to the problems mentioned above, it was not possible to test every piece of software available. However, a few well known packages were communicated across and seemed to work well, including graphics.

A RAM disk package is also provided with the MS-DOS. This allows you to take portions of the 512k RAM and use it to emulate a very fast disk. As has been said, the memory is not battery backed, so switching the machine off scrubs the RAM disk. Nevertheless, it is a useful addition and does a great deal to compensate for the single drive and to enhance speed.

In perspective

People contemplating the purchase of a lap top should think carefully about what they want out of the machine.

A lap top is never going to be the same as a desk top. The keyboard is smaller and crowded, the expansion capability is limited (at the best), and the display quality is simply inferior.

The potential lap top owner must then go one of two ways. Either buy a lap top with the best display, the best expansion capability, perhaps even a hard disk — and end up with something that doesn't really fit in a briefcase, probably needs a 240v supply, runs out of expansion ports, will always have a small keyboard and costs a significant amount of money. Alternatively, instead of trying to find one machine which does everything, the purchaser can distinguish between remote and home operations, and purchase the lap top which is cheapest, smallest and lightest.

These things usually come down to price. You can either buy one of the Rolls Royce lap tops, or you can buy a cheap lap top and a cheap desk top for about the same money. Until someone comes up with a full sized desk top computer which can fold up to credit card size for easy transportation, probably the expression "horses for courses" offers good guidance. Of course, all of this depends on what proportion of your computing time is spent on the road and at home or the office.

I suspect that the two machine scenario is going to become more common, and as such, a machine with the cost effectiveness of the Bondwell has got to be a winner. Its value for money is quite exceptional.

Documentation

Three manuals are provided with the Bondwell. One is a GW-Basic manual and, as usual, is a rehash of the standard Microsoft manual. As such, the manual is fine, except that Bondwell chose to adopt one of the machine-generic manuals, and so it has no references to the cursor or editing keys found on the machine. Instead, everything talks about control characters. It's not too hard to sort out, however, just remember that whenever the manual mentions moving the cursor up, simply use the 'up arrow' key.

An MS-DOS manual is supplied, also adopted from Microsoft. This is almost identical to the manual you will find accompanying any number of IBM compatible machines. It has had little, if any, adaptation for the Bondwell machine, but like GW-Basic, needs little.

The third manual is the Bondwell specific user's manual. This has been written entirely by Bondwell and is really quite good. It contains two main sections, the first on installation, including how to switch it on, connect cables, rules to observe with the recharger, and so on.

The second section is exceptionally well done. It describes usage of the machine, including all the common MS-DOS commands and utilities, and in general, would be a fine substitute for the full MS-DOS manual. Everything is

Technical specifications

Processor:	80C88 running at 4.77 MHz
ROM:	8k
RAM:	512k
Mass Storage:	One 3.5in 720k microfloppy
Keyboard:	76 full-stroke keys
Size:	28.4cm X 7.8cm X 31cm
Weight:	5.5kg
I/O:	RS232C serial, Centronics parallel, RGB, NTSC composite, disk expansion
DOS:	MS-DOS 2.11
Peripherals:	Second disk drive, external monitor, recharger.
Power:	12v DC internally with six hours running time, 240v recharger.

well laid out with diagrams and examples, and sections explaining why various facilities exist. Most sections are followed by a 'what to do if something goes wrong' which describes possible errors which might occur, why they happen, and what to do about them. The manual may or may not be a Chinese translation (it probably isn't), but either way, it's certainly not written in 'Chinglish' and reads very well. For the casual user, the GW-Basic and MS-DOS manuals can probably be ignored, as reading the user's manual tells you most things you need to know.

The user's manual also describes the Modem8 communications facility, for what it's worth. A section on the care and feeding of a RAM disk is included, which hopefully will encourage users to make use of one, but not depend upon it.

Always good to see (but all too rare), the user's manual includes several appendices which describe machine specifications, pinouts for all the ports, I/O port and memory addresses of the various devices and controllers, the character set and a glossary.

Conclusion

The Bondwell 8 is definitely not the Rolls Royce of the lap tops. It probably is, however, the VW.

Many lap top owners also have full sized machines either at home or in the office, and balk at the idea of spending more for the lap top than the full system. Many potential lap top owners have been put off for just that reason.

According to Bondwell, its design objective was purely value for money, and in this it seems to succeed, while still at the same time providing a degree of performance. A battery driven back-lit LCD MS-DOS machine with disk drive for $2200 certainly sounds good to me.

END

Benchmarks

BM1	1.4
BM2	5.1
BM3	10.9
BM4	11.2
BM5	12.2
BM6	22.0
BM7	33.4
BM8	35.2
Average	16.4

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

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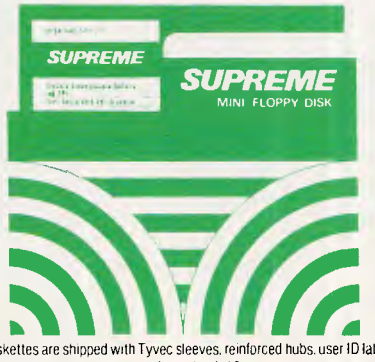

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In this month's American news round-up, David Ahl reports on a Miami Vice-style raid on Comdex, and Data General's new lap-held.

Comdex raid

In a raid similar to a well-coordinated drug bust by the Miami Vice Squad, six investigators from the Federal Communications Commission swooped down onto the show floor of Spring Comdex and slapped labels on computer products that failed to meet federal radio frequency emissions requirements. Over 2500 products were tagged during the three days of the show.

The labels effectively bar the sale of uncertified equipment — not just the specific one with the label, but all others like it. FCC officials also provided manufacturers and resellers with information of FCC certification and labelling requirements.

The Comdex raid is just part of a continuing crackdown on firms which manufacture and sell products that are not certified. Last year, the FCC received about 1000 complaints about radio and TV interference which were traced to micros and related peripherals.

To date, most of the FCC's efforts have been aimed at computers sold by mail-order marketers, most of which don't meet the emissions requirements or carry the required sticker. In April, the FCC shut down the manufacturing operations of PC's Limited of Austin, Texas, a company which had accumulated fines of nearly $US10,000. The company claims it changed the design of some of its products and they are now all certified.

The stepped-up enforcement of the FCC isn't expected to have much effect on the market. Certification testing costs $US5000 to $US7000, some of which will probably be passed along to the consumer. However, there is so much competition in the market for PC clones, that prices probably won't go up by more than a few dollars.

Pricey Data General lap-held

The original Data General One lap-held boasted full IBM PC compatibility, a large screen and a price to match. Although sales were disappointing, the vendor introduced an upgraded version with an optional 10Mbyte internal hard disk drive and improved displays.

The original DG/One had a 24-line display that many customers claimed could barely be read. The new system, the DG/One Model 2, base-priced at $US1795, comes with an improved LCD display or, optionally, a 25-line electro-luminescent display for an extra $US1000. Unfortunately, with the ECD display, the batteries require recharging after only two hours of use. The basic machine also has 256k of internal memory and a built-in 3½in floppy disk drive. The optional 10Mbyte hard disk adds $US1200 to the price.

Most serious users will probably want additional memory (640k), an electro-luminescent display, a hard disk and a modem, which brings the price to over $US5000. While the machine is certainly more impressive than the Hewlett-Packard, the Zenith and the IBM lap-held, it seems to me that the price is about $US2000 too high for widespread market acceptance, and the company will have a hard time selling the Model 2 outside of its existing customer base.

Rise in desk-top publishing

Software companies are increasingly entering the burgeoning desk-top publishing market, which has been enhanced by the introduction of low-priced laser printers which work with the IBM PC and compatibles.

Apple Computer is said to have got the field off the ground with its laser printer and Macintosh system which is more graphics orientated than the IBM PC. Although Apple claims to 'own' the market, recent studies suggest that PC-compatible laser printers are selling at more than twice the rate of the Apple unit.

As a result, software companies are rushing into the market with products that work with the PC and one or more laser printers. For example, Bestinfo is developing a desk-top publishing program that will be marketed by Software Publishing Corp, maker of the highly-successful pfs line of software.

Also, Xerox Corp has stated that it will market a PC-compatible desk-top publishing system developed by Ventura Software. Micropro International, maker of the WordStar word processing software, is preparing a desk-top program that will work in conjunction with its other programs. And AB Dick, one of the earliest companies in the duplicating/printing industry, plans to market Imprint, a high-end interactive page composition system for the PC/AT.

Even makers of Macintosh software are racing to get on the PC bandwagon. Aldus Corp, maker of the best-selling Pagemaker pager composition program, is developing a PC-based version. And Manhattan Graphics, maker of the ReadySetGo desk-top publishing system for the Mac, plans to bring out a PC version in early 1987.

The market is thought to be on the verge of enormous growth. Dataquest, a market research firm, projects that sales of Macintosh-based systems will increase from $US8.5 million in 1985 to $US53 million by 1990, whereas IBM PC desk-top systems are projected to increase from $US5.3 million in 1985 to a whopping $US600 million by 1990. Dataquest also estimates that nearly 50 firms will enter the market by the end of 1986.

Random bits

Apple Computer has terminated its long-standing relationship with Chiat Dav Advertising and has switched its account to BBD&O, claiming that the new agency has a better strategic 'feel' for Apple's new direction . . .

Apple will begin beta-testing a new 'open architecture' Macintosh this summer . . . in addition to committing itself to developing MS-DOS capability on its new machines, Apple also plans to develop a Unix-based Macintosh system for the engineering community and government markets . . .

A bill to protect electronic communication against wire-tapping, bugging and unauthorised disclosure has passed a US House of Representatives sub-committee by a unanimous vote and is likely to become law by the end of the year . . . Illinois legislators have proposed an amendment to the state's software licence law that would allow software purchasers to copy or modify a program for non-commercial purposes, as well as transfer ownership of the program. If the amendment passes, it could spur the passage of similar federal legislation . . . Adapso, the computer software and services industry association, has proposed to companies in the software industry that their programs should be warrantied to perform all the functions claimed on the package, in documentation and in advertising. The association proposed that users be allowed sufficient time to discover discrepancies, errors and bugs, and that, if notified, publishers should correct faulty programs or provide a refund . . . Fastest computers on a recent Benchmark test conducted by Arizona State University: the ARC 286 Turbo from American Research Corp, the ALR Dart from Advanced Logic Research, and the Hewlett-Packard Vectra. All three machines beat the PC/AT, the Tandy 3000, the Z-200 and the Epson Equity III.

END

THE MOUNTAIN PEOPLE OF HUNZA AREN'T THE ONLY ONES TO KNOW THE SECRETS OF LONGEVITY.

Somehow, through a strange blending of things like yoghurt, beans, barley, water and rarefied air, the people in the valley of Hunza, high in the Himalayas have found they generally live until they're well into their nineties. Still, no one outside the tribes is quite sure why.

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BANKS' STATEMENT

The great divide

If we are to fully appreciate artificial intelligence, we must learn to see man/machine 'integration' as a logical advancement. Martin Banks explains.

I'm an ardent traditionalist, really. Being a great believer in the idea that humanity shows an illogical desire to invent things simply for the sake of inventing them — in the hope that they might one day prove 'useful', like the hydrogen bomb — I try to avoid some of the excesses of the computer industry.

I'm the type who finds tap dancing more streetwise than rap dancing (and the tunes are a lot more interesting), so it's hardly surprising that I am pleased to see machines like the Amstrad PCW range making a significant impression on things.

Here we are, having come nearly a decade from the days when the first Z80-based computers appeared, running floppy disks and an operating system called CP/M. Ardent technologists have built IBM mainframe processors into single chips, elephantine memories which put all the world in a match box, and applications software which can sing, dance, wreck national economies and play Russian Roulette with strategic missiles, all at the same time.

What, however, is the punter doing? If the sales figures of Amstrad are anything to go by, they are buying large quantities of Z80 machines which run CP/M. The customer, as they say in retailing, knows best.

Given all that, I have to now admit that I have been smitten by something new (or newish, anyway). I am certainly not the first to succumb, but I have come over all emotional about expert systems and artificial intelligence.

There are those who would say that such an interest has come not a second too soon: a goodly dose of the artificial stuff would be more than adequate compensation for my lack of the natural variety. There are also those who suggest that my interest springs from participation in a fairly large conference on artificial intelligence in the south of France.

Actually, that isn't true. For example, I'd forgotten that it was Digital Equipment that took me out there, so that proves it. The most interesting people speaking at the event weren't from DEC, they were from places like MIT (Massachusetts Institute of Technology) where they've invented at least one of anything technical you've ever thought of.

And what was interesting about these people was not the standard kind of techno-flash, gizmo-orientated, 'this-is-what-we're-making-now' presentations one might expect at a high-tech laud and honour bash. Instead, they had things to say which suggested to me that, at last, there might be signs of common ground between computers and humanity.

One of the key issues about artificial intelligence is its name. There seems to be considerable debate as to whether it should be called that, or something like 'applied intelligence' (which is a little more specific and accurate).

Many people favour calling artificial intelligence something completely different and far more indicative of where the subject is going. The words they use are 'knowledge engineering'.

This is a nicely rounded description of what AI is all about, being ambiguous enough to have a variety of interpretations, ranging from engineering knowledge itself through to engineering with knowledge as a tool.

The words also carry with them the hint that the subject is more than just a fancy computer program. The data processing people have had it their way for too long, producing clear-cut, logical solutions to problems that are in reality all bends and squiggles, and usually fairly illogical.

I have always felt that this is why most computer programs don't work that well. Point a clear and logical mind at a real problem, and the result will often only fit where it touches.

Knowledge engineering is about working with, through, and because of, knowledge. It is about doing interesting, constructive, useful and even sometimes profitable things with knowledge.

The AI *cognoscenti* at the conference were saying that the best people at knowledge engineering systems are philosophers, psychologists, neurobiologists and . . . well, virtually anyone who isn't a rigid, unthinking data processing person. That, I suspect, is the proof of which I spoke. Early AI applications are only likely to come from data processors because AI runs on computers, doesn't it? Data processing applications will often be of the 'more efficient bomb' variety.

Knowledge-based systems, if they are to even scratch the surface of their true potential, are going to be about much more than that. Early expert systems are simply capturing the knowledge of specific individuals so that it can be employed by others. This can be laudable in itself, even when the application is something simple like an automated paint-spraying system. But it is a pinprick of what is possible. Capturing the knowledge of experts is only the start, and is only a logical extension of the computer as computer.

The future, however, lies in removing the 'computer' part as much as possible, so that the application becomes far more integrated with the way in which humans work and the way humans are. That is why people such as psychologists and philosophers are becoming so important to the development of AI: it will be through them that such integration between humanity and 'systems' will occur.

It is entirely arguable that the future for humanity is not good. Either we will continue as now and blow ourselves up (quickly in a big one or slowly and in stages), or we will develop entirely logical systems to the point and capability where they realise that humans, as irrational beings, are totally illogical and should be dispensed with. A third alternative is that we can teach the systems to work with us rather than the other way round.

The last thing needed to achieve such a future is a narrow qualification in computer programming.

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Commodore 64C

Commodore's latest release may seem familiar to most, but read on: Kevin Bergin discovers a few differences.

In the fifties there was Rock 'n Roll. The sixties celebrated the Beatles, hippies, 'love n' peace man'. In the seventies, we settled down worked hard and caught up. The eighties saw the advent of micros, and eventually the Commodore 64. Well it looks as if the 64 might see us through the eighties as Commodore unveils its latest package.

No one would have envisaged writing a review on the 64 so many years after its inception, but here it is — another Benchtest on the 64! Having decided to stop production of the 64, Commodore was besieged by requests from dealers for more machines. In turn, it seems the dealers were still passing 64s over the counter in great numbers. This left Commodore with some hard and quick thinking to do and before deciding to restart production of a new model 64.

The new 64 (renamed the 64C) is housed in a slick cream coloured case, in the style of the C128. Gone is the chunky looking dark case; gone also is the familiar logo, to be simply replaced with, 'Commodore 64 Personal Computer'. The keyboard is also a cream colour, but that seems to be where the physical differences of the new and the old 64 end, except for the disk based operating system GEOS. More of that later.

Commodore's abortive attempts to stop production of the popular 64 have highlighted the long standing problem of keeping pace with technology, and still meeting the needs of existing and potential buyers. While the 64C is not in the same league as the 68000-based Amiga and the Apple Macintosh, it probably comes as close as an 8-bit machine can.

To date, Commodore has sold around five million 64s, and that many buyers cannot be wrong. Commodore has taken

the exceptionally brave decision of listening to the end users. The 64 was always a good machine to work on and has found its way into homes, schools and offices around the world and seems that it may well carry on doing just that. With the vast number of 64s already under the finger, and the huge base of software available, it makes sense to keep the 64 in production and to enhance it, rather than dropping the 64 and leaving owners in limbo, in favour of the latest all singing all dancing machine.

It remains to be seen whether the 64C will whip major software houses into

another round of production, and it is also questionable as to whether new avenues are available for 64C software. It should go without saying that existing owners will be pleased with this development and it will probably please those of us who have cursed and nursed the 64 when developing software for it.

Hardware

As mentioned earlier, the casing on the 64C is completely different, looking like a small 128. The keys are all the same and are in exactly the same position as before, with a qwerty keyboard. There are 64 block graphic characters, which can be selected from the keyboard. The graphics symbols are shown on the front of qwerty keys (two to each key), and can be selected using a combination of the Commodore key or shift with the appropriate key. As before, there are five function keys on the right of the case (10 using shift). These can be programmed and, by using them with the Ctrl keys, 15 functions keys can be used.

The numeric keys 0-9 also have other functions. Any one of 16 text colours can be selected from the keyboard, using either Ctrl or the Commodore key (bottom left of the keyboard) and one of the numeric keys in the range 1-8. Reverse video can be turned on and off by using Ctrl-9 and Ctrl-0 respectively. There are a few other keys which are peculiar to the 64 and 64C: they are the Clr Home, Inst Del, Run Stop and Restore keys. All of them are in the same positions on the 64C.

The Clr Home key, when pressed with the shift key held down, will clear the screen and home the cursor. The Inst Del key will delete the character to the left and when used with shift will insert a space. The Run Stop key is used to terminate program execution, or when used with shift, will load and run a program from cassette. Last but not least, the two beloved cursor keys: these are used to move the cursor down, up (with the shift), right and left (with shift). Some of the keys will repeat if held down; they include the space bar, the cursor keys and the Inst Del key.

Ports

Existing 64 owners will be pleased to hear that the ports on the 64C remain exactly as before. Looking from the back of the machine from left to right we find the expansion port, or the cartridge socket. This is used to plug in games or utilities like the Fastload cartridge from Epyx. It is also used to connect some peripherals to the 64C. Next is the channel switch selector for selection of channel 3 or 4. This switch is only present on US models, as it is not required for PAL versions.

The RF modular output jack provides both audio and video signal for usage by a standard television. The RF modulator acts as a small TV station, converting the 64C's video and audio signals into a signal receivable by the TV's antenna.

The video audio socket provides output of sound (SID chip) and video (VIC-II chip) to high quality monitors. Either a Commodore brand or a third party monitor can be used. This socket can also be used to provide output from the SID chip to hi-fi equipment. The serial port is peculiar to Commodore 64Cs and 128s. It is used to connect disk drives or printers and is not compatible with much else. Only one device can be directly connected to the serial port, but devices can be daisy chained (with much care and respect for the I/O chips).

'With the vast number of 64s already under the finger, and the huge base of software available, it makes sense to keep the 64 in production and to enhance it...'

The cassette port is used to drive Commodore's Datassette tape drive. Some other devices use this port to draw power from.

The user port is designed to allow the 64C to communicate with other devices, for example, modems, printers, disk drives or to control electronic equipment.

Turning now to the side panel of the 64C from left to right we find: control ports 1 and 2, which allow the connection of one or two joysticks, paddles or light pens, and perhaps in the near future a mouse. Next to the control ports is the power switch, which is used to bring the 64C to life.

Taking the lid off

The layout inside the 64C is basically the same as before, but there are some differences when the old and battered 64 is used as a comparison. For example the chip count is lower on the 64C. On opening, a large heat shield was discovered (one presumes it acts as a shield), which covers all of the chips in the box and each of the major chips is coated in silicon compound and connected to the shield. The shield is held with four screws and is awkward to remove and replace, but then you will not be taking the lid off, will you?

Some of the chips have been repositioned on the board; all of them have different version numbers from the 1983 board. Another change is that more of the chips are soldered rather than socketed, making them more difficult to remove and replace unless you have the right equipment, or steady hands. The two CIA (Complex Interface Adapter), or 6526 chips, are still present. They are connected to the keyboard (excluding the Run Stop/Restore key combination), joysticks, the cassette read line, the serial port, the 6510 processor and to many of the pins on the user port. Both of these chips are flexible and fairly easy to program.

The processor is the 6510, which is of the 6502 family, but custom made for a number of operations like shadow RAM. The 6510 can address up to 64k of RAM and runs at 2MHz. The 64C contains three ROMs: Basic, Kernal (operating system) and Character ROM.

The VIC-II chip (Video Interface Chip, or 6569), generates the signal for the colour TV; and the SID (Sound Interface Device or 6581) controls the 64C's sound output. The PLA (Programmed Logic Array — 906114), supervises hardware operations within the 64C, including switching off RAM when a ROM cartridge is plugged in and turning off the 6510 at intervals to allow the VIC-II chip to generate the TV picture. All I/O chips in the 64C are memory mapped and therefore easily accessed and controlled.

System software

The operating system on the 64C is functionally identical to its predecessors. The operating system is in ROM as is Basic, so all functions and commands are present at power up. The operating system or Kernal is an 8k ROM and resides in 64C memory from locations 57344 (E000 hexadecimal) to 65535 (FFFF hexadecimal).

The Kernal is responsible for all housekeeping on the 64C. It checks the keyboard, updates the screen, clears RAM on power up, sets up the I/O devices and video display ready for use, sets up various pointers, checks for autostart cartridges in the expansion port and sets up Basic, if no autostart cartridges are found.

The Kernal also sets up and controls the 64C's interrupt vectors, which can be redirected to user routines. There are

many routines in the Kernal that can be called by the user. Direct jumps to routines can be a hazard, as the 64C updates its Kernal ROM frequently and does not guarantee that routines will be kept at the same addresses. Rather, a jump table has been provided through which the user can call Kernal routines. The jump table is always at the same addresses and will therefore provide compatibility with future versions of the Kernal.

Some of the user callable Kernal routines are: Cint (initialise screen editor), Getin (get character from keyboard queue), Load (load RAM from a device), Plot (read/set X,Y cursor position), Ramtas (initialise RAM, allocate tape buffer and set screen address), and Save (save RAM to a device). The list is fairly long and the names given to the routines are Commodore's.

All of the ROMs on the 64C have one very interesting feature. They have underlying RAM. That means that there's an extra 24k of RAM underlying the Kernal, Basic and character ROMs: an extra 24k of RAM as well as the 38k allocated to Basic on power up is available. But don't try to use it yet: caution is needed! There are a number of ways the underlying, or shadow RAM, can be used. The first and simplest one is to use the Basic POKE command to store data 'under' the ROMs. The standard configured 64C places values POKEd into Kernal and Basic ROMs in the underlying RAM. So, a large amount of data can be stored and retrieved from Basic.

However, to use the shadow RAM for programs it is necessary to switch out the overlying ROM. The status of the ROMs is controlled by location 0 and 1. By setting the appropriate bits it is possible to switch out all of the ROMs on the 64. If you are writing in Basic you cannot alter the power up configuration of the ROMs, but writing in Assembler allows you to easily switch out Basic. The other ROMs are a little more tricky, but it is possible to switch them all out. Current 64 games usually take over the machine by using the underlying RAM and switching out all of the ROMs.

Some of the remaining features indirectly connected to the Kernal are: the ability to switch between 40 × 25 text screen, 320 × 200 high resolution, 16 colour combinations, sprites and the SID chip. The 64C allows all of these features to be used individually or together.

GEOS

GEOS (Graphic Environment Operating System), is entirely new to the 64C. It was developed and produced by Berkeley Softworks in California; it is a disk based operating system, which places the user in an Amiga, or more closely a Macintosh, type environment.

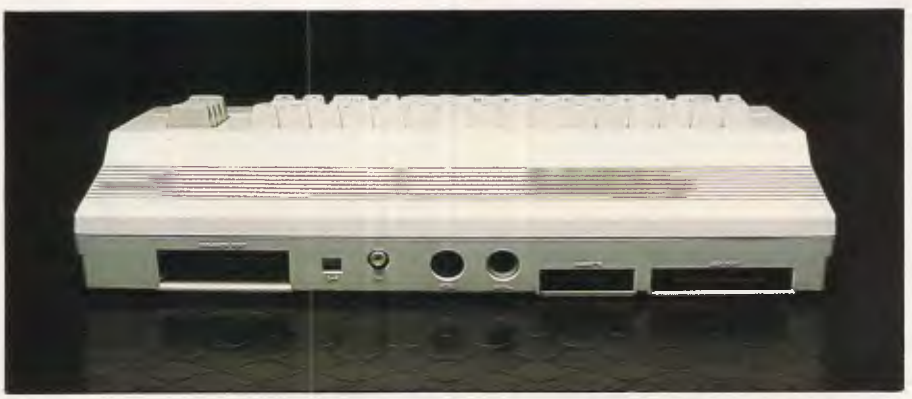
It looks more like a 128 than the work-horse '64

'The idea behind GEOS is to take over the existing operating system, but still allow users to access the resident operating system and for the most part enhance it.'

GEOS will run on all versions of the 64. To do justice to GEOS would require a separate article, but I will cover all of the major points.

The idea behind GEOS is to take over the existing operating system, but still allow users to access the resident operating system and for the most part enhance it. To start GEOS, power up the 64 and load GEOS with the familiar LOAD "*",8,1. Booting GEOS takes a few seconds and the user is then into the desktop. Berkeley stresses that a backup be made of the GEOS master disk, using a routine provided. This is a wise move as GEOS is heavily protected, but the backup procedure is efficient and friendly.

To use GEOS you will of course need a disk drive and a joystick to communicate with GEOS. Berkeley is currently developing other input devices, the first of these will be a mouse driver for Commodore's mouse, and for third party vendor hardware. The core of GEOS is the desktop, from which you can use the pointer to give commands to it GEOS comes bundled with geoWrite, geoPaint and of course the desktop. From the desktop, selection of the preference manager allows the user to select various start up options for GEOS, in much the same style as the Amiga. The time and date can be set allowing the user to keep track of file versions. The



'Round the back is basically unchanged from the original '64

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colours for GEOS can be set as can the acceleration and velocity of the pointer.

The desktop also gives the user access printer options, input options (currently only joystick), note pad, photo manager, text manager, calculator and an alarm clock. All of these options are selected by simply moving the pointer (cursor) to the desired icon and pressing (called clicking) the fire button on the joystick once or twice.

As mentioned earlier, GEOS comes bundled with geoPaint and geoWrite. Berkeley Softworks will be developing further applications to run under GEOS and is encouraging software developers to follow by giving access to all technical details of GEOS. Already three major software houses have started developing or converting existing software to run under GEOS.

GeoPaint is accessed from the desktop and gives the user access to a drawing facility, which allows all users to unleash the graphics power of the 64C. The tools provided with geoPaint include line drawing, solid or outlined circles and rectangles, and painting of patterns with a variety of brushes. There is a zoom mode, a cut and paste option and the usual undo and erase. One spectacular feature of geoPaint is the screen measuring tool, which allows accurate measurement in pixels or inches for the printed document.

The user can move the pointer quickly around the document in one window while a smaller window displays the results on the entire document. These facilities relate closely to Print Shop and to facilities on the Macintosh (and the speed of geoPaint operations is not much short of the Macintosh).

GeoWrite gives the user a word processor with all the facilities of GEOS at hand. Text can be entered in a 'view what you type' mode or a full 80 column mode — the easiest to use is the 40 column mode. All of the fonts offered in GEOS are available in geoWrite (there will be other fonts available, as well as additional printer drivers).

Authors can format their document and flip between each side of the finished document to get a preview. Text may be highlighted and the cut and paste option allows text to be moved around the document. Different pages in geoWrite may be viewed and at any time the user can move to the beginning or the end of the text. Finally geoWrite allows the user to adjust the line spacing and page breaks and to transfer material to other GEOS applications.

GEOS uses the disk drive as virtual RAM which 'extends' the 64C's RAM by 168k. It also allows professionals and hackers alike access to all GEOS routines

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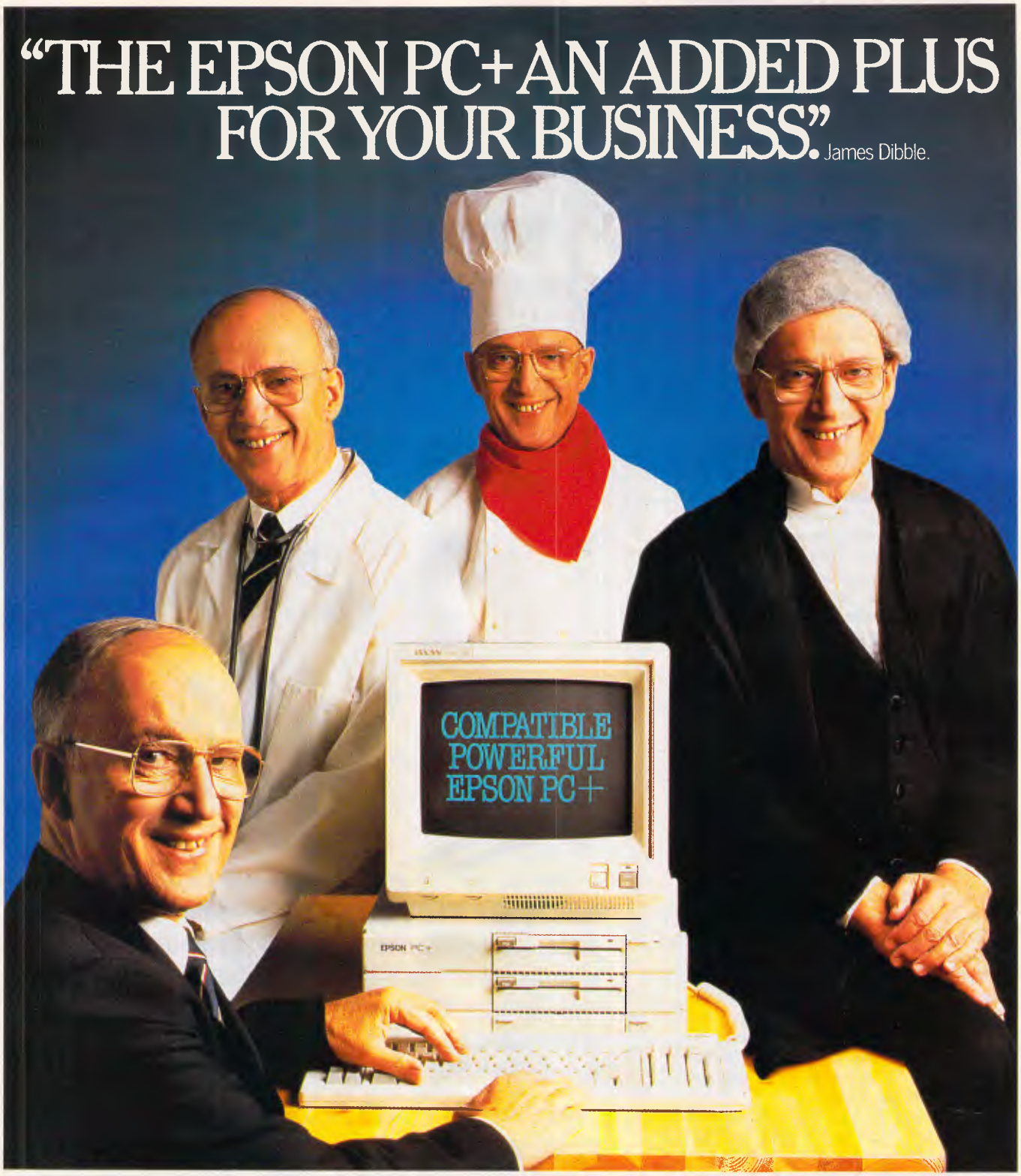

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via a jump table, in the same way as the resident operating system on the 64C does. Berkeley Softworks is currently putting together a developers kit in much the same way that Commodore produced a developers kit for the Amiga.

On the reverse side of the GEOS disk is a communications program called QLINK. It is an American product and it is not clear if the same or a similar program will be on the Australian version of GEOS. Any 64 application, whether or not it is a GEOS product, can be booted from the desktop in GEOS. In fact, if the application is 26k or less in size and does not interfere with address locations 49152 to 49408, GEOS will 'superload' it and will re-boot GEOS when the Restore key is pressed.

Tests were run on a 20k program: using GEOS it took approximately nine seconds to load and, using the 64C routines, it took 54 seconds to load. As a point of interest, it took the Epyx Fastload cartridge 12.9 seconds to load the 20k program. So Berkeley Softworks has certainly developed very good I/O routines.

Applications software

The 64C comes with the resident Commodore Basic V2, which was developed by Microsoft many years ago. There is not a great deal to say about this version of Basic. Most programmers would find it easy if cumbersome to use. For novice programmers, it is not perhaps the perfect starting point, but it does provide the tools and stretches all programmers to get the best out of the 64.

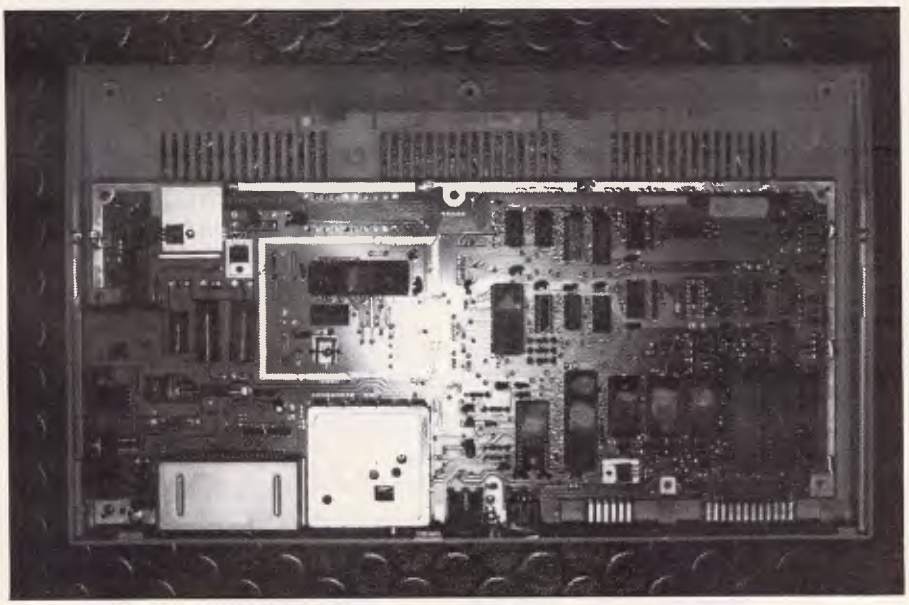
Happily, there is talk of an enhanced version of Basic to compliment GEOS and, for those who cannot wait, there are many packages to enhance and extend Commodore's version of Basic. The old adage, frequently voiced by Jim Butterfield, "Don't knock it if it works", must apply to the 64C Basic. It is exactly as the version of Basic on the standard 64.

There is by now a base of packaged commercial software well into the 100,000 mark for the 64. Obviously not all of these were tested on the 64C or with GEOS, but over 500 business, games and utility programs were tested and all of them worked perfectly on the 64C and under GEOS. Some are even enhanced by the quick loading facilities offered by GEOS. It was a joy to watch Easyscript load in a few seconds. One would not be taking any risks by saying that *all* current 64 software will run on the 64C.

Documentation

The 64C comes with a 188 page manual which covers most aspects for a beginner and has been revised from that supplied with the original 64, but still leaves a lot to be desired. Having said that, Commodore has an excellent Programmers Reference Guide, but if you are not a good programmer you may need an interpreter. Not to worry, as anything Commodore has missed has been covered in the many books available for the 64.

GEOS is a different matter. It comes



The 64C's main board sporting fewer chips than on the original 64.

with a manual that takes the user logically through each step of GEOS and its features. Although the copy used for this review was not in the finished form, it was easy to use and follow. Again however, there is no technical documentation, but that is rumoured to be available soon. Any newcomer to GEOS will probably live inside the manual for some time and it will serve them well. Interestingly, Brian Dougherty, president of Berkeley Softworks, would like to have developed the original 64 operating system in 1982. He has at least had an opportunity to enhance and extend the 64.

Prices

GEOS is bundled with the 64C whether you buy the 64C on its own, or as part of a family pack. GEOS will also be sold separately. The prices have been set but may be subject to change by the time you read this.

The 64C with GEOS will retail at a recommended price of $499 and GEOS will retail as a separate item for between $100 and $120. The prices include documentation and no doubt it will be worthwhile looking out for deals on different packages.

Conclusion

Some say the 64 and the 6502 family of processors are outdated, but looking at the scope and capabilities of the 64C and the way it shapes up in performance and price to some of the current 68000 based machines, it appears to be not so outdated.

With the addition of GEOS it certainly is, and should be, alive and well. It is almost certain to flourish in today's marketplace and no doubt we will see a whole new base of software appear to run under GEOS. The 64C represents good value for money and will continue to service its diverse range of users. What other micro can you buy for $499 that gives you so much? END

Benchmarks

BM1	1.4
BM2	9.2
BM3	18.2
BM4	19.5
BM5	20.8
BM6	31.5
BM7	49.6
BM8	115.2
Average	33.17

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

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Modula-2 compiler

For serious programmers writing large and complex applications, TDI's Modula-2 compiler for the Atari ST is without equal. Gareth Jefferson reports.

Few languages have made more impact upon the computer world in the last 10 years than Pascal, which is claimed to be the most widely used language after Basic. And yet Pascal has failed to make the impact that might have been expected in the 'serious' programming community.

History

The reason for this state of affairs is simple. Pascal was primarily designed as a general-purpose teaching language by Niklaus Wirth, and was conceived as a medium to teach good programming style and methods. It was never really intended to be a commercial programming language and is somewhat deficient in I/O and string-handling capabilities. What it did do, and did extremely well, was instil in a whole generation of student programmers the importance of strict typing, proper declaration and initialisation of variables, and the value of user-definable data structures (which can be of any degree of complexity).

Basic, by comparison, although easy to use for the writing of 'Hello world' and PRINT-the-character-set programs, fails as a professional programming language on several counts. These include the difficulty of breaking down large programs into easily manageable subprograms, the lack of CASE, REPEAT-UNTIL, WHILE-DO and similar control structures, the ease with which GOTOs can obfuscate the flow of the program, the universality of variables (resulting in potentially serious side effects) and the lack of complex data structures such as sets, records, and so on.

Pascal addressed most of these problems and made ugly 'spaghetti programming' anathema to all those who took the trouble to learn it. On the other hand, Pascal, as originally specified by Wirth, has its own short-comings. It has poor I/O, cannot handle strings, cannot link to libraries of subroutines, cannot operate on data at the bit level, and cannot get at or modify specific memory and I/O addresses. Small wonder the programming fraternity prefer C, which can do all of these things! Even dirty old Basic can PEEK and POKE, and actually handles strings rather well.

Modula-2 was developed to program a computer under development at the Institut für Informatik in Zurich at both the high and low levels. Commercially successful versions of Pascal (such as Borland's Turbo Pascal) tried to overcome the limitations of classic Pascal by tacking on extensions at the expense of compatibility with other compilers. Modula-2, however, was designed from the beginning to do everything that Pascal ought to have done.

Since Modula-2 will be new to many readers, I'll begin by summarising Modula-2's features and highlight some of the differences between it and Pascal.

Features of Modula-2

Modula-2 is essentially very similar to Pascal, but with a slightly simpler syntax, low-level facilities to make systems

MODULA.PRG

```
TDI Modula-2/ST     Release 2.00a

Modula-2 Compiler    Version 2.10a
source file : A:\SIEVE.MOD
Import List Processing
Terminal : A:\TERMINAL.SYM
.....................
TextIO : A:\TEXTIO.SYM
.....................................
.....................................
.....................................
..

Declaration Analysis
.....................................
.....................................
.........................

Statement Analysis
.
Expression Analysis
```

Fig 1 Screen messages provide information on the compiler's activity

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programming possible, built-in multi-tasking support and a very important new concept — the module.

Modula-2 allows programs to be split up into small, separate modules that can be individually compiled and shared by other programs.

Modules are of two types: client modules and library modules. Client modules are roughly equivalent to main programs and would normally be quite short and concise. They can *import* constants, types, variables and procedures from library modules. Library modules are able to *port* such facilities to their client modules, but they may also import from other library modules.

In many ways, library modules replace the procedures of a Pascal program by removing the sub-programs to separate files. Library modules contain essential code that can't be dispensed with, but which can so easily obscure the logical flow of a program if incorporated in the main body. Procedures as such are still available and may be used in both client and library modules.

An important part of Wirth's Modula-2 philosophy has been to make the language suitable for the development of large and very large programs. The fact that whole chunks of the program can be hived off, developed by programming teams, individually compiled and independently tested, obviously gives Modula-2 a big advantage over languages that insist on having all the source code in one file.

The way in which library modules are created also helps the team approach. Every library module comes in two parts: a *definition module*, which explains exactly what the library module does, and an *implementation module* which explains how it is done. Definition modules are typically very concise and would normally be written by the chief program designer. The definition module will give the writer of the implementation module all the essentials he/she needs to know in order to write it.

Let's look at how the process works by using an example of what a library module does; and an *implementation module*, which explains the chief programmer, is writing a program called 'Monte Carlo Follies' and will need random numbers in a big way but can't be bothered to write the code, so he says to Smith: 'Write me a library module that will return a random number between zero and a specified maximum value. Here's the definition module . . .'

```
DEFINITION MODULE
  RandomNumbers;
PROCEDURE Random(MaxValue :
  LONGCARD): CARDINAL;
END RandomNumbers.
```

This tells Smith that the library module is called RandomNumbers, and that it contains a function procedure called Random, which takes a maximum value and returns a random number. LONGCARD and CARDINAL are big and regular-sized cardinal numbers. These are just like Pascal's INTEGER (which Modula-2 also has), but they only have positive values.

Smith goes away with this definition and comes back with the actual implementation of the library module:

```
IMPLEMENTATION MODULE
  RandomNumbers;
  CONST
    M = 100000000;
    m1 = 10000;
    b = 31415821;
  VAR seed : LONGCARD;
  PROCEDURE Random(MaxValue :
    LONGCARD) : CARDINAL;
    PROCEDURE Multiply (p, q :
    LONGCARD) : LONGCARD;
    VAR p0, p1, q0, Q1 :
    LONGCARD;
  BEGIN
    p1 := p DIV m1;
    p0 := p MOD m1;
    q1 := q DIV m1;
    q0 := q MOD m1;
    RETURN (((p0*q1 + p1*q0)
    MOD m1) * m1 + p0*q0)
    MOD M;
```

```
MODULE Sieve;


FROM Terminal  IMPORT WriteString, WriteLn, BusyRead;
FROM TextIO    IMPORT ReadCard, WriteCard;

CONST
       Two = 2;
       Maximum = 10000;

VAR
       Sieve : ARRAY [Two..Maximum] OF BOOLEAN;
       left, factor, mult, count, limit : CARDINAL;
       c : CHAR;

BEGIN
       WriteString (" ENTER limit ");
       ReadCard(limit);
       WriteLn;
       count := 0;

          FOR factor := Two TO limit DO
              Sieve[factor] := TRUE;
          END;

          left := limit - Two + 1;
          factor := Two - 1;

        REPEAT
          factor := factor + 1;
          IF Sieve[factor] THEN
            count := count + 1;
            WriteCard(factor,0);
            WriteLn;
              FOR mult := 1 TO limit DIV factor DO
                IF Sieve[factor * mult]
                  THEN Sieve[factor * mult] := FALSE;
                  left := left -1;
              END;
            END;
          END;

        UNTIL left = 0;

       WriteString("The Number of prime numbers up to ");
       WriteCard(limit,0);
       WriteString(" is ");
       WriteCard(count,0);
       WriteLn;
       REPEAT BusyRead(c) UNTIL c =  " ";

END Sieve.
```

Fig 2 A Sieve of Eratosthenes program written in Modula-2

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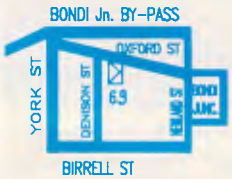

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```
  END Multiply;
  BEGIN
    seed := (Multiply(seed, b) + 1)
    MOD M;
    RETURN CARDINAL(((seed DIV
    m1)
      * MaxValue) DIV m1);
  END Random;
  END RandomNumbers.
```

These can then be compiled and tested with a very simple calling program. If everything works, the RandomNumbers library module can be used by any program requiring random numbers — be it a weather system simulation, an arcade game or a statistics package.

Very little from these examples will look at all unfamiliar to the Pascal programmer. Differences from Pascal include the comment delimiters. They must be delimited (* thus *); the (curly bracket) option of Pascal is not available as Modula-2 uses curly brackets to specify set members, as in:

```
  CONST
    MonthHasThirtyDays =
      SetOfMonths {Apr, Jun,
      Spt, Nov}
```

Another important difference between the two languages highlighted by the above example is Modula-2's case sensitivity.

Most implementations of Pascal are not case-sensitive, so the identifiers DAYOFWEEK, DayOfWeek, dayofweek and Dayofweek would all be equivalent. Modula-2 is always case-sensitive, and no provision is available in the language specification for a compiler directive to de-sensitise it.

In Modula-2 you could, if you wished, have a program with four completely distinct variables called NUMBEROFPUPILS, Numberofpupils, numberofpupils and NumberOfPupils. This hardly aids program clarity, and to my mind is one of Modula-2's most irritating aspects. Almost every time I've had an error during compilation it's been because I had typed in IMPORT ReadSTring, instead of IMPORT ReadString or Total := Total + Result instead of Total := Total + result. Pascal wouldn't have cared!

All of Modula-2's reserved words must be in upper case, while procedure identifiers are written 'LikeThis'. Variables are supposed to be written in lower case, but don't have to be.

Modula-2 allows open arrays so that the size of an array does not have to be specified when an array is passed as a parameter. Thus we could have:

```
UseStringProcedure(CharacterString
  : ARRAY OF CHAR)
(* Rather than: *)
UseStringProcedure(CharacterString
  : CharArray)
(*Where CharArray had previously
  been defined as: *)
TYPE CharArray
  = ARRAY[32..125) OF CHAR
```

This feature allows different sized arrays to be passed to a procedure as a parameter, but it does not allow arrays to be created where the size is determined dynamically at run time (as can be done in Ada).

Extra control structures include LOOP-EXIT-END, which tests within the loop and exits if appropriate; and improved IF-THEN-ELSE (it now allows an ELSIF clause); and a more flexible CASE structure.

Multi-tasking is supported by the new sequencers PROCESS, NEWPROCESS and TRANSFER, while low-level programming is supported by CODE (allows machine code to be inserted), SETREG and REGISTER (allow the 68000's registers to be set or read respectively), the function procedures ADR(variable) and SIZE(variable) (return the address and number of allocated bytes for a variable), LISTEN (to service interrupts) and many others.

Modula-2 is a rich and expressive language that should satisfy the professional systems and applications programmer, and this review will no doubt have missed many important aspects. There is, however, a lot to it and a lot to learn. The beginner with no experience of Pascal might find Modula-2 intimidating, but the Pascal programmer will most certainly have no difficulty in making the transition.

The Modula-2 system

TDI says that its Modula-2 compiler has been so successful that it has formed a new company to market it, called Modula-2 Software Ltd. I hope I will be forgiven for continuing to refer to the company as TDI — Modula-2 Software's Modula-2 compiler is just too much of a mouthful!

TDI has versions for the Atari ST and for the Commodore Amiga. As I don't yet have an Amiga, I obtained the Atari version and was able to start writing programs in Modula-2 within minutes of unpacking the box. Before attempting to describe the language and this compiler in more detail, I will say right away that TDI's Modula-2 software is the user-friendliest implementation of a language I have ever encountered, with the possible exception of Turbo Pascal. The manual, though superb, seems hardly necessary, so easy is the system to use.

The development system — compiler is too modest a name for it — comes on one single-sided disk. Two more are required if the optional 'Toolkit' is purchased. The first thing that will strike the newcomer will be the huge number of files on the disks. There are 64 on the linker/editor disk occupying almost 162k (on the earlier 1.04 version there were 78 files occupying over 310k). On the compiler disk there are 52 files and a meagre 4096k of space left on the disk (corresponding figures for v. 1.04 are 41 files and 37k disk space spare). This is because Modula-2 separates so much off as library modules.

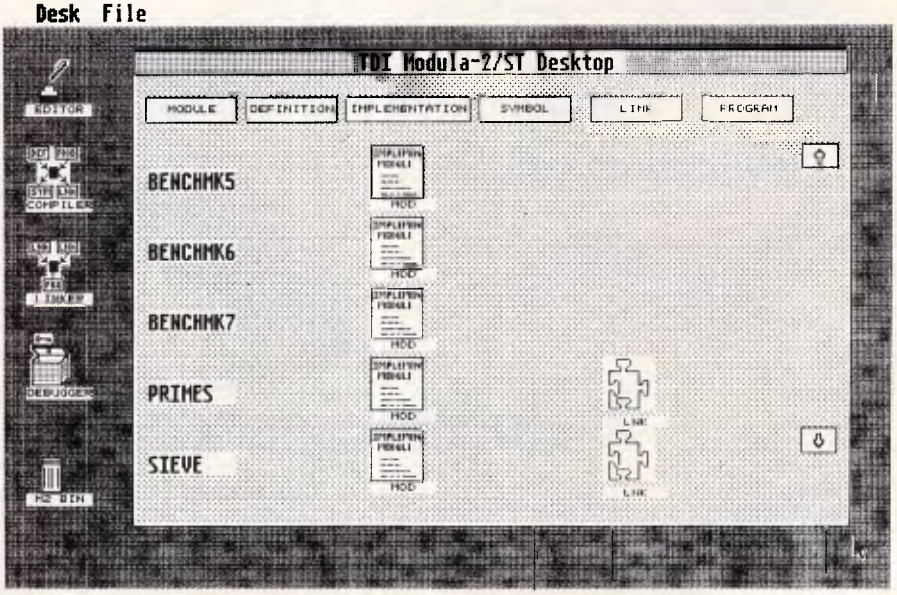

Fig 3 The Modula-2 desk-top metaphor shows how to get a working program from source code — disk modules and appropriate icons are shown

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The editor: TDI's Modula-2/ST editor is a very complete and easy-to-use full-screen editor that's ideally suited to writing source code. Most word processor programs are over elaborate and not all are able to produce the necessary pure ASCII files.

This editor allows the mouse to drag the cursor around the screen and has a simple menu bar at the top with all the essential editing functions. The 'Auto indent' function makes pretty structured programming style layout easy by returning the cursor to immediately below the start of the previous line.

Spectacularly useful is the 'search-for-error' function. If errors are encountered during compilation, an error file is written containing the location and nature of the errors. On re-editing the source code, the editor looks for a file with the same filename and the suffix .ERM. It then inserts error markers in the source text, automatically moves to the first error and displays the appropriate error message. The next error is located simply by clicking the mouse on search-for-error; the editor locates the next error and again the appropriate error message is displayed. Files can be saved with the same filename, saved to a new filename, backed-up without exiting the editor, be appended to other files abandoned or have other files incorporated. The editor also allows up to four markers to be set anywhere in the text and instantly searched for when required.

I have virtually no criticisms of the editor; earlier versions did not produce a proper ASCII single quote (ASCII 27H), seriously limiting the value of the editor for writing code for other languages. Modula-2 can use either double quotes or single quotes to delimit characters and strings, but Pascal insists on single quotes.

A small extra TDI could think about for future versions of the editor is some way of switching case in the text. Since Modula-2 is absolutely case sensitive, the most common errors in the source code are instances where an identifier has been typed sLightly Wrong. A command that switches the word under the cursor from all upper case to initial cap or to lower case would be a useful addition to this editor. The earlier version of the editor also used a thin vertical line as the cursor, whereas the current version uses the conventional reverse video rectangle. It's a mere quibble, but I preferred the vertical line; and perhaps giving the user the choice would be a further improvement.

The compiler: the compiler itself is multi-pass and fairly slow (to those who have been spoiled by Turbo Pascal, at least). It does, however, show on the screen what's going on in a fair amount of detail (see Fig 1) and this relieves the tedium somewhat. The editor is on the same disk as the linker, so, after writing the source, the file has to be copied to the compiler disk for compilation.

After the file has been compiled, the resulting code has to be transferred back to the linker/editor disk so that it can be linked. On my modest 1/2 Mbyte 520ST with only one single-sided disk drive, this resulted in a seemingly infinite number of disk swaps, unspeakable frustration and more than sufficient time to get the simplest program from source code to executable object code. The software engineers at Atari must have worked really hard to create an operating system that requires 10 disk swaps to copy a two-file folder containing a total of 166k (this is an actual example!).

While I still had version 1.04 of the Modula-2/ST system, I got so fed up with this that I rushed out and bought a RAM disk utility. The very same day version 2 of Modula-2/ST arrived, and one of the many enhancements was a 'free' RAM disk utility. Having a RAM disk certainly helped, but I did experience some problems. I had so many system crashes when using both RAMdisks, that I preferred to do without and suffer the time penalty and wrist ache of hundreds of disk swaps. The problems should be less acute with a 1 Mbyte system.

I have no criticisms of the compiler other than that it's traditionally slow. It does a wonderful job of accurately identifying errors in the source code and seemed less prone to error cascades caused by phase errors (omitted semicolons, for example) than other compilers I have used. TDI claims that the compiler complies fully with Wirth's Modula-2 specification, and everything that I have done to test this confirms the claim.

Pascal programmers have gone over in flocks to Turbo Pascal, largely because of its compilation speed, but Turbo is not yet available on the ST. Serious programmers, writing large and complex programs, will have nothing to complain of with TDI's Modula-2/ST compiler.

The latest version of Modula-2/ST (version 2.0) incorporates a number of significant improvements over version 1.04. These are: a fuller and even better manual (more on the documentation below); a new editor that corrects a few minor deficiencies of the earlier version (see above); a Modula-2 'desk-top' that automates program production, compilation, linking and running; and a so-called toolkit, an optional extra that contains many useful extras for the serious programmer.

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The Modula-2 desk-top utility is a program that can be run from the GEM desk-top for the Modula-2 programming environment — see Fig 3. All the modules on the disk are shown on the desk-top together with appropriate icons. Clicking on an icon causes the appropriate action. The desk-top utility stays resident while developing or running Modula-2 programs. It gives TDI's Modula-2 something of the integrated feel of a slow motion Turbo Pascal.

The optional toolkit comes on two disks and contains a symbolic debugger, a cross-referencer, decoders for both link and symbol files, a library of high-level applications and source code for the RAM disk utility. I have hardly had a chance yet to put the toolkit through its paces as it came rather late in the course of this review. It would appear to be the answer to a programmer's prayer, with the kind of tools one normally expects to find only on a minicomputer development system.

Given TDI's massive and brilliantly documented support for GEM disk operating routines, applications environment services routines and virtual device interface routines (source code for all the definition modules is in the manual), there would seem to be no need for the serious programmer to purchase Atari's Development System, though the GEM manuals will certainly be needed.

Documentation

I have to admit that the documentation is 'brilliant'. The *User's Manual* is quite simply the best of its kind. In 370 pages you have everything you need to know to get the best from Modula-2, from simple let's - write -a - working - program - now examples at the beginning to very detailed but easy-to-follow documentation on how to use the system. There are also many sophisticated source code examples of complete programs, source code for the many definition modules, cross referenced lists; in short, everything you could possibly have asked for in a highly accessible form.

The manual, quite rightly in my view, makes no attempt to teach you how to write programs in Modula-2, only how to actually use the TDI implementation of it. If you are not already a Modula-2 programmer, in addition to the *User's Manual* you will need *Programming in Modula-2* by Niklaus Wirth and *Modula-2 for Pascal Programmers* by R Gleaves, both published by Springer Verlag.

Conclusion

At $259 for Modula-2/ST, and an extra $125 for the optional Toolkit,I would say that this system is outstanding value for money. Modula-2/ST does the lot. It could certainly be used to develop very large and very sophisticated programs. Its closest rival is Ada (which is more at home on mainframes), followed by C. I consider it to be far superior to C in that the strict type checking makes system-wide horror crashes less likely, and the source code is easier to read and more 'self documenting' than C's is. Proof of the pudding department... The whole of Modula-2/ST was written in Modula-2.

If you are a novice programmer, I would recommend learning Turbo Pascal, possibly using a CP/M emulator on the ST. But if you already know how to program in C or Pascal and want to write systems software or large applications, then Modula-2/ST has no competition at the present time. You will, however, want a second disk drive despite the RAM disk utility.

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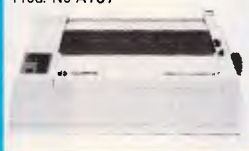

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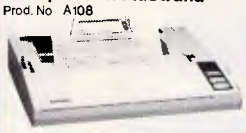

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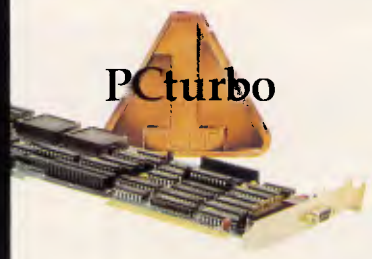

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Tired of the same old 4.77MHz 8088 processor in your IBM PC? Do spreadsheets take an eternity to recalculate, and programs like Windows run like a snail? Perhaps you need an accelerator card to put a little speed back in your life. Ron Dunn takes a look.

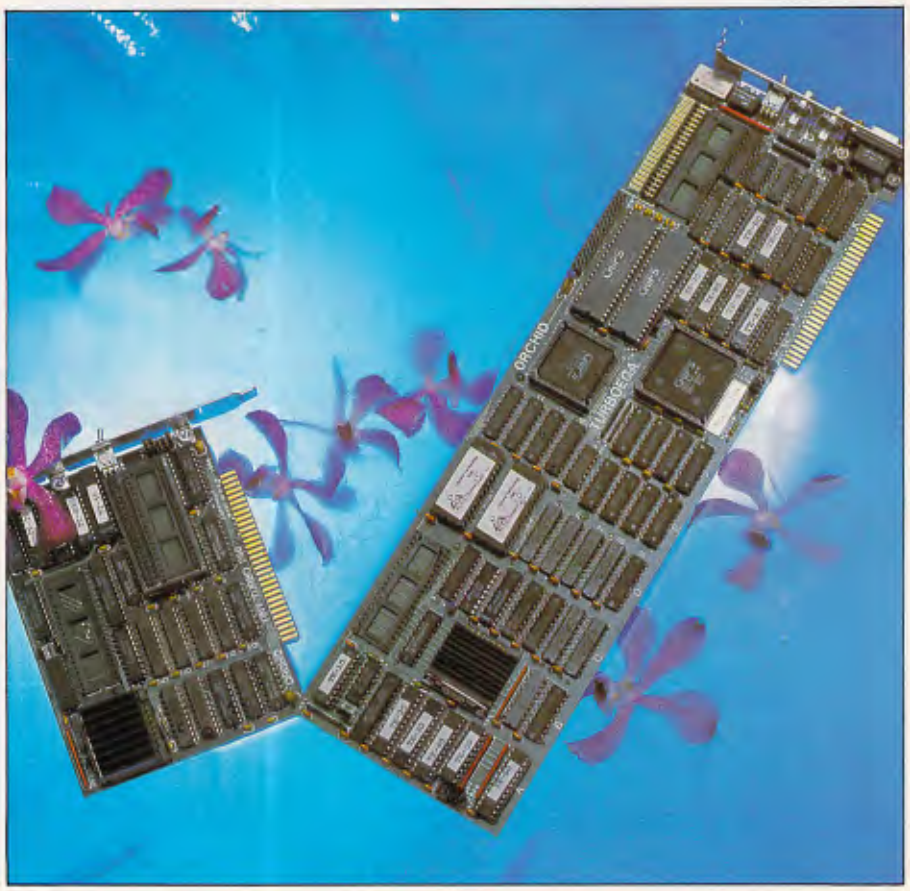
Accelerator cards for the IBM PC and compatibles have lately become more and more common. Ranging from a simple processor upgrade like the NEC V-20 to more complex cards offering a vast array of features, the market has obviously accepted these as welcome upgrades.

A novel approach in this market has been taken by Orchid Technology with the release of TurboEGA. As the name implies, this card provides both speed and style, through the addition of an Enhanced Graphics Adaptor.

Orchid's TurboEGA consists of an accelerator card and a vast array of screen cards, all on the one circuit board. The review card was bundled with Microsoft Windows — a convincing demonstration of the faith Orchid has in its product. Windows on a standard PC is a dog — representing the best argument for an AT I have yet to see. The TurboEGA makes this a different story.

The accelerator portion of this card is the same as the Tiny Turbo-286 card from the same company. This is a short card, offering an 8MHz 80286 processor, but no video emulation.

Like most Orchid products, the TurboEGA comes attractively packaged in a standard sized expansion card box. The components supplied are the expansion card, manuals, cable and chip-puller, as well as the almost obligatory plastic guide for IBM expansion slots. It may be necessary to carefully check the chip puller supplied — one I received had some of the chrome plating flaking away — one scrap of that caught between pins on a computer board and all sorts of trouble could result.



Installation

Installation of the card is a real worry. I began by reading the manual. Fortunately, my PC was configured in a manner that meant no jumpers had to be changed, as the documentation on this subject is not very clear. This is a pity as incorrect installation of this card could seriously damage both computer and display screen. Having done the right thing and read all instructions I then proceeded to install the card.

The first step in this process is the removal of the 8088 processor from the mother board. This is heavy stuff — perspiration literally dripped from my brow as I pried the processor with the tool supplied. It really shouldn't be that bad — unless you are careless and bend or break pins. The job is quite straightforward — but having once had a mother board repaired following an accident with a screwdriver I was in no mood for a repeat.

The processor is then placed in the indicated position on the TurboEGA card. Not so good, however, as the alignment position documented in the manual is not present on the card. The manual clearly states that the notch on the processor should be aligned with the pin labelled as '40' on the adaptor card. Nowhere on this card is a pin labelled in that manner.

I had some worrying moments debating the alignment of the processor, before I gave up and telephoned the distributors. They were helpful — the

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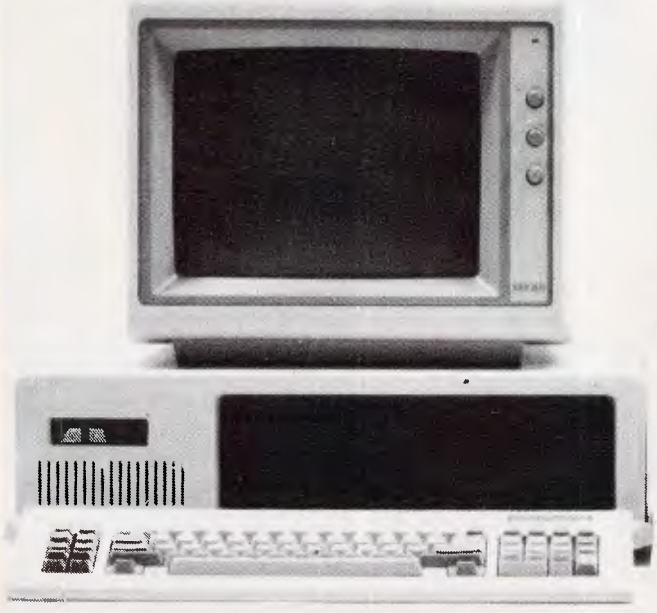

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processor lines up in the same manner as on the mother board. There is a notch on the processor socket that should be aligned with the notch on the processor. This seemed logical, but given that I was already nervous about removing the chip in the first place, I was in no mood for experimentation. If only the documentation made this clear!

The next stage in the installation procedure is to plug a cable into the old 8088 socket. The board is then placed in any long expansion slot, and the cable connected to the appropriate point.

Finally, you set the DIP switches accessible through the rear of the card to reflect the type of monitor being used. The emulations available are IBM EGA, IBM colour graphics, IBM monochrome, and Hercules monochrome graphics. Various switch settings allow for the co-existence of this card with other video cards, but given the rich variety of modes available I would consider this most unlikely.

A toggle switch on the rear of the card allows the user to select 8088 or 80286 processing. This allows for the support of timing dependent software — usually games and arcane copy protection mechanisms. I did not find one package that would not operate in 80286 mode, although I must admit my software reviews are limited to business software, and language compilers and tools.

Operation

Having installed the card I then ran some basic speed tests. The TurboEGA provides disk and processor caching in 80286 mode, and with the processor operating at 8MHz really makes a difference to software. For example, one test involved the execution of a simple program to compute a sum of all the whole numbers from 1 to 10,000. This ran from the DOS prompt to completion in 44 seconds on an IBM PC/AT. The TurboEGA in a standard IBM PC ran the job in just 27 seconds!

All of a sudden Windows became very usable. Turbo Pascal compiles approximately 10,000 lines of code completed in 94 seconds, against four minutes and 23 seconds on a standard PC. The time taken to process a DOS TREE/F command on the same computer dropped from 72 seconds to 44.

Some official benchmarks from the Orchid documentation are shown in Fig 1. Depending on the package used, the degree of disk manipulation and the timing methods, actual results may vary slightly.

Video updates are deceptively fast. I had the opportunity to test the card next to a computer with a Tiny Turbo and a Hercules monochrome card. Straight calculation times were equivalent, but screen updating was quicker with the TurboEGA.

The EGA part of the card works very well. It provides the full 256k of graphics memory not present on the IBM card, and functions without fault. Present on the card are the expansion bus and RCA plugs not utilised yet on the IBM card. These are completely compatible from an electronic and physical viewpoint, and will provide users with the ability to follow any future developments for the IBM card. All the EGA software I threw at this card functioned perfectly.

The Hercules emulation, however, contains some significant flaws. The TurboEGA uses the Chips brand of processor for video emulation, as do most of its EGA competitors. I understand that there is a basic flaw in the programming of this processor, evident in Hercules emulation. This could also have come from the software program that must be run before Hercules emulation can be used.

The card ran Windows, Freelance, Enable and Turbo Pascal graphics in Hercules mode, seemingly without fault. The problem came, however, when trying to use Microsoft Word. This package examines the video card on start-up to determine what mode it should be used in. With a start command of Word the program ran as if on a standard monochrome display adaptor. The Word/H command, for the display of 40 text lines on the screen, seemed to work satisfactorily. I would have liked more software to test the compatibility of this emulation more thoroughly.

No hardware conflicts were detected during the testing of this card. It ran with both a Microsoft and Mouse Systems mouse, with numerous multi-function, expanded memory and interface cards, and with any mainframe communications card that was thrown at it.

Switching back to 8088 mode is a simple operation. All that is necessary is to reach around the back of the computer and flick the toggle switch. The computer will require re-booting after this, so it should not be done while a program is in operation.

The 8088 mode functioned exactly the same as a standard PC. No timing differences could be detected anywhere.

Conclusion

This card could be just what is needed to prolong the life of many computers groaning under the burden of processor bound software. Many PC/AT sales have the potential of being lost to this card, particularly as it provides video control as well.

The TurboEGA has a recommended retail price of $1865, including Microsoft Windows. The Tiny Turbo mentioned at the start of this article costs $1370. With Windows currently selling at a recommended price of $195, the TurboEGA represents excellent value for money.

With the IBM PC/AT currently retailing for over $10,000 in enhanced form, the economies of using this card are easily noted. Standard benchmarks are let down by the speed of the IBM PC hard disk. If this were replaced by a fast access, voice coil drive the PC would beat the AT in almost all instances — and at around half the cost.

Hercules emulation aside, this card is recommended to all PC users needing a little extra muscle, or to anyone contemplating the purchase of a new graphics adaptor. It is advisable, however, that unless users are very confident in hardware modification, installation of the card should be left to a computer dealer.

Orchid products are distributed in Australia by: Porchester Computers, PO Box 193, St Kilda South, Vic 3182. Tel (03) 537 2722.

Benchmarks

	IBM PC/XT	IBM PC/AT	TurboEGA
Spreadsheet calculation	44	15	14
Database sort	25.4	13.4	17
CAD draw	61	33	36
Sieve benchmark	10	4	3
Norton SI	1.0	5.7	6.6

All timings in seconds

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LETTERS

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Too early to tell

I am provoked to write to you by two pieces in the May issue of *APC*. Firstly, Guy Kewney tells us that to him spreadsheet use is a totally irrational human activity. Then Nick Walker enthuses over the Atari 1040ST as compared to all those boring PC-compatibles.

The link between the two is the blinkered view of the computer and its potential. To Messrs Kewney and Walker, computers are marvellous grown-up toys; not only can these gentlemen spend their time playing with them, but they can get paid for doing so. To me, and I suspect most other serious computer users, the computer is a tool, something to help us do more, and better, than we could otherwise achieve.

Nick Walker is impressed by the Atari, because he is a self-confessed enthusiast for the latest technology. He admits the poor record on reliability, the failure to deliver the originally promised bundled software, and the absence of any substantial business software of the kind that IBM or even Macintosh users can choose from. This is quite enough to dampen any remaining enthusiasm I might have for the machine, but it apparently has no effect on him. Why? Because he is fascinated by the technology, whereas I am interested in what can usefully be done with the machine. Boring the compatibles may be, but in terms of serious use they offer far more now, and probably in the future, than the Atari. As Amstrad has shown, with its 'outdated' CP/M machine, there is a mass market for old technology if it means good value and a wide choice of existing software. If Amstrad's rumoured PC-compatible does appear, I would back it against the Atari any time.

Guy Kewney's problem is obviously that he is literate but not numerate. Because he works with words he fails to realise that, for those of us who work with figures, a spreadsheet is just as much an essential tool as his word processor. Just as he would not be satisfied with the kind of word processor found on most home computers, I would not be satisfied with the equivalent spreadsheet. Is it too much to hope that in the future he will stick to what he knows, and does well, and not fall prey to the occupational disease of journalists, namely uninformed comment based on their own prejudices?

R Williams

You mention the Apple Macintosh as a machine that has a substantial amount of business software. Two years ago the Mac was in a similar position to the one the Atari ST is in now — no decent software, insufficient RAM and full of bugs. But still the journalists of the day ranted about how wonderful it was. It's my belief that the ST represents such value for money that it's guaranteed some measure of success. True, this success will initially be among the enthusiast (hacker) type, but give the machine two years, and it will be a serious proposition for a business which requires a cheap, easy-to-use system — Nick Walker.

Intuitive thought

I am an avid reader of *APC*, not necessarily because of its useful contents, but because of its entertainment value. In my opinion, it reflects the romantic attitudes of a minority.

I run one of those very 'backward' computers — an IBM PC clone. I use mainly a very 'backward' integrated program called Intuit, which bypasses DOS and takes over the computer completely, doing its own thing.

It formats, copies, saves and organises the material in hierarchical file structures automatically and naturally. In addition, it automates the A-B drive selection. It has limited database-reporting facilities, a programmable 'spreadsheet', and text as its main modules. The Basic machine requirement is a PC/AT with a minimum of two drives and 256k.

As an ordinary individual I am thankful for the standardisation provided by IBM in the market-place. A long, basic halt in technical progress seems to be a prerequisite for useful applications to appear. Software is the gasoline needed for unromantic, private users like myself. Without it, the computer remains an exclusive, unobtainable toy for the uninitiated multitude of ignoramuses, and that is where I most definitely belong. Everyone can type if they have access to a typewriter; everyone can now compute reliably and fast with access to a PC. That is real market progress.

APC obviously dislikes that. That attitude will bring horses and blacksmiths back into the transportation business. Computers are eventually destined for 'Everyman's' very prosaic use. That use will not be limited to games, and it certainly will not include programming.

The Intuit program obviously was made by enthusiasts with a very definite set goal. It reduces computing to a push-button operation; the things that Intuit will do are therefore limited. However, I do not have to study my fat DOS manual when running that program.

I stumbled on Intuit by accident when reading about the maker's marketing philosophy; it interested me — and made me curious about the product, so I ordered a copy from the company by direct mail. The program is sufficiently different to warrant an interesting review. I have used the program for more than a year and can recommend it.

Intuit is a 'no frills' type of program: 'Copy your old data for use in new contexts' is the basic philosophy. All the commands are simple push-button operations. The program uses the 10

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function keys on two levels only to achieve full control. Small stickers on those keys inform you what happens if you press them. The basic Intuit operator requirement is thus an ability to read.

I am a user who is very far removed from the authors of the Intuit program package. I use it because it's easy, and because it's fast. In addition, the package is very competent in some user-important areas.

I suspect that I'm not the only person who has a difficult time understanding the DOS manuals. I have been so used to Intuit hierarchical files that I, with floppies, have had to study DOS to bring about something similar when running DOS-dependent programs. I dislike Microsoft immensely — those engineers are not my cup of tea.

My main objection to the Intuit program has now been removed. Earlier Intuit program editions and upgrades were copy-protected — the new edition is not. A copy of Intuit can be ordered from: Noumenon Corporation, 512 Westline Drive, Alameda, CA 94501, US.

Carl Fr Figenbaum

We are not heavy investors in buggy-whips — the IBM standard has frozen the microcomputer world like a statue. We are trying to show that there is still movement and excitement in the business.

Blatant plug

Unaccustomed as I am, it gives me great pleasure (as the saying goes) to see a report on Mumps in your magazine (June *APC*). I have been developing systems using this powerful tool for the past ten years and disagree with Ian Davies that Mumps is not commercially viable. There are many extremely complex and time critical applications implemented entirely in Mumps in such diverse areas as medical laboratories, waterfront functions (ship planning and container management), point of sale systems, manufacturing and online order entry.

The CCSM that was tested does not include the latest ANSI standards recommendations with regard to parsing, which allow more flexibility in the layout of program lines, including the implementation of structuring which is a great advantage over other interpretive languages.

Ian Davies was critical of the readability of Mumps programs, but most programmers would be glad to be able to shorten the length of command names. This is not compulsory in Mumps although the obvious saving to disk and memory space to aid the speed of loading and subsequent execution of code must be weighed against the loss of readability. And like any language, an experienced programmer can read his code like a book.

The comparison to Unix and omission of the comparison to Pick is interesting and may be avid followers of those systems should take the time to inspect Mumps as a cost effective alternative which incorporates some of the advantages of both products.

If anybody would like more info on Mumps I can be contacted after hours on (03) 781 3868 or write to Paul Staff, Mumps Factory Pty Ltd, 27 Mincha Street, Frankston, Vic 3199.

P Staff

Lonely user

I read the June issue article by Ian Davies on Mumps with a good deal of interest.

I have been using a version of the Mumps language for some time now. This version, which complies with the ANSI Standard for the language, is called MicroMumps and is currently available at release

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Description	PC/XT	PC/AT
Processor Processor Speed	8088 4.77MHz or 6.77MHz	80286 6Mhz or 8MHz
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Expansion Slots	8 (5 vacant)	8 (6 vacant)
Ports	2 × Serial 1 × Parallel	2 × Serial (1 installed) 1 × Parallel
Real Time Clock	Yes	Yes
Games Port	Yes	No
Co-Processor Opt.	Yes (8087)	Yes (80287)
Monochrome Hercules Comparible Adaptor	Std. 720 × 348 1 × Parallel	Std. 720 × 348 1 × Parallel port
System Pricing with: (Does not include Sales Tax) Single Floppy Two Floppies Hard Disk Drives	 360K $1695.00 720K $1995.00 10MB $2995.00 20MB $3495.00	 1.2MB $4595.00 2.4MB $5060.00 20MB $5995.00 40MB $7645.00
Video Options	Colour/Graphic Mono/Colour	320 × 200 4 colours 640 × 400 4 colours
Power Supply	150 Watt	200 Watt
DOS	3.1 Std.	3.1 Std.
Warranty	6 Months	6 Months
Availability	Ex-stock	Ex-stock

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4.61. The language is available in CP/M-86 and PC DOS 2.0+/MS-DOS 2.0+ versions from Dr Richard F. Walters, Division of Computer Science, University of California, Davis, Ca. 95616. In standard formats (IBM, DEC Rainbow) these are a 'snap' at $US56, especially as the diskette has a very useful editor thrown in.

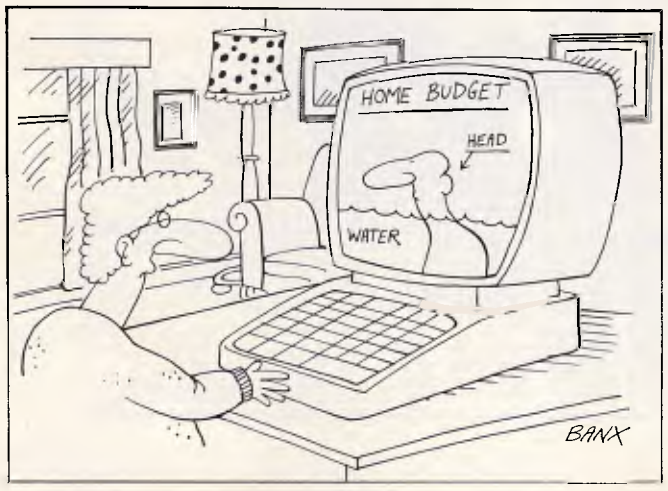
A quite useful and powerful DBMS is also available from the same source. This is called File manager, and while it is a bit profligate of disk space for floppy disk applications because of initial overheads, really comes into its own on hard disk storage. This package provides indexing to fields and/or subfields, simple numerical analysis of data (mean, median, standard deviation, histogram), separate files of word processed fields (but don't get too excited about the word processor), the usual boolean searching, and so on. Field size is limited to 256 characters, but an unlimited (?) number of subfields can be added, and the word processing 'fields' are also unlimited (searchable, but not indexable). There seems to be no limit to the number of fields. Print, search and sort templates are easily built and stored. I've used it for a number of small databases, analysing costs of periodical subscriptions, from different countries, suppliers and so on, and the application seems only limited to the amount of global space allocated to the files. Searching then sorting then printing using unindexed fields on an IBM PC XT isn't exactly lightning fast, but neither are some of the more common database packages, which have greater restrictions and price tags well in excess of $US56.

A multi-user version, Northstar Dimension Multi-user MicroMumps, is also available for $US112. I haven't used this so I can't comment.

Local support is a bit thin on the ground, although the only time I thought I'd struck a small problem (I actually hadn't) I wrote to Dr Walters and had a reply within 10 working days, and that's faster than some local support.

While part of my reason for writing was to alert readers to the availability of a cheaper, if remotely supported, version of a very usable language and database driver, my other reason was to see if there were any support for a (micro) Mumps SIG in Australia. There is a list of Australian users of Mumps in the membership guide to the US Mumps User Group, but I'd be interested to hear of other micro users out there.

David Foott
35 Loretto Ave
Ferntree Gully 3156 END



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Business Filevision

Business Filevision provides sophisticated database facilities for those Macintosh users who are not familiar with intensive business computing. Mick O'Neil tests its capabilities.

When the Macintosh made its entry onto the micro scene in 1984, there were more than a few sceptics who considered the icon-based user interface (WIMPs) to be cute but cumbersome, and certainly a passing fancy. Now, with the introduction of Digital Research's Gem operating system for MS-DOS machines, Commodore's AmigaDOS and Apple's own refinement of the Mac's interface, an industry standard, based upon icons and Mac-like graphics, may be evolving. Business Filevision, a new and powerful version of a visually-orientated information management system on the Macintosh, extends this desk-top metaphor and threatens to overcome the most intractable sceptic of all — the database administrator!

Business Filevision is an update of Telos Software Products' innovative file manager, Filevision, and is a significant improvement in both power and scope. The original program allows the manager to create a graphic by using drawing tools provided within the program, and relate parts of the drawing to information files. The new version substantially enhances the power of Filevision by allowing for the importation of MacPaint, MacDraw, MacDraft and digitised graphics, and by increasing the potential file size, the number of objects in a file, fields per type, characters per field, and so on (Fig 1). In addition, a separate Import/Export facility is now available which will allow Business Filevision to exchange data with existing Macintosh and MS-DOS programs or, for that matter, any programs which use DIF, SYLK, SDF or ASCII files (Fig 2).

Picture this

The first step in using Filevision is to analyse information requirements and determine how data is related graphically. This process requires some imagination and ingenuity, particularly for those who have grown used to staid databases with cryptic prompts or sterile menus. Once this barrier has been overcome, however, the program literally

Files	
Maximum file size:	4Mbytes
Minimum file size:	4k
Max types per file:	16
Max objects per file	32000 (depending upon memory size & disk space)
Max fields per type layout:	99
Max characters per record:	4000
Max length of field name:	31 characters
Field:	Size adjustable at any time, selected fonts, graphics
Field types:	Standard (numbers, text or pictures); calculated; initial text; copy from previous record
Max freehand or polygon graphic size:	100 points
Max size of type or print layout:	30ins × 30ins
Max text characters allowed as one object on the graphic display:	400
Records without graphics allowed:	Yes
Drawing and graphics	
Drawing area:	8inx × 10ins, with 6in × 4in close-up window view; accessible via page miniature and Edit menu

Graphic objects:	Text (selectable sizes, fonts and styles); symbols (16 × 16-dot editable from a palette of 20); lines (constrainable to 0, 45 and 90 degree angles); polygons (constrainable as above); rectangles (constrainable to squares); ovals (constrainable to circles); arcs (constrainable to circular arcs)
Imported graphic objects:	Pictures (MacPaint or ready-made); text; Business Filevision pictures; Business Filevision symbols and symbol palettes
Lines:	Adjustable width (0 to four dots)
Shades:	18 editable
Selection:	Shown with handles, blinking, black or nothing
Multiple selection:	Like finder — can be constrained to proportional unlimited layers. Objects can be permanently, or temporarily grouped graphics can be selected and deselected with button Can be set to go to record, activate link, or be ignored
Grid:	Optional; adjustable in 1/12in increments
Also:	Overlap; grouping; pop-ups; double-click; stretch & shrink

Fig 1 Specifications

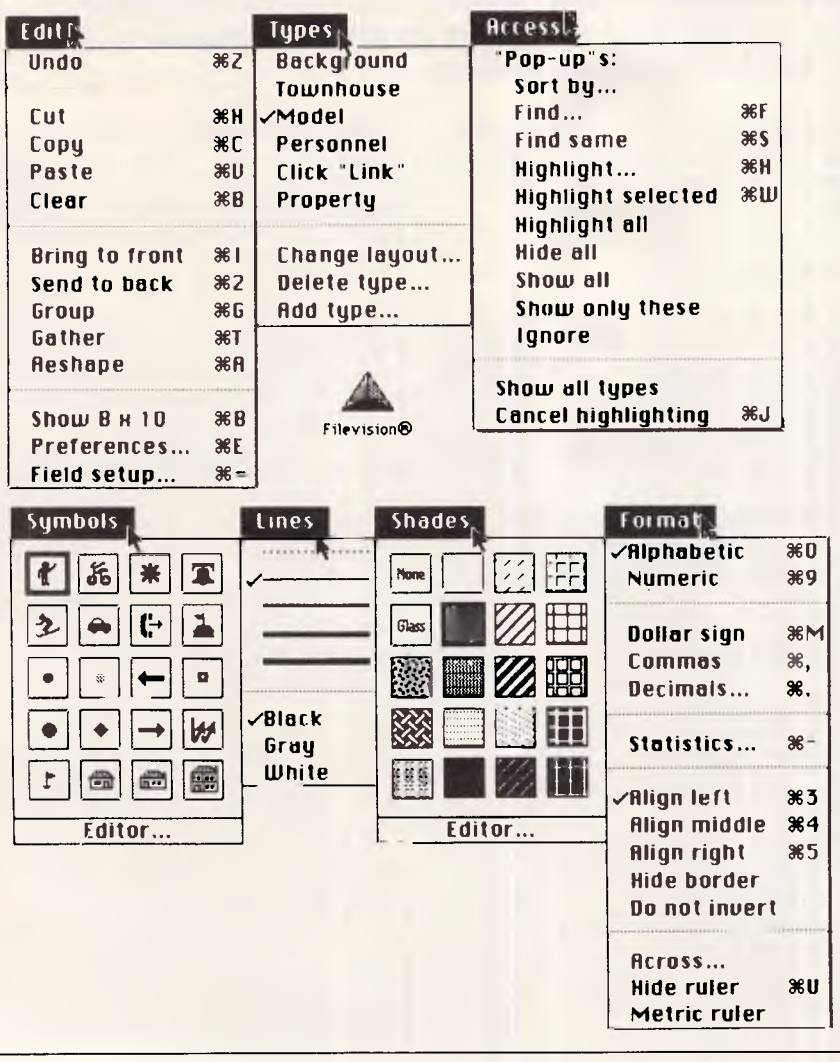

Fig 3 The pull-down menus contain many options

flows. If your data doesn't seem to benefit from graphic representation, Business Filevision allows you to create standard data files.

A master drawing can be created using tools provided by the program (Fig 3) or imported via the clipboard from other Mac software. This could take the form of a map, an office layout, a factory floor, a wine cellar, a parts schematic and so on. This object can be assigned as 'background type', and Filevision makes it easy to add individual graphics to the background which can be typed to associate with data files. Alternatively, parts of the original background can be fenced for the same purpose.

For example, an estate agent might use specially tailored icons to show rural land sales, while fencing towns and cities in which housing is available. By double-clicking a land sale icon, information on land sales in that particular area could be displayed. Double-clicking a town could link the agent to a file which displays a detailed map of a housing area, with each house icon associated in turn with its own data file. Filevision allows linked files up to five deep.

When you have started to create the graphics layout, you can easily find yourself overdoing things with informational 'clutter'. In order to avoid this, the program includes the option to create 'pop-ups'. A pop-up is a graphic display which shows important information which won't fit on the background layout. Pop-ups are triggered by clicking a specially designated graphic (called a 'button') and are just as easily removed by clicking the toolbox (Fig 4).

Data files

Creating a data file couldn't be easier (Fig 5). After giving a file an individual type (for example, 'land' or 'housing'), you then design a layout for all the records in that type. Up to 99 fields can be added and sized to fit a 30in by 30in format. Field names can be up to 31 characters in length, while the field size can be as long as 2000 characters.

Each field comes with a handle for easy placement, and fields can contain virtually any kind of information including graphics, text and numbers. In addition, computed fields are permitted. An important feature is the ability to change field placement and design even after data has been entered.

It should be noted that despite the flexibility in file set-up and the sophistication of the graphics interface, Business Filevision is not a relational database program in the traditional sense. Only one file can be open at a time,

and without the Import/Export facility, it's quite impossible to update one file by using information from another. Stock management, for example, might require a transaction file entry as well as a stockfile entry, so giving rise to duplication of effort which is easily avoided using a relational database.

Highlights

A datafile can be queried with up to four conditions; this is accomplished by using the Access menu to 'highlight' those records which meet a given set of conditions (Fig 6). After you have entered conditions using standard Boolean operators which are provided in a dialog box, the program returns you to the drawing display where you observe that any graphic objects which meet those conditions have been highlighted. The Access menu also provides a powerful Find command which will function with up to 22 significant characters as well as wild-cards and constraints. Files are automatically sorted according to the name field, but this can be overridden to sort on any designated field.

Printing

One of the strongest features of Business Filevision is its flexibility in printing. Filevision can easily generate labels, merge information into reports or form letters, and produce tables of your own design. The ability to save up to 16 re-usable report formats and to preview a report onscreen sets a new standard in database reporting.

Documentation

A first-class tutorial, a superb reference manual a support number, a glossy and informative magazine, access to public domain Filevision templates — there is the distinct impression that Telos is

Process ASCII files from the following programs:
- DB Master (Import only)
- Filemaker
- Helix
- Microsoft File
- Overvue 2.0 (Export only)
- PFS:FILE (Import only)
- Omnis 3
- Excel
- Jazz
- MacWrite, and so on

Process imported data records based on the following:
- Add all imported data as new records
- Update matching records; otherwise add new records
- Update matching records; otherwise disregard
- Replace matching records; otherwise add new records
- Replace matching records; otherwise disregard
- Do not change highlighting
- Highlight all new or changed records
- Highlight only new records
- Highlight only changed records
- All new or changed records *not* highlighted

What you can do:
- Build a mail-merge file with your word processor
- Automatically enter a customer list from another database program
- Update production costs as calculated by your spreadsheet or custom program
- Prepare sales data for your corporate computer
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- Exchange data with other Business Filevision files

What Import/Export can do:
- Import and export data in standard industry formats: ASCII, DIF, SDF and SYLK
- Add new records to your file or change selected information in existing records
- Convert data along the way, using several options: convert all characters to upper-case; translate special characters; ignore characters; convert numbers in scientific format to normal format
- Switch among different Business Filevision files and types
- Build a standard set-up file to automate the import or export process
- If your program doesn't run on a Macintosh, exchange data between the computers by using a communications package such as MacTerminal

Fig 2 Import/Export specifications

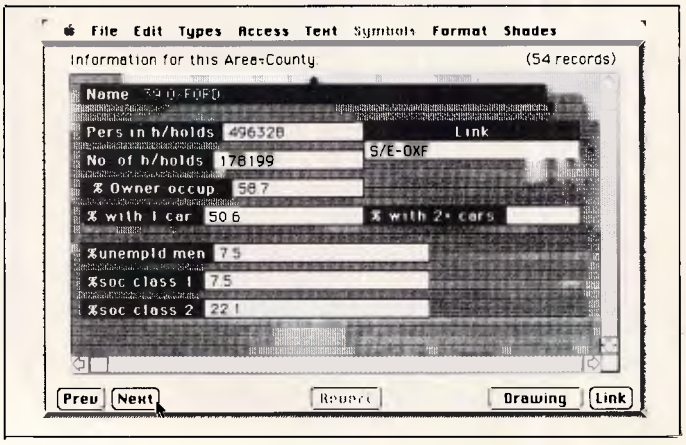

Fig 5 Field layout is flexible and easy to use

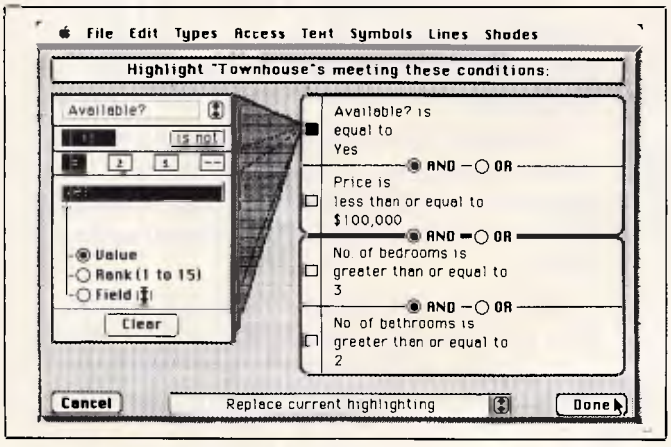

Fig 6 Standard Boolean operators can be used

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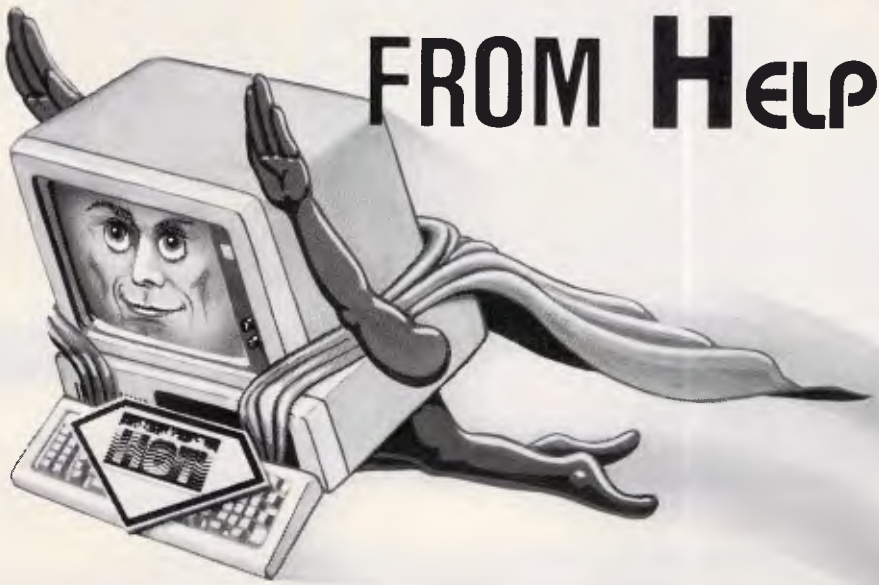

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selling much more than an isolated piece of software.. The documentation and support makes learning Business Filevision easy and pleasant, and disks are covered by a warranty. Though the program is copy-protected with the standard Macintosh disk insertion system, it can be completely installed on a hard disk, eliminating the need for insertion of the key disk. A nice feature is the capability of uninstalling Business Filevision to allow hard disk back-up. Ironically, the close publisher/client relationship fostered by Telos is a much more effective deterrent to software piracy than any protection scheme.

An additional service provided by Telos is access to dozens of public domain Filevision templates. For a $10 charge per disk ($3 if you send a blank disk), Infomagic, the Australian supplier, will send registered users software ranging from Cabinet File to Walt Disney World. As part of the service, a brochure briefly describing each of these applications is included. Though you may find that none of these templates exactly fulfills your needs, some may come close, and, with a little editing, you may save hours of work.

Conclusion

If Business Filevision is viewed as a stand-alone database, its graphics interface, flexible file design and extensive print options make it well worth consideration. It also compares favourably with other Macintosh file management programs. Still, it is not a full relational database in the style of dBaseIII on the PC or Omnis III on the Macintosh, and it would be wrong to consider Business Filevision by itself in the same light.

It is in combination with a full relational database that Business Filevision may have its most important role. Relational database systems are notorious for their complexity, and it's the user interface which usually requires the most design time. In combination with its announced Import/Export program and a network, Business Filevision may offer a user-friendly shell that makes the power of dBase accessible to 'the rest of us'. It could do for data management what MacPaint has done for computer graphics!

END

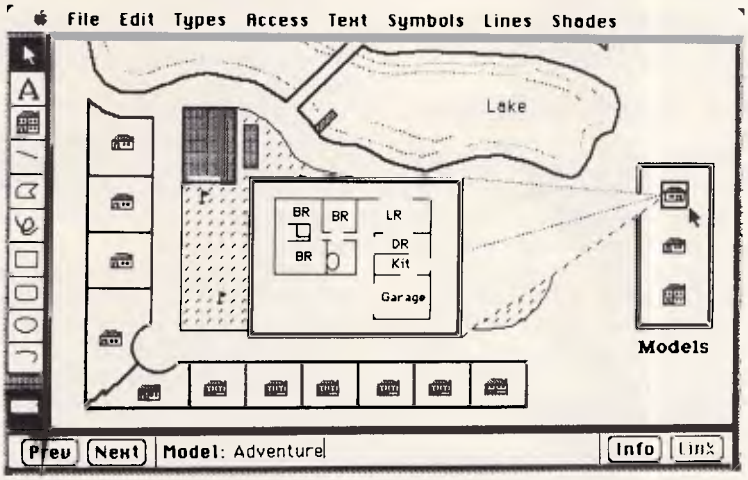

Fig 4 Double-clicking the house icon generates a pop-up floor plan

Business Filevision details

Supplier:	Infomagic
Address:	PO Box 131, Eastwood NSW 2122
Telephone:	(02) 858 4111
System:	512k Macintosh, Macintosh Plus
Type:	File manager with sophisticated graphics interface
Package:	Start-up diskette, program diskette, hard disk support; magazine; access to public domain templates; excellent 250-page manual including superb tutorial
Cost:	$595
Features:	See review
Drawbacks:	None
Ease of use:	Sophisticated data relationships made available to users unfamiliar with business applications

Smooth operator

Christopher Korycinski explains how to structure and simplify your programming with the use of logical operators in Basic, and illustrates their usefulness with some simple routines.

Problems in computer programming often lie in inadequate or badly documented manuals. One of the areas in which there seems to be maximum murkiness is that of bit-wise logic operations. These may not be mentioned at all, or just skimmed over. If you're very lucky, you may come across some 'truth tables', but overall very little attention is given to these very useful (and often time and space-saving) operators which can be used to reduce a spaghetti-like heap of IF . . . THEN statements to one line of Basic. The purpose of this article is to cast at least a little light on this area.

True or false?

As is well-known, all computer operations finally resolve to manipulation of two logic states:
0 = zero voltage level or FALSE in logic terms
1 (or −1) = a negative voltage level, or TRUE in logic terms

You could see this for yourself by loading Basic into your computer and typing:
PRINT TRUE

If TRUE is a reserved word, then the chances are that you will find the number −1 (minus one) on your screen. If you find that this evaluates to 1, then you will need to change some of the routines discussed below to take account of this.

In a similar way you could type
PRINT NOT(TRUE)
to find that 0 (zero) is printed. You have to type NOT(TRUE), or perhaps NOT TRUE, as the word FALSE is not part of the reserved word list (the words which act as instructions) for all computers. Obviously, if it is present, use it. However, this omission is not a problem as it is obvious that if something is NOT TRUE, then it must be false; in other words, the two are identical.

One other problem may arise if you don't have either TRUE or FALSE as a reserved word, as, for example, in Microsoft Basic. When you type PRINT TRUE you will find '0' printed, as the variable TRUE has been given the value 0. So, if you type PRINT NOT(TRUE) you will find that −1 appears. More confusing still, is that Microsoft Basic will work by evaluating a TRUE statement to −1 and a FALSE one to 0 just as normal. The problem is not in the values assigned to TRUE or FALSE, but in the absence of the reserved word, so it is merely a slight inconvenience rather than a major problem.

What practical use is this? Well, it allows the setting up of a number of flags in your program which can be tested at any point to see how the program should branch. Type the following in and see:

```
10 A=−1
20 IF A THEN GOTO 40
30 PRINT "YOU SHOULDN'T BE
   HERE"
40 PRINT "YOU SHOULD BE HERE"
50 END
```

Now RUN it and see what happens. If everything has gone well, only 'YOU SHOULD BE HERE' should have been printed, and the computer should have skipped over line 30. It tested A in line 20 to see if A was 'true' because IF A . . . means the same as IF A = TRUE THEN . . . Finding that it was true (that is, it was −1), it went straight to line 40. (Note that some Basics will evaluate any non-zero value of A as TRUE when used in this way.) If you want to be absolutely sure that only −1 will evaluate to TRUE, then it is safest to rewrite line 20 as:
20 IF A =−1 THEN GOTO 40
but I have never found it necessary to do so.

You could go back to the program and change line 10 to
10 A=0
then RUN it again.

You should see that both lines have been printed because the test in line 20 failed (A was set to 'false'), so both the PRINT statements were used.

Setting a number of such flags in your program can make it far neater than testing for a variable. For example, you may have inserted a default printing subroutine in your program, but may wish to change it if required. Normally you would just type 'P' to print, but if changes are necessary, you could go to a printer menu by typing 'C'. Your program would trap the 'C' and set a flag — why not call it C? This would mean that if you selected the 'change printer' menu, then the flag would be set, otherwise it would not. So your program could run:

```
1000 K$=INKEY$
1010 IF K$= "C" THEN C=−1
       (or C=TRUE)
       .
       .
       .
2000 IF C THEN GOTO (user-defined
       printing)
       .
       (default printing)
```

(You might be able to change line
1010 to
1010 IF K$= "C" THEN C

This implies that if the test is true, then C is also to be set to TRUE (−1). Try it and see: it tests the flag at line 2000 and branches according to whether or not it is set.

Similar concepts could be used to refresh part of a screen display; for example, to test whether an 'INSERT ON' display should or should not be on the screen of a word processor. But in this case it is useful to have a key acting as a toggle rather than having to remember two separate keys for the same operation — one to switch it on, and another to switch it off. Let's say that you are using a routine involving INKEY$, INKEY, INPUT$(1) or something similar to obtain the value of a key pressed by the user without having to type an ENTER. So we could have:

```
100 K$ =INKEY$:IF K$="" THEN
  100
110 IF K$="I" THEN GOSUB 1000
:REM TOGGLE INSERT MODE
  .
  .
1000 IF J THEN J=0: GOTO1020
:REM IF INSERTION TOGGLE IS ON,
  SWITCH IT OFF
1010 J=−1 : REM SWITCH
  INSERTION TOGGLE ON
```

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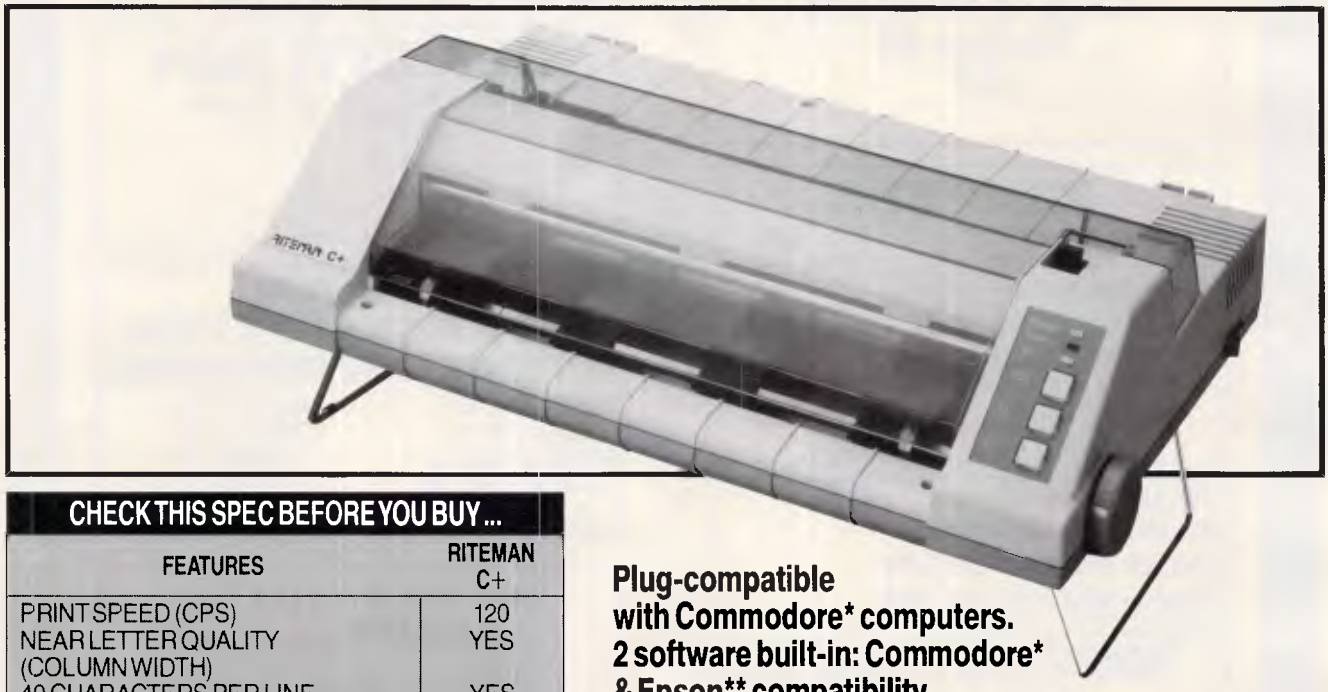

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1020 .... change screen display, etc, to reflect new status
1030 .

Whether or NOT?

This works, but it is far from neat. Note how you have to test the status of the insertion toggle in line 1000 before you can decide whether it should go to 'off' or to 'on'. How do we get around this?

The solution is easy. Type in the following and see what happens.

```
10 CLS: REM CLEAR SCREEN
20 A=-1
30 IF A THEN PRINT "ON": GOTO
   50: REM IF TRUE PRINT "ON"
40 PRINT "OFF": REM OTHERWISE
   PRINT "OFF"
50 A = NOT(A)
60 GOTO 30
```

Now RUN it. You should find that ON and OFF are printed alternately down your screen. Why? Because NOT TRUE = FALSE, so NOT(−1) = 0. In a similar way NOT FALSE = TRUE, so NOT(0) = −1.

So as the program runs, line 50 will toggle A between 0 and −1 at every pass. What is more important is that this enables us to change the logic state of any TRUE/FALSE value without having to test it first.

So lines 1000 and 1010 (above) could be rewritten as one:

```
1000 J = NOT(J)
1010 ... not needed
1020 ... refresh screen display in
   accordance with value of I.
```

A word of warning about the use of NOT. In terms of logic this should reverse the bits of a number in the sense of 0 being changed to 1 and 1 being changed to 0. So if we had 10101111 (= 175), then NOT(10101111) should evaluate to 01010000 (= 80). It doesn't. It will give you −176. This is because logical NOT evaluates to one's complement of the number. This is why NOT(0) = −1 and NOT(−1) = 0. So take care.

Versatility

Another property of the TRUE/FALSE logic is that these flags are used with all of the *relational operators* both singular and in all their combinations, *viz* <, >, =, <>, <=, =>. So if we have a statement

```
IF A > B THEN ...
```

the TRUE flag is set to −1 if the relationship is true, and to 0 if it is false. The program will now branch depending on the value of the flag. But this is not the only way in which we can use these flags, because we can assign the flag to a variable.

```
V = (A > B)
```

In this case the numerical variable V will hold 0 if the relationship is false and −1 if it is true. So far so good, but this in itself has rather limited application unless we can extend it in some way. Needless to say this can be done.

If you look at the following line you will see that the variable V is set to 34 if A is greater than B, otherwise it is set to 0.

```
10 IF A > B THEN V = 34:GOTO 30
20 V = 0
30 ... rest of program
```

This can be simplified a little by rewriting it like this:

```
10 V =ABS((A > B)* 34)
20 (not needed)
30 ... rest of program
```

First of all the relationship A>B is evaluated and given a value of −1 if it is true. This −1 is now manipulated by 34 to give −34. We then use ABS to give us a positive value (obviously not needed if logic TRUE = 1 in your computer) which is assigned to V. If the relationship is false, then we have 0*34 = 0 and V is assigned to this value.

'... the programs and routines given here are just starting points for some not-so-common exploration of the possibilities of Basic... once you look at problems in text or number-handling, their solution becomes easier...'

With a little ingenuity a number of IF ... THEN statements could be telescoped into one line, but it is a good idea to make sure that you have a REM statement as a reminder of what you are trying to do. Logic statements can be far from clear when you return to them after some time.

As an example, take a look at the following:

```
10 IF A > 34 THEN V = 4: GOTO 50
20 IF A = 34 THEN V = 3: GOTO 50
30 IF A < 20 THEN V = 2: GOTO 50
40 V=1 : REM V=1 if A=>20 and
   >34
50 ... rest of program
```

Here the value of the variable V is set to either 1, 2, 3 or 4 depending on the value of A. Using TRUE/FALSE logic this could be rewritten to:

```
10 V = ABS((A > 34)*4 + (A =
   34)*3 + (A < 20)*2 + ((A =>20)
   AND (A <34)))
20 ... not needed
30 ... not needed
40 ... not needed
50 ... rest of program
```

You can see that each term involving A (compare them to the IF .. statements above) would be evaluated as either TRUE (−1) or FALSE (0) and is then multiplied by the value we wish to assign to V. Unless a mistake has been made, only one of these terms will be true and after the multiplication give us the negative number corresponding to the value of V we want. All the rest will evaluate to 0. By obtaining the positive value of the number we get the value we want for V.

This is still rather untidy, though we have saved a number of lines. We can simplify it still further by changing line 10:

```
10 V = 1 + ABS((A>34)*3
+ (A=34)*2 + (A<20))
20 ... not needed
30 ... not needed
40 ... not needed
50 ... not needed
```

As using logical operations in this way is a real space and time-saver, let's see exactly what happens using two values for A in the above simplified form of line 10. Read the following first.

Let's say that A = 56. The first test (A >34) is true, so the flag is set to −1. This is then multiplied by three to give us −3. The second test (A = 34) fails, so the flag is given a value of 0. 0 * 2 is still 0. The third test (A<20) also fails, so the flag is evaluated to 0 in the same way. So we have −3 + 0 + 0 = −3. This is then changed to a positive number and 1 is added to give us 4 as the final result, which is correct for the value of V.

Now let's run through it again using A = 25. The first test (A>34) fails, so the flag is given the value of 0. 0*3 = 0. The second test (A=34)*2 fails, so the flag is given the value of 0. Again 0*2 = 0. The third test (A<20) fails, so the flag is given the value of 0. The whole expression inside the brackets evaluates to 0+0+0=0. The ABS of this is still 0. Finally, we add the 1. 1+0=1, and this is the value we assign to V, which is correct.

If you compare the space taken up by the original IF... THEN and the final one-liner, you can see that the effort required to rethink the problem in terms of logic values is certainly worth making. It might be faster, and it is definitely more elegant.

AND/OR operators

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work in a bit-wise fashion. This means that they work on single bits of a number, and not on the number itself — just as 'NOT' does. In order to discuss them, let's examine how numbers are represented in bit-wise form. Life is short, so let's just consider positive numbers in the range 0-255, which will include the control codes (0-31), all the ASCII set (32-127), and the 'high bit' set of characters — often graphics or foreign letters — in the range 128-255.

All the numbers in the above range can be defined in eight binary bits. The highest number, 255, is represented by:

$2^7\ 2^6\ 2^5\ 2^4\ 2^3\ 2^2\ 2^1\ 2^0 = 255$

1 1 1 1 1 1 1 1

and

0 0 0 0 0 0 0 0 = 32

Note that the eighth bit (high bit) is bit 7 because the first bit is bit 0.

It is fairly straightforward to work out the decimal value of a binary number — though rather tedious. All you have to do is remember that $2^7 = 128$; $2^6 = 64$; $2^5 = 32$; $2^4 = 16$; $2^3 = 8$; $2^2 = 4$; $2^1 = 2$; $2^0 = 1$ and then patiently add up all the powers of 2 which have their bits set.

As it is more common to do things the other way around to get the bit representation of a number, the following program will do it for you.

```
10 CLS: REM CLEAR SCREEN
20 INPUT "NUMBER?",A
30 B = A - INT(A/2) * 2
40 A = INT(A/2)
50 B$ = STR$(B) + B$
60 IF A = 0 THEN PRINT B$: END
70 GOTO 30
```

If you now type a number, its bit representation will be produced for you.

The program works in the same way as a person would work it out with pencil and paper — dividing the number by two, and writing down the remainder, which may be either 1 or 0. Reading the digits of the remainder gives you the bit representation.

Using the program, take a look at the bit representation of the following numbers: 65, 66, 67, 68, 69, 70. These represent ASCII values for A, B, C, D, E, F. If you examine them carefully, you will see that bit 5 is not set on any of these numbers. This is the case until you get to 96. Now try getting the bit representation of 97, 98, 99, 100, 101, 102. These represent the ASCII values of a, b, c, d, e, f. Compare the bits of A and a, B and b, and so on. You will find that with the exception of bit 5 they are identical. The only bit difference between upper and lower-case letters is that bit 5 is set in the lower-case ones and is 0 in the lower case.

It is not hard to see that by manipulating bit 5, we can change between upper and lower-case letters. To see how this can be done it will be necessary to look at 'Truth Tables'.

This is a truth table for the logical operator AND

	0	1
0	0	0
1	0	1

Unless your chief amusement is reading books on symbolic logic, the above may look rather daunting. But it is easy to see that if you AND two zeros, then you get zero. In a similar way, if you AND a zero and a one, the answer is zero. The only time ANDing gives a 1 is if the bits of *both* numbers are set. The usefulness of this may not be apparent at first, so let's put it another way: if you AND a bit with zero, the answer will always be zero. If you AND a bit with 1, then the number will not be changed as 0 AND 1 = 0; 1 AND 1 = 1. Remember that these are *logical* operators, so don't confuse ANDing with adding! AND means that the result is TRUE (−1) if both propositions are TRUE. If just one of the propositions is FALSE (0), then the

result must also be FALSE.

So if all we need to do is to zero bit 5 and leave the rest the same, then it is only necessary to AND with 01011111. The bits ANDed with the 1s will be unchanged, while bit 5 *must* be changed to 0. Now this is rather nice, because we now have a simple way to change all keyboard input to upper case — but remember that it will also affect other ASCII characters which have bit 5 set. In particular, characters below 63 will have their values changed to lie in the range of 1-31 (that is, control characters). This can be rather inconvenient. The other snag is that only numbers can be ANDed. If you can access ASCII values directly from the keyboard using an operator like INKEY, then there is no difficulty. If you can only get characters, then you will have to change them to numbers before ANDing them. This is not hard.

Try:

```
10 CLS: REM CLEAR SCREEN
20 A$=INKEY$:IF A$ = "" THEN 20
30 A$=CHR$(ASC(A$) AND 95)
40 PRINT A$;
50 GOTO 20
```

RUN this and then play around with the keyboard pressing keys which are both SHIFTed and unSHIFTed. Everything should come out in upper case.

If you look back to the 'toggles' paragraph, you will recall that an insertion toggle can be controlled by typing an 'I', but I skated over what would happen if you typed an 'i'. All that is necessary is to AND the input with 95 and the problem disappears.

If you have a character string, for example, from an INPUT statement, then the above method is not possible. But all you need to do is step through the string ANDing each character.

```
110 FOR N = 1 TO LEN(TX$):
  REM TX$ = TEXT STRING
120 MID$(TX$,N,1) =
  CHR$(ASC(MID$(TX$,N)) AND 95)
130 NEXT N
```

The above might do the job, though some computers will not accept line 120 unless MID$(TX$,N,1) on the left is replaced by a variable, giving:

```
110 FOR N = 1 to LEN(TX$)
120 TM$ = TM$ +
  CHR$(ASC(MID$(TX$,N)) AND 95)
130 NEXT N : REM TM$ = A
  TEMPORARY HOLDER FOR THE
  CONVERTED STRING
140 TX$ = TM$: TM$ = ""
```

It is clear now that any bit, or bits, can be unset by ANDing them with 0, while those which are to be unchanged are ANDed with 1. Another example of how useful this can be is if you have some text in which the high bit is set. A number of word processors do this to indicate 'soft' carriage returns or where spaces can be inserted for justification. Other computers use a high bit to select inverse video or bright/dim test. Whatever the purpose of setting bit 7, the result is a shambles if you try to display it on your screen as ordinary text. The obvious way out of this is to unset the bit by ANDing each character with 01111111 (= 127). This leaves everything alone except the high bit, which is ANDed with 0 making it a 0 no matter whether it is a 0 or a 1. Note that in these logic functions there is no need to test the bit. ANDing automatically leaves correct ones alone.

All you have to do is read in the text, then step through it using the MID$ function described above to change any high bits. It's that easy.

You may have noticed that the example of changing to upper case by ANDing with 95 will also set the high bit to zero because 95 = 01011111. This is usually an advantage on computers where you can produce characters in the ASCII range 128-255 by pressing a GRAPHICS key with one of the ordinary keys, because it now doesn't matter whether the user types a, A, graphics+a or graphics+A, the result will always be A. If you want to have the option of using some graphics symbols, then instead of ANDing with 95 you could AND with 11011111 (=223). But remember that this will also zero bit 5 on all of your graphic characters as well.

Before looking at the last example of ANDing numbers, it might be worthwhile typing in a program which will show you the numerical result of ANDing. Otherwise it can all get rather confusing.

```
10 CLS: REM CLEAR SCREEN —
   'AND' PROGRAM
20 INPUT "FIRST NUMBER",A
30 INPUT "SECOND NUMBER",B
40 PRINT: PRINT A;" and";B;" =";A
   AND B
50 PRINT "AGAIN? (Y/N)";
60 AN$ = INKEY$: IF AN$ = ""
   THEN 60
70 IF (ASC(AN$)AND 95) = 89
   THEN 10
80 END
```

If you want to see the effect of ANDing characters, then try this:

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```
10 CLS
20 INPUT "WHICH CHARACTER . . .
   ",A$
30 INPUT "ANDed WITH ? . . .",A
40 PRINT A$;" when ANDed
   with";A;" =";CHR$(ASC(A$) AND
   A)
50 PRINT "AGAIN? (Y/N)";
60 AN$ = INKEY$:IF AN$ = ""
   THEN 60
70 IF (ASC(AN$) AND 95) =
   THEN 10
80 END
```

Note the brackets round the IF statement in line 70, which ensure correct evaluation of the IF statement as logic operations such as AND OR NOT have a very low priority. Missing out brackets can lead to some *very* mysterious bugs as the statement looks fine but is evaluated in a rather unexpected, and incorrect, way.

Suppose we have a fairly large menu to choose from — say 20 items. It is convenient to both the programmer and the user to be able to choose the menu option without having to type an ENTER after the input. The snag is that there appears to be no easy way of doing this. If we use the usual INKEY$ or INKEY operator, this will only pick out one keypress. The obvious solution is not to have each menu item numbered, but have it lettered (A, B, C . . . .) instead. This allows up to 26 items to be selected with only one keypress. So far so good. But what do we do with the input? If we used INKEY$, it is a letter which makes it rather clumsy to use a list of computed GOSUBs or GOTOs after the menu.

If we used INKEY, then it could be either one of two numbers for each letter, depending on whether an upper or lower-case letter was input. So we could get either 65 or 97 for an A. Awkward.

If we look at the bit pattern of A, we see that it is 01000001; a is 01100001. B is 01000010; b is 01100010 . . . and so on. If we ignore the three high bits, the rest of the number is (in binary) 1, 10, 11, and so on, as we work our way up the alphabet. Notice that it doesn't matter whether we input a lower or an upper-case character — the result is the same if we ignore the three top bits. This is fine, because if we remove bits 6 and 7, we are left with numbers which go up from 1 to 26 in exact correlation to the order of letters in the alphabet. So if we type in an A or an a, then we end up with 1. If we type in a B or a b, then we have a 2. C or c will give 3, and so on. Just right for our computed GOSUBs. It should be obvious how to achieve this marvel — you just AND the input with 00011111 (= 31). The two top bits are 0, so the result must have the three top bits set to 0 as well,

irrespective of what they were before. So we could have:

```
.
.
. (menu items — up to 26)
300 C$ = INKEY$: IF C$ = "" THEN 300
310 C = ASC(C$) AND 31
320 ON C GOSUB 1000, 2000, 3000, 4000 .....
```

Very simple and tidy.

Alternatives

Here is a much better way to do the same job which I recently came across and adapted for use with Microsoft Basic. It only handles numbers up to 255, but this is easy to change.

```
3000 INPUT "WHICH NUMBER? ";A
3010 IF A>255 THEN 300
3020 FOR B = 7 TO 0 STEP -1
3030 IF A AND 2^B THEN PRINT 1; : GOTO 3060
3040 REM You are ANDing with 2 'to the power of' B
3050 PRINT 0;
3060 NEXT B
```

The key line is 3030. It steps through the powers of 2 (that is, the value of bits in a number) ANDing them with the number itself. If the number has got the appropriate bit set, then the result of ANDing will be true, so you print a '1'. If ANDing produces a 0, then the test in line 3030 fails and the bit must be 0, so you print a '0'. You then repeat the procedure until you have stepped through all the bits down to 0.

So far, lower-case letters have been changed to upper-case by ANDing them with 95 to change bit 5 to 0. But suppose that you want to do the opposite and change upper-case to lower-case? ANDing won't work, because this will either leave bits as they are, or unset them. What we want is something to set bit 5 to 1 irrespective of whether it is a 0 or a 1.

There is, of course, a logical operator to enable us to do just that. Look at the truth table below for the logical operator OR:

	0	1
0	0	1
1	1	1

Here you can see that if either bit of the two digits being ORed is set, then the result will be set.

0 OR 0 = 0
0 OR 1 = 1
1 OR 0 = 1
1 OR 1 = 1

Look again at the last one in the table. Even if both bits are set, then the result of ORing is TRUE. This is not immediately obvious if you look at it from the 'intuitive' point of view, because you immediately think of it in 'either/or' terms — either one or the other must be set, but not both. This is wrong, so be careful.

We can see from the table that ORing a digit with 0 leaves it unchanged, and ORing it with 1 will set it irrespective of whether it was a 0 or a 1 originally. Now this is just what we want. If we have a number of which bit 5 is to be set and the rest left unaltered, then all we need to do is OR the number with 00100000 (= 32).

The best way to see how this works is to use the AND program (above) but change all the ANDs for ORs. RUNning this will take the mystery out of ORing.

Using this information, our change-to-lower-case routine would look like:

```
500 K$ = INKEY$: = IF K$ "" THEN 500
510 K$ = CHR$(ASC(K$) OR 32))
```

Let me emphasise that this, like ANDing with 95, will not only affect

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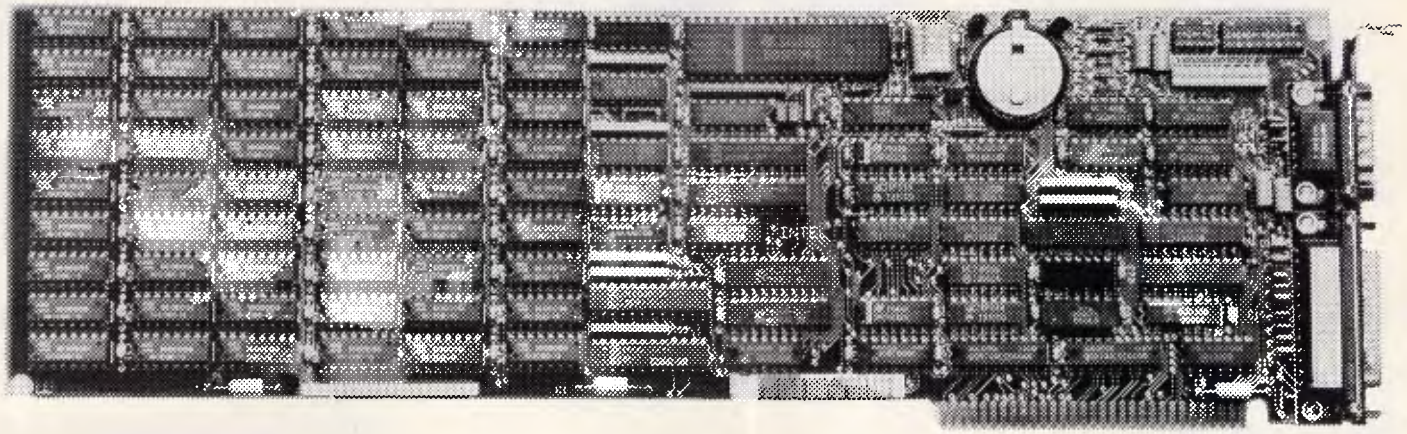

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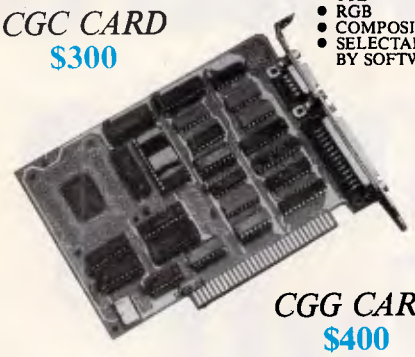

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letters, but also any other character which has bit 5 set to 0. So check that this does not cause any problems with your expected input.

Truth tables

So far I have only discussed AND, NOT and OR. These are, I believe, found in all computers. Other Basics will also give you XOR, IMP, EQV. Although I don't propose to discuss them here, I will give their truth tables in order that those of you who have the patience can work through them and devise other useful routines. Basic is far from dead!

	0	1
0	0	1
1	1	0

Truth Table for XOR (exclusive OR)

	Y	0	1
X			
0		1	1
1		0	1

(Note that if X is 1 and Y is 0 then X IMP Y is false, but if X is 0 and Y is 1 then X IMP Y is true).

Truth Table for IMP (implication)

	0	1
0	1	0
1	0	1

Truth Table for EQV (equivalence)

Conclusion

All the routines given in this article have been run using Microsoft Basic, but I have tried to make them generally applicable across a wide range of computers by not using any IF . . . THEN . . . ELSE statements and keeping things simple.

Obviously they can be improved on by using the power of your version of Basic. For example, the BBC can use INKEY and not INKEY$, thereby picking up the ASCII value of the keypress straight away. This would avoid having to use ASC(I$).

Finally, the programs and routines given here are just starting points for some not-so-common exploration of possibilities of Basic. You may well find that once you look at problems in text or number-handling as logic problems, their solution becomes easier and more elegant.

END

Data representation

Mike James examines data representation, and stresses its importance in keeping your programming simple.

Nearly every programmer thinks that the difficult part about programming is working out what the program should do — that is, constructing an algorithm. In practice, what to do in a program is a minor problem compared with the difficulty of thinking up a good data representation. As described last month, the way you think about your program lends itself to suitable algorithms; this is only the start of the central role that data plays in program creation. The way you choose to represent data determines how easy it is to invent and implement algorithms to achieve your goal.

Where is the data?

All programs comprise two parts: the part which tells the computer what to do; and the part which tells it what to do it to. Programmers are generally very aware of the part that tells the computer what to do — the algorithm — because it is usually the largest and most visible part of any program.

The part of a program which defines the data the algorithm is to work on is usually well-hidden within the algorithm. If you were asked to point out the lines in a Basic program that defined the data, you would most probably point at a few DIM statements and maybe the odd DATA statement. Most programmers are taught that the only parts of a program that deal with data construction are the few statements in the language that define either the type or the value of a variable. This view of the data creation process is far too narrow; for example, the Basic statement DIM A(10) defines A to be a one-dimensional array of 10 elements (I prefer to ignore A(0) even if it exists!), but in the mind of a programmer a one-dimensional array can be a number of different things. For example, it can be a mathematical vector subject to all the rules of matrix algebra, or it can be a simple list of numbers, or a look-up table. In the mind of the programmer a data type is not just a way of organising variables, such as an array; it also includes a set of natural operations. This may seem like an empty observation but when you're constructing a program you really do think of an array, for example, as something more than a collection of variables because you're going to *use* it for something — that is, as a vector, as a list, as a look-up table, and so on.

The fact that much of the act of data definition is in the mind of the programmer accounts for the observation that there are very few statements in programming languages which deal with data. This also accounts for why so little of any program is ostensibly devoted to data definition.

However, once you move away from the *supplied types* of the language, large chunks of program can be seen to be concerned with data definition. For example, the only advanced data type offered by most versions of Basic is the array, and any array can be defined by a single DIM statement. However, other types of data, queues, stacks, linked lists, trees and graphs can all be constructed using simple arrays and subroutines (see below). In many cases we have to extend our ideas about what parts of a program are concerned with constructing data for the remainder of the program to work on.

Representing the world

The whole point about data inside a program is that it has to represent some part of the external world. Sometimes that part is physical; for example, an oil rig in a program that does stress or vibrational analysis. Sometimes it is an abstract idea, such as a mathematical vector in a program that computes the solution to a set of linear questions. But whatever has to be represented within the program, the program is easier to write if the data type used is as similar to the external world object as possible. In other words, the data type should have as many properties of the real world external object as possible and as few additional properties.

Ideally a representation should have exactly the same set of properties as the external object and no more. Such an exact representation is often referred to as an *isomorphism* from the Greek meaning 'equal shape'. Although exact isomorphism between the real world and a data representation is impossible, the closer we get to it the better. This is known as *the isomorphism principle* of data representation.

All this talk of isomorphism is a little abstract. To make things clearer, let's consider a simple example. Imagine you were writing a program to construct a timetable that works with the days of the week. There are two obvious ways of representing the days of the week. You could use the familiar three letter names for each day as strings — that is, 'MON', 'TUE', 'WED' . . . 'SUN', or you could use the numbers '1' to '7' to stand for Monday to Sunday. At first sight it looks as though there is very little difference between the two representations, but consider the problem of deciding if one day is earlier in the week than another. What you would like to write in the program would be something like

```
IF DAY1<DAY 2 THEN . . .
```

where the '<' sign can be read as 'comes before'. If the numeric representation is chosen, then the above IF statement will work as written, and deciding which of two days is earlier is trivial. This is because the data representation used has the same ordering as the days of the week — that is, Monday comes before Tuesday and 1 is less than 2, and so on. But if you use the string representation, then deciding which of two days is earlier is not at all easy. You cannot use

```
IF DAY1$<DAY2$ THEN . . .
```

because the comparison is based on the ASCII alphanumeric order and "THU"< "WED" is true because T comes before W in the alphabet, even though Thursday comes after Wednesday in the week! (I still haven't worked out a satisfactory solution to this very simple problem.)

The days of the week example given above shows that there is an advantage in the data representation having as many properties of the real world object as possible. It may look as though representing the days of the week by the numbers 1 to 7 is a good isomorphic representation, but it brings with it rather too many properties. For example, what

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do you make of an expression such as DAY1+DAY2? Numbers can be added together, but days of the week cannot! In this case, the data representation suffers from having additional and unwanted properties.

In simple programming languages there is no way of restricting the operations on a data representation to those that make sense, but this rarely causes trouble in a well-organised program where the object represented by the data is clearly stated. The opposite problem of not including sufficient properties of the external world object in its representation is much more common and serious.

Data=type+structure

If the name of the game is finding good representations of external world objects, then it is important to know what type of internal data is available to us to construct such representations. The modern view of data is that there are roughly two basic types of data and a large number of organising principles or *structuring methods*. This idea of a structuring method is best explained by pointing out that the familiar act of forming an array is a structuring method. Any type of data can be organised into an array. You can have numeric arrays, string arrays and even arrays of arrays! Most of the theory of data is concerned with different structuring methods.

Types=scalars and reals

There is very little to say about the simplest types of data to which structuring methods can be applied. There are two types: scalars and reals. The archetypal scalar is the set of integers (whole numbers) 0,1,2,3 ... 'Scalars' have a variety of incidental properties: they can be compared; you can do arithmetic with them; and so on. The key thing about them, however, is that they are countable. If you think that everything is countable, then you have never come across the other fundamental data type — the 'reals'.

'Real' numbers are the usual sort of numbers that we do maths with including fractions, numbers like 'pi' and 'e' and the irrational numbers which can only be represented by infinite decimate fractions. The most important property of real numbers is that given any two real numbers, there is always a third that lies between them — no matter how close together they are. For example, between .5 and .49 there is .495; between .5 and .499 there is .4995; and so on. This means that the real numbers are 'uncountable' because you cannot start at a real number, call it the first and then move on to the next and call it the second, because, no matter which number you choose as the second, there is always a real number closer to the first.

Nearly everything's an integer!

The idea that real numbers are uncountable is fascinating, but almost irrelevant to practical programming. Real numbers are best regarded as numbers which you use to do calculations and scalars, or more accurately, the *integers* are what you *use* to count things with. The use of real numbers is the province of mathematics, and while we often have to worry about the practical details of calculating with the reals, it is the variety of things that can be done with the integers that is the main concern of programming.

We have already seen that the integers 1 to 7 can be used to represent the days of the week. The integers can also be used to represent *any* countable set of objects, but beware — they can bring with them properties that you don't really

want. For example, in the case of the days of the week, the ordering of the integers was useful, but what if you use '1' for red and '2' for yellow? In this case, what do you make of an expression such as red<yellow? The integers contain the idea of 'next larger' or 'successor' — that is, the next larger integer from 1 is 2. In the case of the days of the week it is sensible to say that the next day after Monday is Tuesday, but it is usually not sensible to say that the colour after red is yellow.

The fact that using integers implies an order is rarely a nuisance unless you need to use a different order. For example, the letters of the alphabet are represented in most computers by the integers according to the ASCII code — that is, 'A' is represented by 65, 'B' by 66, and so on. It is this that caused the problem when the days of the week were represented by three letter strings. If you think that this is not an important problem, the assignment of letters to integers according to the ASCII code contains a trap which nearly every programmer falls into at one stage or another. The letters 'A' to 'Z' are represented by 65 to 90 and the letters 'a' to 'z' are represented by 97 to 122. This implies that "Zebra"<"cat" is true because 'Z' comes before 'c' in the representation. In other words, if you sort using the standard ASCII order, you will find that all the words starting with capital letters come first, followed by all the words starting with lower-case letters, and this is generally not what is required. (The problem of changing the order implied by the ASCII representation is very similar to that of changing the order of the days of the week represented by three letter strings — once again, I know of no straightforward solution.)

Structuring methods

Given that the only fundamental types of data are the real and the scalar, it should come as no surprise to discover that most of the work in data representation is in inventing and applying structuring methods. There are too many different structuring methods to cover them all in detail here, so what follows is no more than a thumbnail sketch.

Structuring methods fall into two groups: static and dynamic. A static structuring method creates a data structure that is fixed in size while the program is running — an array is an example of a static data structure. A dynamic structuring method creates a data structure that changes its size and possibly its 'shape' while a program is running. The only dynamic data structure supplied by Basic is the string, which is essentially a sequence of characters that can change its length.

There are only three types of static data structure: the array, the record and the set. The array is well-known to all programmers and it corresponds to lining up a collection of identical data types and assigning to each one a unique index. For example, the Basic array DIM A(10) lines up 10 real variables and calls them A(1), A(2) ... A(10); the Basic array DIM A$(10) lines up 10 string variables and calls them A$(1), A$(2) ... A$(10).

Inside information using arrays

Arrays are the most widely used data structure in any programming language, so it might come as something of a surprise to discover that they are only ever used in one of three ways:

- As a representation of a mathematical vector or matrix with natural operations of matrix multiplication and addition.
- As a representation of a list of numbers of other data items. The natural operations include finding an item with a givenproperty (for example, the largest) and moving items around. If the data items are numbers, then the natural operations also include finding the total, the difference between adjacent items, and so on.
- As a look-up table. In this case, each item in the array is a value that is associated in some way with the index of its position in the array. For example, if you fill the elements of an array so that the 'Ith' element contains I*I, you can use this as a look-up table to find the square of any integer: that is, A(I) contains the square of I. The only natural operation on a look-up table is a look-up!

A record is similar to an array but you can line up a collection of different types of variables, and instead of a numerical index you use a *qualified name* to select one of the elements. Basic doesn't provide records but Pascal does. For example, in a cross between Basic and Pascal, a record for name and telephone number might be

```
Person
        Name$
        Number%
```

where Perso.Name$ is a string and Person.Number% is an integer. It should be clear that the record data type is meant to be used to represent traditional external world record cards. The final static structuring method — the set, is also not available in Basic.

A set is a collection of values with no predefined order and so, for example, it is ideal for the representation of colours {red,yellow,blue} or any external world objects that have no natural order. Once again Basic doesn't provide sets, but this is no particular disadvantage as they are used very little in languages that do provide them.

There are a great many dynamic structuring methods and you can, I'm sure, invent as many as you want! There are two ways to implement such dynamic structures in Basic. You can either use the one dynamic data type that Basic supplies, or you can use arrays and *pointers*. For example, a very useful dynamic data type is the *queue*.

A queue is a sequence of items with a front and a back. Items can only be added to the back of the queue and removed from the front. You should be able to see that a queue is a data representation of a queue in the external world. To implement a queue using a string Q$ is easy. The front of the queue could be the left-hand end of the string and the end of the queue would then be the right-hand end. Adding an item I$ to the queue is then simply

```
Q$=Q$+I$
```

Removing an item from the front of the queue is simply

```
I$=LEFT$(Q$,1):Q$=RIGHT$(Q$,LEN(Q$)-1)
```

To use an array 'Q' to represent a queue is almost as simple. All you need is a pointer 'S' to the start of the queue and a pointer 'E' to the end of the queue. (That is, Q(S) is the first item in the queue and Q(E) is the last item.) Adding an item I to the queue is then achieved by

```
E=E+1:Q(E)=I
```

and removing an item is achieved by

```
I=Q(S):S=S+1
```

The only problem with this scheme is that the front and end of the queue slowly move their way up the array as items are added and removed. The solution to this is to make the array 'circular' by adding:

```
IF S>N THEN S=1
```

and

```
IF E>N THEN E=1
```

after each update of 'S' and 'E' respectively.

You can construct other dynamic structures in the same way. The only ones that are in common use are:

The queue — see the description given above. A queue is also called a FIFO (First In First Out) stack.

The stack — a list of items, such that items are added to and removed from the start of the list. A stack is like a queue but items leave and join at the front. A stack

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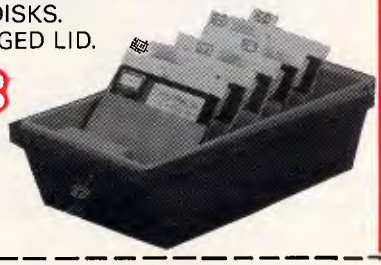

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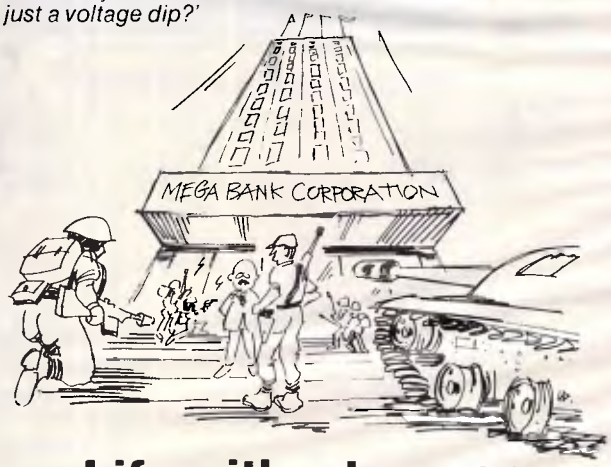

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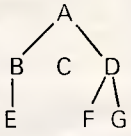
is also called a LIFO (Last In First Out) stack and various other names.

The deque — a cross between a queue and a stack, in that it is a list of items with a front and a back, but items can both leave and join at the front and the back. This is similar to a deck of cards where cards can be placed on or dealt from the top or bottom.

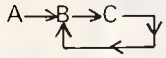
The linked list — each item in a linked list includes a pointer to the next item. Linked lists are easy to modify, for example, because you only have to change the value stored in the pointer to alter which item is next, rather than move items. Each item in a linked list can have a pointer to the previous item, making what is usually referred to as a *doubly linked list.*

The tree — a linked list in which each item has a number of pointers to a number of next items. Each item can only be pointed to by one pointer. It is called a tree because if you draw a diagram with the pointers represented as arrows, then it forms the shape of a tree:



There are many different types of trees according to what extra restrictions you place on the structure. For example, if each item is required to have exactly two pointers, then the tree is called a *binary tree.*

The graph — a tree in which each item can be pointed to by more than one pointer. As an item can be pointed at by more than one pointer, it is possible to form 'circular' data structures. For example:



Graphs are sometimes called networks because they can be used to represent complicated relationships between data items.

Facing the problem

One of the most important ideas in constructing data representations is that any of the above structuring methods can be applied to any type of data item, even if the data item is itself a complex data structure. For example, you can have an array of records, a stack of arrays, a tree of strings, and so on. This idea of structuring structures can be taken as far as you like so you can have a tree of arrays of records, or an array of trees of stacks or strings. Fortunately it is rare that structuring methods are applied more than two deep!

Armed with all the ideas of data representation, you should now be able to tackle programming projects in a new way. Instead of worrying about how to solve the main problems, first of all think about the object that the program is concerned with and make a list of the different data representations you could use. For each one, think about what the natural operations are and how you would implement them using the language in which the program is to be written. It is usual to choose the data representation that has as many properties of the real world object as possible, but sometimes it's worth sacrificing some property for ease of implementation.

Finally, once you've decided on a data representation, you should find that the rest of the program is easy! If you don't believe me, try this month's creative challenge.

Next month: How to spot a sub-routine.

END

Creative challenge 2

You live in a group of islands, and tourists need to know if it is possible to get from one town to another by car without using a ferry. Given the basic information that there is a road between town X and town Y for all the roads in the islands, construct a program that will answer 'Yes' if it is possible to drive between two towns, possibly via a number of other towns.

For example, if there is a road between town A and B, B and C, E and F, then the program should answer 'Yes' to the question 'Is it possible to drive between town A and C?' but 'No' to 'Is it possible to drive between town A and F.'

Notice that your program does not have to give any details of the route between the towns in question; it just has to decide whether or not they are connected by a road.

The answer will be given next month.

Answer to creative challenge 1

If you think of the row of asterisks that have to be printed as a *sequence* of asterisks, then the natural way of solving the problem is to use a loop as in:

```
  FOR J=1 TO D(I)
  PRINT "*"
NEXT J
PRINT
```

which will print the number of asterisks indicated by D(I). However, if you think about the row of asterisks as a static chunk of characters, then you might think of using the MID$ function to generate such a chunk in one operation as in:

```
PRINT MID$(A$,1,D(I))
```

assuming, of course, that A$ contains a string of at least 40 — that is, the maximum number of asterisks ever needed.

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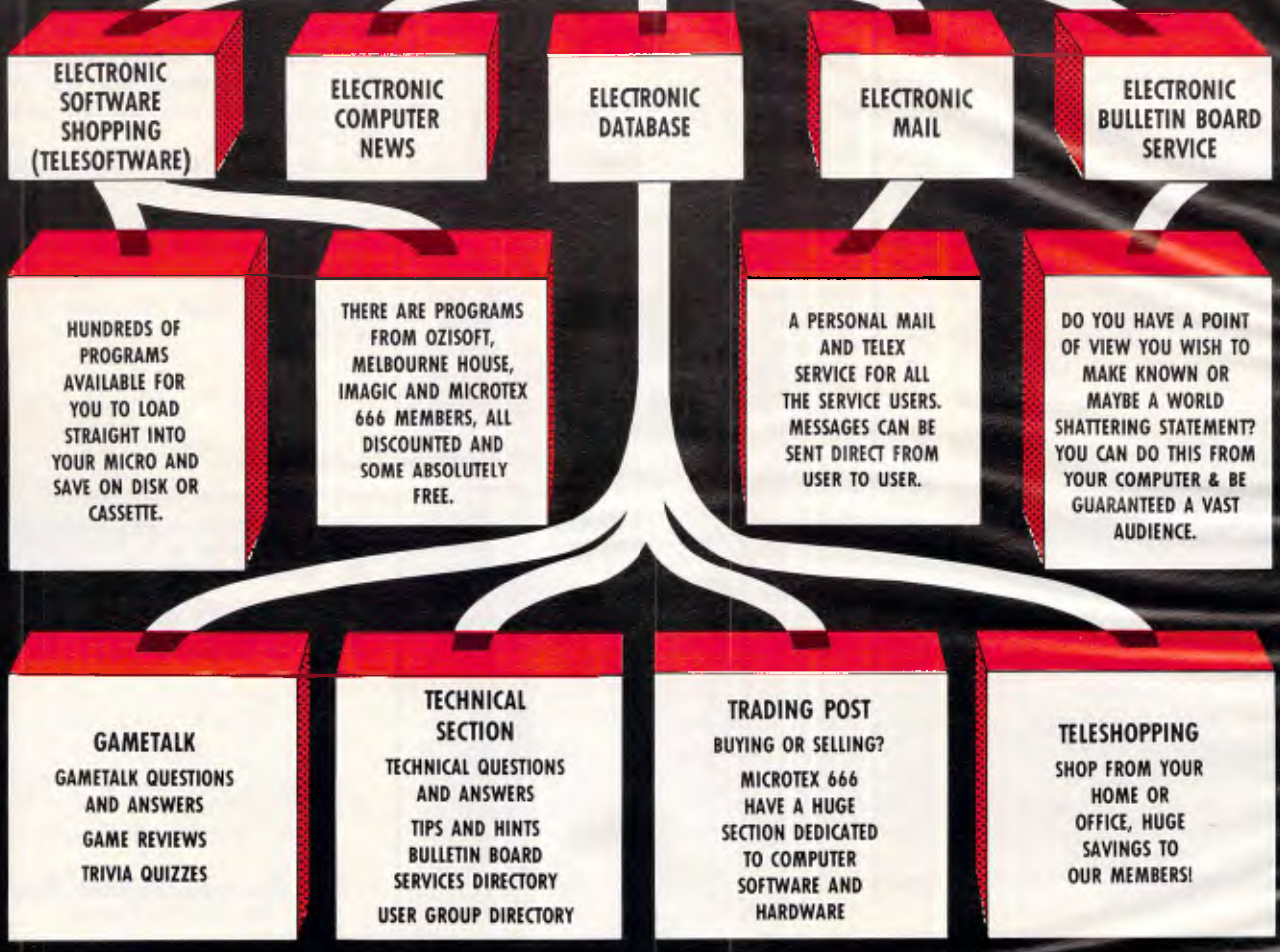

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SCREENTEST

Telex operating system

Telex is still the world's most popular form of electronic mail. Ron Dunn sees how micro users can link up to the telex network.

Sometimes packages arrive in our offices in a form not ideal for review. Rather than omitting such products entirely from our pages, we feel it of benefit to our readers to include these with a suitable comment.

TOS (Telex Operating System) is one of these; a telex control package for the IBM PC, was supplied in demonstration format only. The complete TOS package consists of both hardware and software, and must be installed at a registered telex site in the presence of a Telecom employee.

Due to resource limitations we were faced with the option of either ignoring a potentially good product, or pressing on with a limited review. We chose the latter.

Package installation

The standard TOS package is supplied with a manual, program disk, interface card and isolator box. User training and support is currently provided with all purchases.

It is just as well TOS is installed and supported by the supplier, as the manual and disk are totally opaque. Installation instructions, such as they are, can only be found by hunting around the appendices at the rear of the manual. There are instructions, poorly labelled, under Chapter Three — but these are wrong, and most confusing. As supplied, they would only just be adequate for an experienced user.

The TOS package requires an IBM XT, or AT, with 256k of memory and at least one disk drive. A hard disk is strongly recommended. You must also have a telex line installed, and have purchased or leased a Telecom telex unit. The isolator unit contains a number of relays that, should the TOS system fail, return control to the telex unit so that message receipt may continue uninterrupted. Messages waiting to be sent should be retained on the computer disk.

As the law stands, the TOS system must be installed by a trained technician under the supervision of a Telecom employee.

When I discovered this I began to wonder if the system was really worthwhile.

The big question raised at this point was if a standard telex device were required to operate the TOS system, what possible benefit could it be? The

```
Hello  OFFCOM AA170606    Total Disk use 24 %  07-JUL-1986  15:09

TELEX Unit is:On          PRINTER is:On          OUTPUT is:SCREEN
PRIVATE Line :Off Line

                    TOS (Telex Operating System) V. 2.54

                        F1 PREPARE & SEND a Message
                        F2 MODIFY/RE-SEND a Message
                        F3 CONVERSATIONAL Transmission
                        F4 TRANSMIT an Existing File
                        F5 STATUS Details of Messages
                        F6 ADMINISTRATION Functions
                        F7 ANSWER Incoming Call
                        F8 ACTIVATE Modem

Alt/F10 Exit to DOS                                          F10 Help
```

Fig 1 screendump of the main menu

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**

TELECOMMUNICATIONS AUSTRALIAN STYLE ADAPTOR CABLE

- Australian socket to plug/socket
- Length 10 metres

Cat. Y16015 ..... **$15.95**

TELEPHONE ADAPTOR

- Australian plug to U.S. socket
- Length 10cm

Cat. Y16026 ..... **$6.95**

TELEPHONE CURL CORD

- U.S. plug to U.S. plug
- Rapiecement hand set cord
- Length 4.5 metres

Cat. Y16022 ..... **$7.95**

TELECOMMUNICATION PLUG TO 2 SOCKETS.

Ideal for modem connections.

Cat. Y16014 ..... **$12.95**

TELEPHONE EXTENSION CABLE

- U.S. plug to 2 U.S. sockets
- Length 10 metres

Cat. Y16028 ..... **$10.95**

TELECOMMUNICATION EXTENSION LEADS

Cat Y16010 5m **$12.50**

Cat Y16012 10m **$14.95**

TELECOMMUNICATIONS AUSTRALIAN TO U.S. ADAPTOR CABLE

- Australian socket to U.S plug.
- Length 5 metres.

Cat. Y16017 **$7.95**

MICRODOT 5¼" DISKS

100% certified and error free guaranteed! Where else can you get 100% guaranteed disks at these prices?!

	1-9	10+
S/S Cat.C12440	**$17.95**	**$16.95**
D/S Cat.C12445	**$19.95**	**$17.95**

Bulk and Dealer inquiries welcome please phone (03) 543 2166

DELUXE 5¼" DISK STORAGE UNIT

Features...

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

Cat. C16050 **Normally $49.95**

SUPER SPECIAL, $24.95

BARGAINS!

FLOPPY DISKS GALORE!!

All prices per 10 disk boxes!

Our Cat. Number	Product's Coda	Description	1-9 Boxes	10+ Boxes
XIDEX 3½" DISKS				
C12600	3012-3000	S/S	$69.95	$64.95
			(Normally $75.00)	
C12602	3022-3000	D/S	$99.95	$89.95
			(Normally $109)	
XIDEX 5¼" DISKS				
C12401	5012-1000	S/S D/D 40 track	$29.95	$28.95
			(Normally $37.50)	
C12410	5022-1000	D/S D/D 40 track	$36.95	$34.95
			(Normally $47.50)	
VERBATIM 3½" DISKS				
C12610	MF350	S/S D/D 80 tracks/135 TPI	$69.95	$64.95
C12612	MF360	D/S D/D 80 tracks/135 TPI	$89.95	$85.95
VERBATIM 5¼" DATALIFE DISKS				
C12501	MD525-01	S/S D/D soft sector 40 track	$27.95	$26.95
			(Normally $44.95)	
C12504	MD550-01	D/S D/D	$34.95	$33.95
			(Normally $49.95)	
C12505	MD550-10	D/S D/D 10 sectors 40 tracks	$61.20	$56.95
C12507	MD577-01	S/S D/D soft sectors 80 tracks	$61.20	$56.95
C12510	MD557-01	D/S D/D soft sectors 80 tracks	$75.60	$68.95
VERBATIM 5¼" VALULIFE DISKS				
C12421		S/S D/D	$22.95	$21.95
C12421		D/S D/D	$29.95	$26.95
VERBATIM HIGH DENSITY 5¼" DISKS				
C12520	MD/HD	D/S H/D soft sector	$99.95	$89.95
			(Normally $109.95)	
VERBATIM 8" DISKS				
C12811	DD34-4001	D/S D/D	$63.60	$57.50
C12814	DD34-4026	D/S D/D	$66.00	$59.95
HEAD CLEANER DISKS				
C12551		5¼"	$14.95	$12.95
C12851		8	$14.95	$12.95

APPLE* COMPATIBLE CARDS

Printer Card Cat. X17029	**$79**
Drive Card Cat. X17019	**$79**
80 Column Card Cat. X17025	**$89**
Speech Card Cat. X17009	**$49**
Music Card Cat. X17011	**$89**
Super Serial Cat. X17035	**$109**
RGB Card Cat. X17039	**$79**
Z80 CP/M Card Cat. X17041	**$59**

IBM COMPATIBLE CARDS

MULTIFUNCTION & DISK CONTROLLER CARD (ALL IN ONE)
Save valuable board space with this new combined card. (RAM excluded)
Cat. X18014 ..... **$295**

MOTHER BOARD!
XT compatible mother boards, 8 slots, room for 256K RAM
Cat. X18020 ..... **$295**

MULTIFUNCTION CARD
(384K RAM included) Parallel, serial and game port, battery backup clock
Cat. X18013 ..... **$329**

DISK CONTROLLER CARD
Controls 2 slimline drives
Cat. X18005 ..... **$79**

HIGH RESOLUTION MONOCHROME GRAPHICS CARD
Give your IBM real graphics capability.
Cat. X18007 ..... **$199**

PRINTER CARD
Cat. X18009 ..... **$39**

COLOUR GRAPHICS CARD
Cat. X18011 ..... **$239**

COMPUTER LEAD

- 25 pin "D" plug to 25 pin "D" plug (RS232) DIP switches in each plug allow many combinations of internal wiring, making this a truly universal lead.
- Mylar shielding against RF interference.
- Length 2 metres.

Cat. P19031 **Normally $59.95**

SPECIAL, ONLY $49.95

RAINBOW CABLE

Suitable for IDC connectors.

Cat.No.	Description	$/metre
W12714	28AWG 14W	**$1.80**
W12716	28AWG 16W	**$1.80**
W12720	28AWG 20W	$2.20
W12726	28AWG 26W	$2.90
W12734	28AWG 34W	$3.60
W12740	28AWG 40W	$4.40

RITRON (ZETA) DATASETTE

For data loading and saving, the Ritron Datasette suits most home computers and features tape counter, monitor function for audio verification and slide control for output level.

Cat. C14900 **Now only $24.95**

SAVE $10

SAVE!

INLINE SWITCHING BOX

- 25 pin "D" plug to 25 pin "D" socket (RS232)
- DIP switches allow easy switching of internal wiring.

Cat. P **$32.95**

COMPUTER CASSETTES

Quality 20 minute tapes.

Cat. D11141

1-9	10+	100+
$1.00	**$0.90**	**$0.80**

METEX MULTIMETERS

These instruments are compact, rugged, battery operated, hand held 3½ digit multimeters. Dual-slope A-D converters use C-MOS technology for auto-zeroing, polarity selection and over-range indication. Full overload is provided.

Features...

- Push-button ON/OFF power switch.
- Single 30 position easy to use rotary switch for FUNCTION and RANGE selection.
- ½" high contrast LCD.
- Automatic over-range indication with the "1" displayed.
- Automatic polarity indication on DC ranges.
- All ranges fully protected plus Automatic "ZERO" of all ranges without short circuit except 200 ohm Range which shows "000 or 001"
- High Surge Voltage protection 1.5 KV-3 KV.
- Capacitance measurements to 1pF
- Diode testing with 1 mA fixed current.
- Audible Continuity Test.
- Transistor hFE Test.

SPECIFICATIONS

Maximum Display: 1999 counts 3½ digit type with automatic polarity indication.
Indication Method: LCD display.
Measuring Method: Dual-slope in A-D converter system.
Over-range Indication: "1" Figure only in the display.
Temperature Ranges: Operating 0-C to +40-C
Power Supply: one 9 volt battery (006P or FC-1 type of equivalent)

Cat. Q91540 **Normally $129**

SPECIAL $109

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 adaptor to join 2 female ends
Cat. X15650 ..... $19.95

Female adaptor to join 2 male ends
X15652 ..... $19.95

CENTRONICS

Cat. No.	Description	Price
P12200	36 way plug IDC	**$12.50**
P12201	36 way skt IDC	**$13.50**
P12203	50 way plug IDC	**$14.50**
P12204	50 way skt IDC	**$15.50**
P12207	24 way solder plug	**$12.90**
P12210	36 way solder plug	**$ 9.50**
P12211	36 way sldr line skt	**$15.95**
P12213	36 way sldr chss skt	**$15.95**

RANGE!

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**

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**

RS232 & 'D' TYPE SPECIALS

Part	Description	Cat.No.	Price
DE9S	9 pin Famale	P10881	**$1.75**
DE9P	9 pin Male	P10880	**$2.25**
DE9C	9 pin cover	P10882	**$1.95**
DA15P	15 pin Male	P10890	**$2.10**
DA15S	15 Female	P10891	**$2.25**
DA15C	15 pin cover	P10892	**$1.15**
DB25P	25 pin Male	P10900	**$1.95**
DB25S	25 Female	P10901	**$2.95**
DB25C	25 pin covar	P10902	**$1.20**

COMPUTER LEADS

CL2
- 9 pin 'D' plug to 9 pin 'D' plug
- All pins wired straight through (removable terminals)
- Length 1.5 metres

Cat. P19033 **$14.95**

CL3
- 9 pin 'D' plug to 9 pin 'D' plug
- All pins wired straight through (removable terminals)
- Length 3 metres

Cat. P19035 **$17.95**

CL5
- 9 pin 'D' plug to 9 pin 'D' socket
- All pins wired straight through (removable terminals)
- Length 3 metres

Cat. P19036 **$17.95**

CL7
- 15 pin 'D' plug to 15 pin 'D' plug
- All pins wired straight through (removable terminals)
- Length 3 metres

Cat. P19016 **$24.95**

CL8
- 15 pin 'D' plug to 15 pin 'D' socket
- All pins wired straight through (removable terminals)
- Length 3 metres

Cat. P19017 **$27.95**

CL10
- 25 pin 'D' plug to 25 pin 'D' plug
- Pins 1 through to 8 and 20 wired straight through (removable terminals)
- Length 1.5 metres

Cat. P19011 **$26.95**

CL11
- 25 pin 'D' plug to 25 pin 'D' plug
- Pins 1 through to 8 and 20 wired straight through (removable terminals)
- Length 3 metres

Cat. P19009 **$23.50**

CL12
- 25 pin 'D' plug to 25 pin 'D' plug
- Pins 1 through to 8 and 20 wired straight through (removable terminals)
- Length 7.5 metres

Cat. P19037 **$25.95**

CL13
- 25 pin 'D' plug to 25 pin 'D' socket
- Pins 1 through to 8 and 20 wired straight through (removable terminals)
- Length 3 metres

Cat. P19020 **$29.95**

CL21
- 25 pin 'D' plug to 25 pin 'D' plug
- All pins wired straight through (removable terminals)
- Length 1.5 metres

Cat. P19007 **$33.95**

CL22
- 25 pin 'D' plug to 25 pin 'D' plug
- All pins wired straight through (removable terminals)
- Length 3 metres

Cat. P19008 **$41.95**

CL23
- 25 pin 'D' plug to 25 pin 'D' socket
- All pins wired straight through (removable terminals)
- Length 3 metres

Cat. P19012 **$42.50**

CL25
- 36 pin Centronics plug to 36 pin Centronics plug
- All pins wired straight through
- Length 2.13 metres

Cat. P19014 **$49.95**

CL27
- Apple II, IIa, II+, with parallel interface card
- Dual 10 pin (20 contacts) connector to Centronics 36 pin plug
- Length 2.4 metres

Cat. P19025 **$29.95**

CL28
- Apple III with universal parallel interface card
- Dual 10 pin (20 contacts) on Apple end to Centronics 36 pin plug
- Length 2.4 metres

Cat. P19026 **$29.95**

CL30
- Tandy II/12/16/16B/2000, with dual 17 pin famale on computer end to Centronics 36 pin plug. (Equivalent to 26-1323)
- Length 2.4 metres

Cat. P19027 **$33.95**

CL31
- Tandy I/III/4/4P, with 34 pin edge connector on computer end to Centronics 36 pin plug. (Equivalent to 26-1401)
- Length 2.4 metres

Cat. P19028 **$37.95**

CL33
- IBM PC, XT and look-a-likes with 25 pin 'D' plug on computer end to Centronics 36 pin plug.
- Length 2.13 metres

Cat. P19029 **$44.95**

WE HAVE THE BEST MEMORY PRICES!

IC SPECIALS!

	1-9	10+	100+
4116	$3.95	$3.75	$3.50
4164	$2.95	$2.75	$2.50
2716	$5.90	$5.50	$5.50
2732	$6.25	$5.95	$5.50
2764	$6.25	$5.95	$5.00
27128	$6.95	$6.50	$6.25
6116	$2.95	$2.75	$2.50
41256	$6.95	$6.50	$6.00
6264	$6.50	$5.50	$5.25
27256	$11.50	$10.50	$10.00

WORLD MODEM CHIP
Cat. U21614 Normally $49.50
Save $20, SPECIAL $29.50

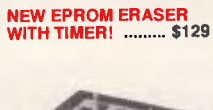
IC SPECIALS! 8000 SERIES

	1-9	10+
8085	4.50	3.50
8212	1.50	1.40
8216	1.50	1.40
8226	1.70	1.50
8243	4.50	3.90
8251	3.90	3.50
8253	3.50	3.30
8255	2.90	2.50
8257	3.50	3.10
8259	3.50	3.10
8279	3.50	3.10
2532	7.50	6.90
2764	5.50	5.10
27128	7.50	6.90
1488	.55	.45
1489	.55	.45

Erase your EPROMs quickly and safely. This unit is the cost effective solution to your problems. It will erase up to 9 x 24 pin devices in complete safety, in about 40 minutes (less for less chips).
Features include:
- Chip drawer has conductive foam pad
- Mains powered
- High UV intensity at chip surface ensures EPROMs are thoroughly erased
- Engineered to prevent UV exposure
- Dimensions 217 x 80 x 68mm

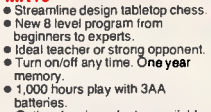
Without timer Cat. X14950
Special, only $79.95

NEW EPROM ERASER WITH TIMER! $129



ELECTRONIC CHESS MK10
- Streamline design tabletop chess.
- New 8 level program from beginners to experts.
- Ideal teacher or strong opponent.
- Turn on/off any time. One year memory.
- 1,000 hours play with 3AA batteries.
- Optional mains adaptor available.
- Take back moves, verify, solve problems to mate in 3 and beyond.
- Player vs. player mode, thinks on opponents time, built in opening library.
- Beginner to expert. Estimated 1,500 Elo.

MK10 offers so much for so little!
Cat. C30002 **$149**



TURBO 16K
This brand new chess computer sets new standards in user convenience, and beats 92% of all chess players with its powerful 16K program.
Features:
Instant response
- Solves mate in 10 moves
- Internal clock with 2 LCD displays
- Displays moves considered
- Thinks in opponent's time
- Takes back
- 17 Levels
- 2 Year memory
- Mains adaptor socket

Cat. C30010 **$295**

TTL MONITORS
Fantastic resolution! Enjoy a crisp, sharp image with the latest Ritron TTL monitor! IBM* compatible, green display, swivel and tilt base.
$265

COMPUTER PAPER
Quality paper at a low price! 2 500 sheets of 11 x 9½ , 60 gsm bond paper.
Cat. C21001 **Normally $44.95**
SPECIAL $37.95

VALUE!

RS232 DATA SWITCH WITH TESTER
- 25 pin RS232 "D" connectors 2 in, 1 out or 1 in, 2 out.
- Ideal for 2 computers to one peripheral or 1 computer to 2 peripherals.
- No power required.
- Six dual coloured LED indicators showing certain flow status:
  T.D. Transmit Data
  R.D. Recieve Data
  R.T.S. Request To Send
  C.T.S. Clear To Send
  D.S.R. Data Set Ready
  D.T.R. Data Terminal Ready
- Housed in heavy duty metal cabinet.
- Size: 200(W)x68(H)x150(D)mm

Cat. X19110 **Normally $149**
SPECIAL, ONLY $129

NEW IMPORTED DISK DRIVES!
Are you sick of paying up to 100% more for Japanese Disk Drives? We now have "direct import" disk drives at much lower prices!

Description	1-9	10+
500K	**$179**	**$169**
1 M/Byte ..	**$219**	**$199**
1.6 M/Byte	**$239**	**$219**

CENTRONICS DATA SWITCH
- 36 pin gold plated female Centronics connectors.
- All other specs as for RS232 Data Switch with Tester.

Cat. X19115 **Normally $169**
SPECIAL, ONLY $149

APPLE* COMPATIBLE SLIMLINE DISK DRIVES
Japanese Chinon mechanism, compatible with 2E and 2 plus.
Cat. X19910 **Only $249**

Japanese Chinon mechanism,
Cat. X19901 Normally $225
NOW $195
(*Apple is a registered trade mark.)

JUKI PRINTER
Professional daisy wheel printer 18CPS full incremental mode Diablo 630 emulation. Large range of daisy wheels. 8K internal buffer available.
Cat. C20040 **Normally, $825**
SPECIAL, ONLY $795

IC STORAGE CASE
Electro static charge proof plastic IC case with conductive sponge. Dimensions: 75 x 130 x 19mm.
Cat. H10095 **NORMALLY $8.95**
SPECIAL, ONLY $7.95

RITRON 2 MONITORS
Stylish, swivel base monitor, available in amber or green.
Green Cat. X14506 **Normally $215**
Amber Cat. X14508 **Normally $219**
SPECIAL, ONLY $199

NEW INTRA HIGH RESOLUTION RGB COLOUR MONITOR!
Size: 14 inch
Sync. Horiz. Scan Freq: 15.75 KHz
Sync. Vert. Scan Freq: 50 Hz
Band width: 18 MHz
Resolution: 640 x 400 dots
Display Format: 80 x 25 Characters
Display Colours: 16 colours.
Input Connector: 9 pin D type
Cat. X14520 **only $695**

NEW!

"IBM*AT STYLE" KEYBOARD
- 100% IBM* PC, XT compatible
- low profile keyboard design.
- proper placement of shift keys with large key tops to suit professional typists
- 3 step height/angle adjustment.
- Cherry brand TS-M0001 19mm low profile switches, meet 30mm ergonomic requirement, and provide high performance and maximum reliability.
- Curl lead plugs straight into IBM* PC/XT
- Status displays. (3)

Just like the "real McCoy" only at a fraction of the price!
Cat. X12000 ..... **only $245**

COMPATIBLES

IBM* COMPATIBLES from $849*
Incredible deals to suit everyone including special package deals!
*256K RAM, single drive, graphics, disk controller and printer cards. **$849**
IBM* is a registered trade mark

256K RAM: Colour Graphics, Disk Controller Card, 1 parallel port, 2 disk drives and 3 months warranty. **only $1,350**

640K RAM: Colour graphics, Multifunction Card, Disk Controller Card, 2 serial and 1 parallel ports, 2 disk drives and 3 months warranty. **only $1,450**

256K PACKAGE DEAL: includes Colour Graphics Card, Multifunction Card, Disk Controller Card, 2 serial and 1 parallel ports. A 120 C.P.S. printer and a monochrome monitor and 3 months warranty! **only $1,899**

640K PACKAGE DEAL: Includes Colour Graphics Card, Multifunction Card, Disk Controller Card, 2 serial and 1 parallel ports. A 120 C.P.S. printer, a monochrome monitor and 3 months warranty! **only $1,999**
*IBM is a registered trademark.

IBM* AT COMPATIBLE!
- 6/8 MHz (switchable)
- 80286 CPU
- 8 slots
- 1 M/Byte main board
- 1.2 M/Byte Floppy disk drive
- 20 M/Byte Hard disk
- Colour graphics display card
- Floppy and Hard disk controller card
- Printer card and RS232
- 200W Power supply
- Keyboard
- Manual

All this for just $3,490

20 M/BYTE HARD DISK DRIVE FOR IBM* AND COMPATIBLES
Includes disk controller card.
Cat. X20010 ..... **WAS $1,250**
SPECIAL, ONLY $990
*IBM is a registered trademark.

APPLE JOYSTICKS
Ideal for games or word processing. Fits most 6502 "compatible" computers.
Cat. C14200 **$34.95**

JOYSTICK FOR IBM
Features Selectable "Spring centering" or "free floating". Electrical trim adjustments on both axis. 360 degree cursor control
Cat. C14205 **$39.95**

MITSUBISHI MONITORS
Green Cat. X14514 ..... **$209**
Amber Cat. X14516 ..... **$219**

CENTRONICS GENDER CHANGER
- Female to Female.
- Saves modifying or replacing non-mating Centronics cables.
- All 36 pins wired straight through.

Cat. X15662 **$33.95**

SWIVEL BASE
Make life easier with these quality, swivel and tilt bases, complete with rubber fittings!
Cat. D11100 **$29.50**

ARGUS 726 ADJUSTABLE MAGNIFIER WITH LAMP
Absolutely perfect for close up work! Intricate PCB's, projects, etc. will be a breeze under this superb, adjustable magnifying lamp
- Magnifies 1.75 times
- 40 watt incandescent lamp
- 2 spring-balanced arms, extendable to 95cm
- Adjustable head for optimum viewing angle
- Fantastic Value!!

Cat. **only $89**

MITSUBISHI DISK DRIVES

MF353 (3½" DRIVE)
Double sided, double density, 1 M/Byte unformatted, 80 track per side.
Cat. C11953 **$280**

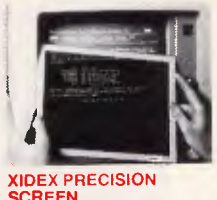
M2896-63
Slimline 8" Disk Drive, Double sided Density No AC power required. 3ms track to track, 1.6 Mbytes unformatted, 77 track side 10s/su10 bit soft error rate.
Cat. C11916 **$895**
Case & Powar Supply to suit
Cat X11022 **$159**

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 **$375**
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 **$295**

M4851
Slimline 5¼" disk drive. Double sided, double density 500K unformatted, 40 track/side. Steel band drive system.
Cat. C11901 **$249**
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**



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answer is found in its text and message manipulation facilities, and the ability to interface external devices to the telex network.

Running TOS

Starting TOS is quite straightforward, providing the ANSI.SYS driver is installed in your CONFIG.SYS file, with only the command TOS being entered at the operating system prompt.

The entry screen to TOS displays some system information (including a handy percentage check on disk space), and a main menu of telex functions. A copy of this screen is displayed in Fig 1.

The F10 key is usually available within TOS for assistance, with well written Help screens offering support for most functions.

Having got this far I paused to wipe my sweaty brow, and requested assistance from a person with a little more experience in the telex field. We then proceeded to test some of the basic features, and compare them to a traditional telex environment.

The basic task of message preparation and transmission is quite easy. TOS contains a text editor, primitive by word processing standards, but better than traditional tape punch or keyboard methods. Text files are created by this, with basic syntax checking for character validity. Wordwrap and cursor positioning facilities make editing simple, and when finished, editing is terminated with the Ctrl/z character familiar to many MS-DOS users.

This causes a rather terse menu to be displayed. As with many TOS commands it is off-putting to the novice, but once learned will be easily recognised and acted on. At this stage a text file may be queued for later transmission, filed on disk, printed, or deleted. Several other functions are available for administrative support.

Transmission options allow for the specification of send date and time, or standard queue management procedures. Messages may be sent to more than one destination in turn, allowing for easy transmission of multiple copies such as press releases, or standard advice forms.

Text files may be edited and retransmitted, allowing the use of standard boilerplate telex documents to be used.

The person with whom I was reviewing the package believed these editing features alone would be worth many hours per year to a normal telex user.

Transmitting a telex

Standard TOS transmissions over the telex network are performed through a background processor. This means that the system can be used for the preparation, editing and printing of telexes both received and for transmission at the same time that the telex unit is in operation.

"... several operators may share one telex machine through standard word processing files."

A main menu feature supplements this feature with a 'direct' connection to the network, allowing operation in the foreground for joint communications with another telex user. This allows operators to 'chat', or interactively transfer messages and responses.

Standard TOS editing is not available

```
P01 L08 C12  F10-HELP CTRL/Z-END F2-VITEL                          EDIT
____>____>____>____>____>____>____>____>____>____>____>____>____>___<
TO: >EVERYONE NEEDING EASIER TELEX PREPARATION FACILITIES<
FM: >OFFCOM<
<
<
THE BUILT-IN SCREEN EDITING FACILITIES IN TOS OFFERS WORD WRAP AT 69
CHARACTERS (TELEX NETWORK REQUIREMENT) AUTOMATIC UPPER CASE AND
CONVERSION OF ILLEGAL TELEX CHARACTERS TO THE NEAREST TELEX
EQUIVALENT.<
<
THE EDITOR ALSO PERMITS FULL CURSOR CONTROL AND PAGE SCROLLING.
INSERT AND DELETE MODES ARE AVAILABLE FOR EASY PREPARATION AND
CORRECTION OF TEXT.<
<
TAB SETTING CAN BE ALTERED TO ACCOMODATE DIFFICULT FORMAT
REQUIREMENTS.<
<
THE SYSTEM ALLOCATES A UNIQUE MESSAGE IDENTITY AND DATE AND TIMES
STAMPS ALL MESSAGES (INCOMING AND OUTGOING) FURTHER ALLEVIATING THE
WORKLOAD ON OPERATORS.<
<
(THIS IS A SCREEN VIEW OF THE TOS EDITOR IN EDITING MODE).!
```

Fig 2 screendump of the full screen editor

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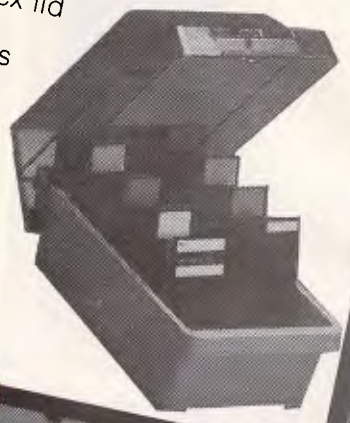

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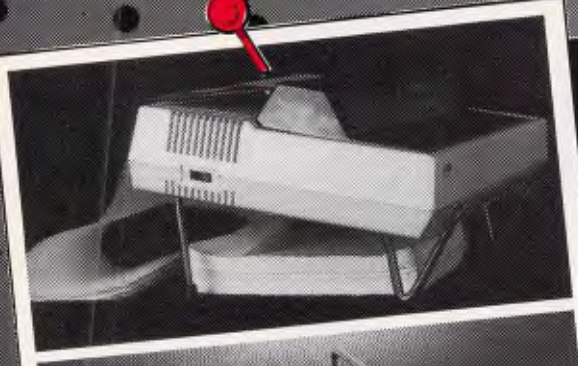

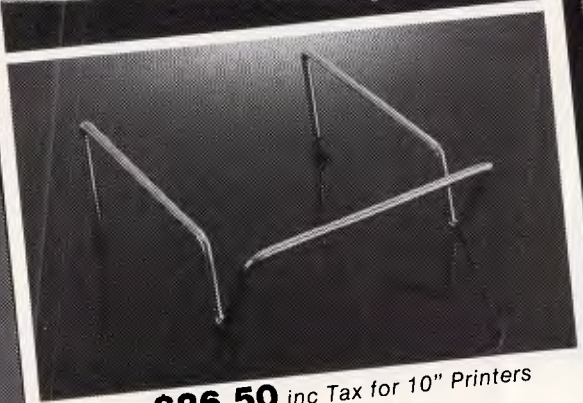

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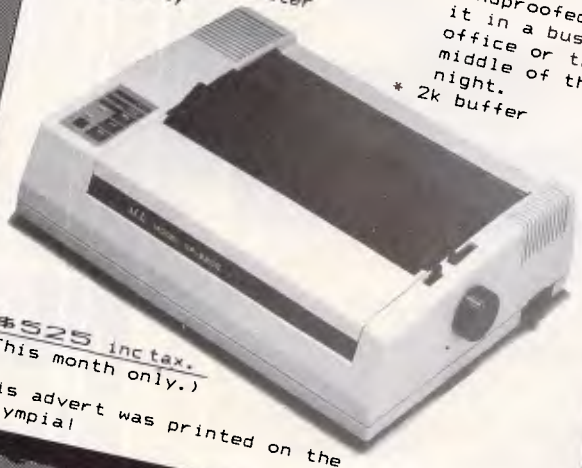

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in this mode.

Direct transmission also allows the user to send other documents across the telex network. These are expected to be close to standard telex format, although the TOS system will perform basic editing functions to convert line lengths to the required 69 characters, and perform basic character conversions where possible.

Such documents may, for example, consist of spreadsheets printed to disk, or word processing files output in ASCII format by other word processors.

TOS allows the editing of these documents, and will display illegal characters as a question-mark (?) for easy recognition and correction.

The operator may at any time check message status displays to check on transmission progress, and messages received. These displays are quite complete, and provide a good level of support to the telex operator. A sample status screen is displayed in Fig 2.

Additional features

TOS supports several features to aid in the automation of the telex process. The first of these is the facility to use 'mailcodes' to save details of regularly called telex subscribers. Facilities allow for the creation, editing and deletion of mailcode information. These are used during the transmission of telex files, instead of typing long names, numbers and callback numbers.

Two additional features are provided to poll either an area of disk or another input device for incoming text files.

This allows the system, for example, to be placed in a multi-user environment and continually poll a disk directory for files for automatic transmission. Thus, several operators may share one telex machine through standard word processing files. Serial ports may also be polled for incoming files, and the Irma card is supported for interfacing to IBM mainframe equipment.

These features dramatically increase the benefits obtained from the system, to the extent where it can become part of a large scale corporate communications network.

Mention is made in the TOS manual regarding connection to private telex networks through high-speed modems. These appear to be with private companies, and should be discussed with the TOS distributors.

Conclusion

I was pleased that this review persisted past the initial stages, as once installation and learning difficulties have been overcome the TOS package provides a great deal.

In talking to the developers and distributors of the package, I learned that many of the difficulties I experienced are currently being repaired — the ANSI.SYS driver is being eliminated, and the manual will shortly be rewritten. Once these two major gripes are removed, all other faults seem minor in comparison.

The TOS system will allow a company to provide telex operators with enhanced facilities, making their task much easier and more efficient. In any company with the need for more than one telex device, or where telex operation takes a major part of an employee's time, I recommend that the TOS environment be examined.

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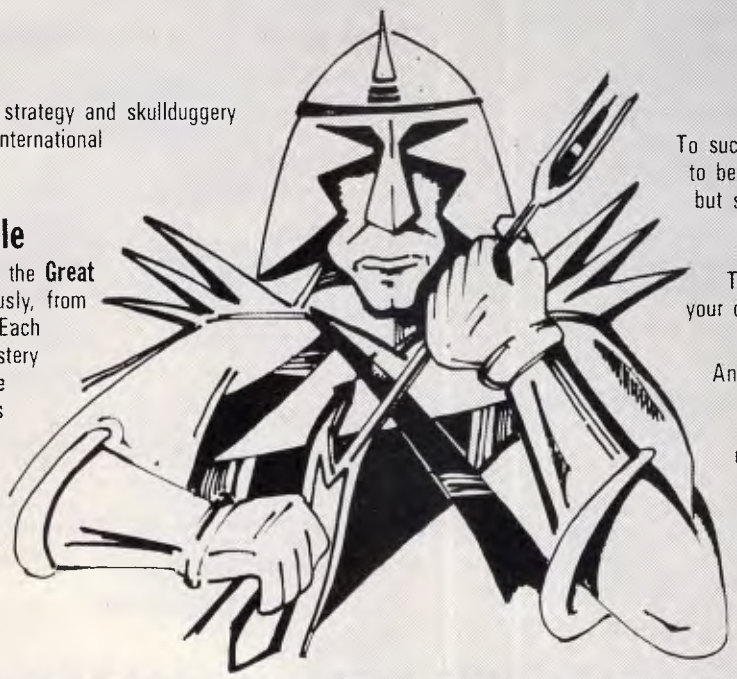

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Batch magic

DOS batch processing is notoriously slow, but it does have its uses. John DeHaven provides a compendium of tricks, techniques and curiosities for your reference.

What is the world's slowest interpretative language? This dubious honour surely belongs to DOS batch processing, which runs like *granny*. Let's go ahead and stretch a point and call DOS batch processing a language. It is useful to think of the statements of this language as including the traditional batch processing commands, all DOS commands and the names of any executable files (including other batch files) that are available in the default directory or via PATH.

Unfortunately, even if we generously expand the definition in this way, DOS batch processing still isn't a complete language, since it is not interactive and cannot add or even count. Even so,if you hold your jaw a certain way there is plenty of unsuspected power to be found. We'll explore generation and passing of variables, file creation, true calls with return, giant loops under control of 'FOR' and recursion. Batch processing is not really as boring as IBM and Microsoft try to make it seem.

The traditional (IBM/Microsoft) discussion lists only six batch processing commands, and we'll assume you have a working knowledge of these: ECHO, FOR, GOTO, IF, PAUSE, REM and SHIFT. Of these, ECHO is useful outside of batch processing, and FOR can be used outside batch processing to do some non-trivial things. Four other commands, COMMAND, CLS, EXIT and SET — are not usually mentioned as part of batch processing, although they would rarely be used anywhere else. We will use them all here.

Speed

One reason batch processing runs so slowly is that it makes a disk call for each line of code. Evidently then, a given batch file will run faster if you can reduce the number of lines in it. After you have a batch file running, you may be able to reduce the number of lines by combining some of them in a FOR structure. The following rules apply:

1 If statements have no argument, they may be combined;
2 If statements have the same argument, they may be combined; and
3 Statements with the same argument may also be combined with statements with no argument.

Here are some examples to illustrate the above points:

```
FOR %%A IN (CLS VER VOL BREAK
  VERIFY SET) DO %%A
FOR %%A IN (CLS A: ECHO PAUSE
  CLS) DO %%A Insert back-up
  diskette
FOR %%@ IN (CLS C: IF A:) DO
  %%@ EXIST PP. BAT PP
FOR %%@ IN (MD CD) DO %%@
  \ SDIR1
```

These work because certain commands like CLS and PAUSE (and certain other executable files you might have created) do not take any arguments, so when FOR expands them with an argument, the argument is ignored.

Batch files will run much faster if you allocate extra 'buffers' with CONFIG-SYS. Briefly, this specification allocates memory for disk I/O, one buffer per cluster read from diskette. When a disk call is made, these buffers are checked first, and if the record is already here, no physical disk reference will be made. The overhead cost is about 1k per buffer (*not* 512k as IBM states), above the default two buffers. Here is how you can be sure you have those extra buffers activated:

1 The disk from which you boot must contain a file called: 'CONFIG.SYS.'
2 This file must contain the statement:
  BUFFERS=9
  although a larger number will be OK.
3 For good measure, include the following two lines:
  FILES=99
  DEVICE=ANSI.SYS

The first of these will allow a much larger number of file handles to be opened than the default eight, at a cost of only 3783 bytes of memory. Many programs need more handles than eight, and you'll be disappointed in the performance of some of the following examples if you don't allow this extra latitude. As for the assignment of the ANSI.SYS driver, I can't imagine anyone with more than 16k of RAM not wanting this, because it allows control over screen colours and attributes, arbitrary cursor positioning and even keyboard reassignment (16-character keyboard macros at the DOS level without a fancy program!)

If you are echoing many lines to the display, you will find that it is much faster to put in a single line to TYPE a file that contains your multiline display. This will cost some disk space, since you will have to create this extra file. I usually denote such files as .SCR (for 'screen') files.

If you use labels in a batch file, those that are most likely to be called should be put near the beginning, as the batch processor scans the entire file from the beginning every time it looks for a label.

Control

Whether you use ANSI.SYS or not, the display understands the sequence ESC-[-2-J to mean 'clear the screen'. The CLS command in fact sends just this sequence to the screen. This means that you can include this string in any statements

you ECHO to the display and in any file that you might TYPE to the display. If you write your batch files with an editor that allows the insertion of the ESC code, you will be able to echo ANSI control sequences from the batch file. Some very nice effects are available. If we let the expression '^[' stand for the ESC code, the sequence

```
CLS
ECHO^[[2JInstall the back-up
   diskette in drive A.^G^[[5m
PAUSE
ECHO ^[[2K^[[0;1m
```

will clear the screen and display the prompt message followed by a beep and a *blinking* pause message. When a key is struck, the blinking pause message is wiped out.

You could output blank lines with ECHO followed by two or more spaces with DOS 2.x, but this no longer works with DOS 3.x. The sequence ESC-space-<255h> will work with DOS 3.x, the idea being to echo the invisible character 255 hex. On an IBM machine you can get this character if you hold the ALT key and press 2-5-5 on the numeric keypad. On other machines, or with certain editors, the procedure may be different.

You may want to shut up the display at some stage. To do this you set ECHO OFF so that you won't see the batch procedure running, but certain commands still natter at you. The bit bucket 'file' NUL may be used for this. If your file contains the statement

```
DEL *.BAK>NUL
```

then it will attempt to delete all back-up files. If there are none, the error message will be redirected into the 97th dimension and will not be seen. You could also get the effect with the statement

```
IF EXIST *.BAK DEL *.BAK
```

but this would require a bit of extra time for the existence test. IF EXIST only works for files in the *current* drive and directory, which is sometimes a bother.

Variables

There are four kinds of variables in batch processing. %0 returns the name of the batch file itself while %1, %2, %3 represent tokens passed in on the command line after the name of the batch file. %%A, where 'A' may be any character, is the form of a variable that takes successive values of the 'IN' portion of a FOR statement.

The usual literature does not make it obvious that a variable in the form %WORD% will return the value of a variable called 'WORD' that has been set into the 'environment'. To install such a variable, you execute a command, in or out of a batch file, of the form

```
SET VAR=SOME STRING
```

where VAR is the variable name, and the value is any string.

To see how SET works, try the following batch program.

```
ECHO OFF
SET X=NOT
ECHO THIS DOES %X% FAIL.
SET X=
ECHO THIS DOES %X% FAIL.
```

These variables set into the environment are made available to all executable programs, and this is how they are accessed by .BAT programs.

Often you may need to control batch file behaviour according to whether a variable *exists* or not (regardless of its value). The IF statement does not directly test for this; you must supply some minimal string on both sides of the '==' operator. I'll use a minimal string of '@' to show the two basic kinds of existence tests.

Executes if the variable %1 *exists*:

```
IF NOT %1@==@ . . .
```

Executes if the variable %1 *does not* exist:

```
IF %1@==@ . . .
```

Later we'll see some other uses for these techniques but, as an example, suppose you have a program that becomes memory-resident when called, and if called again will install another copy of itself, gradually eating up your available memory (some otherwise excellent commercial products have been known to behave like this). The program is not used every day, and is too large to install no matter what with AUTOEXEC.BAT. What you need is a batch program that calls this maverick program if it is needed, but only once per session. Let's suppose our resident-type program is called DBSORT. A batch file fragment that would do the trick might be:

```
IF NOT %SORT%@==
   INS@ DBSORT
IF NOT %SORT%@==
   INS@ SET SORT=INS
```

After DBSORT is installed once, the variable SORT is set to INS in the environment and, therefore, DBSORT will not again be called until the machine is rebooted.

Creating a file with a batch file

The command 'ECHO This is a test message >TEST.TXT' will create a one-line file named TEST.TXT which contains the words 'This is a test message'. One reason to do this would be to set a flag that will last between sessions. Things set in the environment go away with the power, but a temporarily-created file will not, and its existence may be tested by the IF EXIST statement of batch processing. Your AUTOEXEC.BAT might want to set up a large print spooler if you have a dot-matrix printer installed, and omit the spooler if a daisywheel unit is attached. The following statement in AUTOEXEC.BAT would do it, based on the existence or not of a file called DAISY.

```
IF NOT EXIST DAISY BIGSPOOL/128
```

At some point in your configuration procedure you could create the flag file if required with the statement:

```
ECHO Daisywheel printer installed>DAISY
```

You can create a temporary file and then use the temporary file to answer a question. Two commands that are hard to automate are DEL and PRINT, because under certain conditions they ask questions of the user. The following batch sequences will proceed without pause:

```
ECHO Y >YES
DEL *.* <YES
ECHO LPT1 >PSPEC
PRINT %1 <PSPEC
DEL PSPEC
```

In each case, if the procedure asks a question, it finds a file waiting with the answer, and it takes the answer from the file.

A multiple line file may be written a line at a time, by using the '>>' operator, which adds a line to a file. '>>' creates the file if it doesn't yet exist. The following sequence writes a three-line file (try it).

```
DEL TEMP
ECHO This is the first line
   >>TEMP
ECHO This is the second line
   >>TEMP
ECHO This is yet another line
   >>TEMP
TYPE TEMP
```

You could even write another batch file this way and then execute it! Here is how to create a program that keeps an activity log. First create a file that contains only a carriage return and a line feed by the following procedure:

```
COPY CON CRLF.BAT <return>
<return>
<CTRL-Z> <return>
```

We've named this weird little file

CRLF.BAT because there is another important use for it that we'll discover below. One use for this will come clear if you try

```
DATE <CRLF.BAT
```

and then

```
DATE <CRLF.BAT >LOG
TYPE LOG
```

This, then, would be your activity log program fragment. It records a date and time in file LOG whenever it runs:

```
DATE <CRLF.BAT >>LOG
TIME <CRLF.BAT >>LOG
```

For maximum speed we compress this to:

```
FOR %%@ IN (DATE TIME) DO
%%@
  <CRLF.BAT >>LOG
```

You could also use this technique to put *data* in a file. Below we will see how a batch file could read such data.

Chaining

As is well-known, if you name another batch file in a batch file, the next batch file begins executing. In this way batch files may be chained. This chaining can be used to cause an abrupt exit from a long batch file that runs slowly. Suppose the batch file has the following structure:

```
:LABEL1
<FIRST PROCEDURE>
GOTO EXIT
:LABEL2
<SECOND PROCEDURE
GOTO EXIT
.
.
.
:LAST LABEL
<LAST PROCEDURE>
:EXIT
```

This is likely to execute slowly because after any given procedure is executed, EXIT is called and the batch processor must read the whole file from the beginning to find the label in the very last line. If the do-nothing file CRLF.BAT is still available to DOS, the preceding program may be considerably speeded up by writing it in the following form:

```
:LABEL1
<FIRST PROCEDURE>
CRLF
:LABEL2
<SECOND PROCEDURE
CRLF
.
.
.
:LASTLABEL
<LAST PROCEDURE>
```

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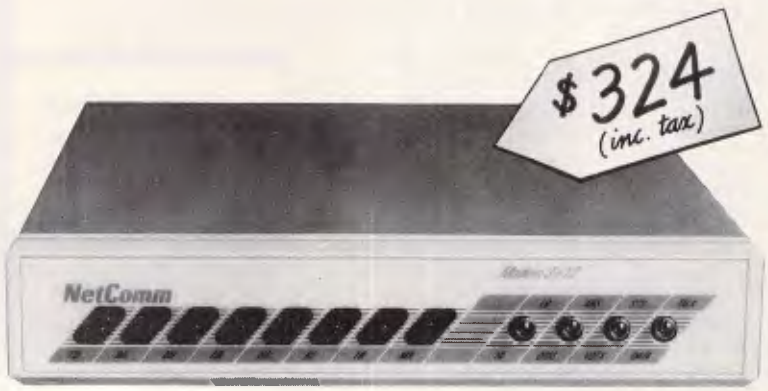

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Now, instead of searching the file for ":EXIT", the program will directly chain to CRLF and abruptly quit.

Using SHIFT

There are two good uses for the SHIFT command: to allow an indefinite number of command line parameters and to count. Suppose you have a print formatter called PRT.COM. You could feed several files to it with a batch file containing the following:

```
FOR %%@ IN(%1 %2 %3 %4 %5
  %6 %7 8% 9%) DO PRT %%@
```

This is fast enough, but is limited to nine arguments. This little program will accept unlimited arguments, using SHIFT:

```
:DO
  IF %1@==@ GOTO ENDDO
  PRT %1
  SHIFT
  GOTO DO
:ENDDO
```

or quicker:

```
:PROC
  IF %1@==@ GOTO ENDPROC
  PRT %1
  FOR %%@ IN(SHIFT GOTO) DO
  %%@ PROC
:ENDPROC
```

This is the most general form that will not execute if there are no arguments. A shorter (and therefore faster) version of this basic loop may be used, but this form will execute at least once, even if there are no arguments. Use it by all means if this does not matter.

```
:LOOP
  PRT %1
  SHIFT
  IF NOT %1@==@ GOTO LOOP
```

or quicker:

```
:LOOP
  PRT %1
  FOR %%@ IN(SHIFT IF) DO %%@
    NOT %1@==@ GOTO LOOP
```

If we can use CRLF.BAT to break out of the program, we can have the best of both worlds.

```
:LOOP
  IF %1@==@CRLF
  PRT %1
  FOR %%@ IN(SHIFT GOTO)
    DO %%@ LOOP
```

Soon we'll see a more advanced application of this principle. You can also use the command-line tokens as items to be counted. Write TEST.BAT:

```
ECHO OFF
CLS
:DO
  ECHO Display for token %1
  SHIFT
  IF NOT %1@==@ GOTO DO
```

Run TEST with several calls to see this work.

```
TEST
TEST 1 2 3
TEST X X X
TEST NOW THREE WORDS
TEST 1 TWO 3 2+2 5 6 7 8 9 TEN 11
```

PP.BAT

```
ECHO OFF
CLS
IF NOT %1@==@ GOTO %1
ECHO Enter PP E for elite          PP P for pica
ECHO       PP W for wide           PP C for condensed
ECHO       PP B for BOLD           PP D for doublestrike
ECHO       PP R to reset printer
CRLF
:E
ECHO ^[M^[1^G >PRN
CRLF
:P
ECHO ^[P >PRN
CRLF
.
.
.
```

Fig 1

Batch procedures

You may want to create a complex batch file to automate an obnoxious procedure, but perhaps you don't use it often enough to remember its complex call syntax.

The answer to this is to set the batch file up so it will give you some instructions if called with no arguments. For example, here is the start of my batch program 'DLOAD.BAT' which permits unattended downloading of partitioned datasets from the IBM mainframe, a procedure that could take hours. The actual download procedure is so slow that batch file speed is a negligible factor, so nothing is compressed into FOR loops here.

```
ECHO OFF
CLS
IF NOT %1@==@GOTO START
  ECHO DOWNLOAD PARTITIONED
    DATASETS FROM MAINFRAME
    ECHO
  ECHO SYNTAX: DLOAD DSN DIR
    MEMBER1 MEMBER2
    MEMBER3 . . .
  ECHO Where DSN   is the fully
    qualified dataset name,
  ECHO          DIR  is the
    destination subdirectory.
  ECHO and MEMBERn
    are any number of member
    names.
  CRLF
:START
SET DSN=%1
SHIFT
SET DIR=%1
FOR %%@ IN(MD SHIFT) %%@\%1
MD\%1 >NUL
SHIFT
:DO
  IF %1@==@ CRLF
  <DOWNLOAD PROCEDURE>
  SHIFT
  GOTO DO
```

Several techniques are used in this program. If DLOAD is entered with no arguments, the first IF statement detects this, and the instructions are echoed. When DLOAD is called with arguments, the first variable is set to %DSN% for later use by <download procedure>, then is shifted away. The second variable (now %1) is stored as %DIR% and then creates the desired subdirectory before banishment by shifting. The 'members' are shifted in turn into position %1 by the loop, until they are all used up. Exits from the program are by fast calls to CRLF.BAT, which was created earlier. If the attempt to make the subdirectory fails, perhaps because the subdirectory already exists, the resulting error message will be shunted off to NUL.

Menus

Fig 1 shows a program to control some settings for an Epson/IBM-type printer. It will display a menu if called without argument, but this menu may be bypassed if the user knows what to enter.

Calling batch files

Now we will see how we can call another batch file and return from it, as though it were a subroutine. If

you chain to another batch program, that's it — there is no return. The secret of true calls is the 'COMMAND' statement.

'COMMAND' loads another copy of part of COMMAND.COM into memory and gives it control. This does not consume as much memory as IBM would have you believe, since it does not load another copy of the whole 28k or 40k COMMAND.COM — it only loads another copy of the *command processor* which is about 4k. The new command processor runs quite independently of the previous one.

The command 'EXIT' purges the currently executing command processor and puts you back to the previous one. EXIT does nothing if entered into the one and only original command processor.

It is not obvious what the use of this is until you remember file redirection. What happens if the new command processor takes its input from a *file*? Try it by making a file full of commands, ending with EXIT. We'll call it GIZMO. (If you don't end this file with EXIT you'll never return; the computer will hang up for good.)

```
VOL
ECHO This line is from
  the called file.
VER
EXIT
```

Next create DRIVE.BAT and run it:

```
ECHO OFF
CLS
ECHO This line is from
  the main program.
COMMAND <GIZMO
ECHO This line is again
  from the main program.
```

This illustrates the general principles. We can vastly improve on this, though. The special form:

```
COMMAND/C string
```

says, in effect, to invoke a new command processor, feed it 'string' as an input command, execute the command, then EXIT. If we feed a command processor a batch file name, it executes the batch file. Because of this we can rename GIZMO to GIZMO.BAT and drop the EXIT command from the end, thereby converting it into a plain vanilla batch file. Change DRIVE.BAT as follows:

```
ECHO OFF
CLS
ECHO This line is from
  the main program.
COMMAND/C GIZMO
ECHO This line is again
  from the main program.
```

This is almost the effect we want.

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We are spared the installation message from the command processor, but the secondary command processor echoes everything. Even if you put ECHO OFF at the beginning of GIZMO.BAT it will still echo the first prompt and the ECHO OFF. If it is *really* important to silence everything, you can use redirection. Change the programs as follows:

GIZMO.BAT:

```
VOL >CON
ECHO This line from the
  called file. >CON
VER >CON
```

DRIVE.BAT:

```
ECHO OFF
CLS
ECHO This line from the
  original batch program
COMMAND/C GIZMO >NUL
ECHO This line again from
  the called program
```

The trick here is to send all output from the secondary command processor into NUL. Then we override this in the called batch file with redirections to CON for everything we really want to see. (More examples on this are given below.)

This call/return procedure can be nested to any depth that your memory allows, and you can play tricks with variables. Try these three batch programs.

MAIN.BAT

```
ECHO OFF
CLS
ECHO MAIN here. Are you watching?
COMMAND/C SUBFILE1 file speak
sub %1 >NUL
ECHO Whew! We made it back to
MAIN again.
```

SUBFILE1.BAT

```
ECHO This is %3%1 1 %2ing. >CON
COMMAND/C %3%12 %1 %2 %3
%4
ECHO Goodbye from %3%1 1.
>CON
```

SUBFILE2.BAT

```
ECHO Now %3%1 2 %2s. >CON
IF NOT %4@==@ ECHO
  What does "%4" mean? >CON
```

Try launching this collection with 'MAIN' and 'MAIN AXOLOTL'.

More practically, suppose I have a lot of programs to download from the mainframe with DLOAD.BAT. What I want are several members from each of several partitioned datasets. This whole procedure might take all night — I plan to submit a huge metabatch file when I go home in the evening. I can create a driver for DLOAD.BAT and off we go:

```
COMMAND/C DLOAD BNW.TE.CLIST
  TECLIST M1 M2 M3 M4 . . .
COMMAND/C DLOAD BNW.TE.SAS
  TESAS M1 M2 M3 M4 . . .
COMMAND/C DLOAD BNW.TE.
  TABLES
  TETABLES M1 M2 M3 M4 . . .
```

If nothing goes horribly wrong, I should return in the morning to find the selected members neatly copied into appropriate subdirectories.

Recursion

By now you may be saying 'All that is very well, but if a batch file can be made to call another file, what would happen if you asked it to call *itself* or maybe call another batch file that called the first one, or maybe . . .' Being of an inquisitive nature I explored some of these questions. The answer, in general, is that you *can* have any number of recursive chains or calls, so long as memory and file handles are available. If you are careful of counts and end conditions, you won't get in too much trouble. On the other hand, if one of these were to run away . . .

To ease into this subject, we'll consider recursive chaining first. Recursive chaining is an alternative to SET that initialises variables for further use by the program. The difference is that this way the program sets %1 through %9, so an operation like SHIFT might be used against them. Nothing fancy is needed for recursive chaining. Consider a file called CHAIN.BAT:

```
ECHO OFF
CLS
IF %1@==@ CHAIN 1 2 3 4 5 6 7 8 9
:DO
  ECHO <DO SOMETHING WITH
    FILE%1>
  SHIFT
  IF NOT %1@==@ GOTO DO
```

Here is a catalogue printer for your hard disk. Your various subdirectories are 'remembered' in the recursive call statement.

CAT.BAT

```
ECHO OFF
CLS
IF %1@==@ CAT DBASE LOTUS
  ORD WRK C
CD\
DIR | SORT >PRN
:LOOP
  DIR\%1 | SORT >PRN
  FOR %%@ IN(SHIFT IF) DO %%@
    NOT %1@==@ GOTO LOOP
```

CAT.BAT will print catalogues for any arbitrary selection of directories if called like this:

```
CAT DIR1 DIR2 DIR3 . . .
```

Suppose you have a file card ACTION.DATA which expects to find data in the form of tokens in a file called DATA.BAT. Possibly DATA-.BAT was generated by another program which could be another — or even this — batch file. DATA.BAT contains a statement as follows:

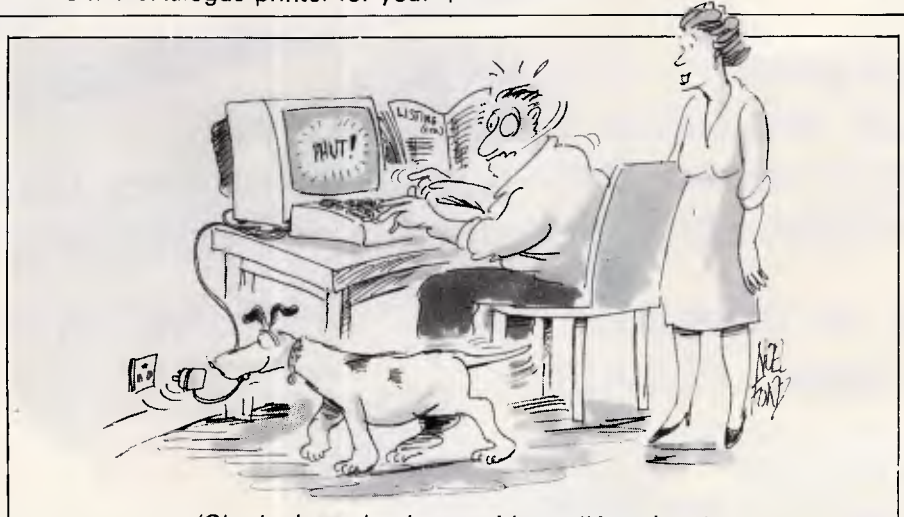
```
ACTION DATA1 DATA2 DATA3 . . .
```

ACTION.BAT starts as follows:

```
IF %1@==@ DATA
```

As we can see, if ACTION.BAT is called with no arguments, it will immediately chain to DATA.BAT which calls ACTION right back, passing DATA1, DATA2, DATA3 . . . to it as %1, %2, %3 . . .

So far I haven't been able to think of something I needed to do with batch processing that couldn't be done more easily some other way. No doubt the Lisp-wallahs out there will immediately think of several important applications. On the other hand, this may be one of those case which vividly illustrates the difference between what you get away with and what's useful. END



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Commonplace as they are today, music synthesisers are a relatively new phenomenon; they were almost unheard of until as recently as the late 1960s. It wasn't until bands like The Beatles and The Doors began to experiment with synthesisers in their recordings, that the record-buying populace really became aware of the revolution that was taking place in the world of music production.

Since those days of flower power and long, hot summers, the synthesiser has become an integral part of most bands' musical arsenal. In many cases, synthesisers have given people with little musical flair a chance to enter a world that would otherwise have been closed to them.

Over the past few years, another revolution, no less important than that which gave birth to the synthesiser, has been taking place; though this time the synthesiser's influence extends to computer programmers, as well as musicians.

MIDI

Although not as obvious as the product of the 1960s revolution, the Musical Instrument Digital Interface (MIDI) is in some ways more important. MIDI's purpose is to provide a standard interface between different manufacturers' keyboards, allowing the musician to play several units simultaneously.

More important, it provides the means to link a keyboard to a computer, turning the latter into a powerful control device for the former. And as MIDI allows two-way communication between keyboards, or keyboard and host, it makes sequencing relatively easy. For example, one keyboard can be made to play one part of a musical score, a second another, and so on — all at the same time. Then, as the keyboards are able to 'speak' to one another, each one can tell the others when to start and stop playing.

Although it has been around for some time, the MIDI is only now making its presence felt at the lower end of the computer market. Much of the reason for its slow emergence into the public eye has been the lack of software available to use it, and the limited availability of MIDIs designed to work with, say, the Commodore 64 or the Spectrum.

Japanese manufacturers have not been as slow to recognise MIDI's potential, and have already incorporated it as standard on their MSX machines. Occidental companies are still dragging their feet, although Atari has seen the light and has included a MIDI on its excellent ST range of micros.

To buy a MIDI and a good-quality synthesiser, you'd probably have to shell out upwards of $1000. However, Commodore has produced a powerful music package, based around its 64 and 128 machines, which turns them into a synthesiser or a MIDI-compatible recording studio. In spite of the recording studio providing the software to control up to six MIDI-standard keyboards, the Commodore packages do not include a MIDI to connect your micro to a synthesiser.

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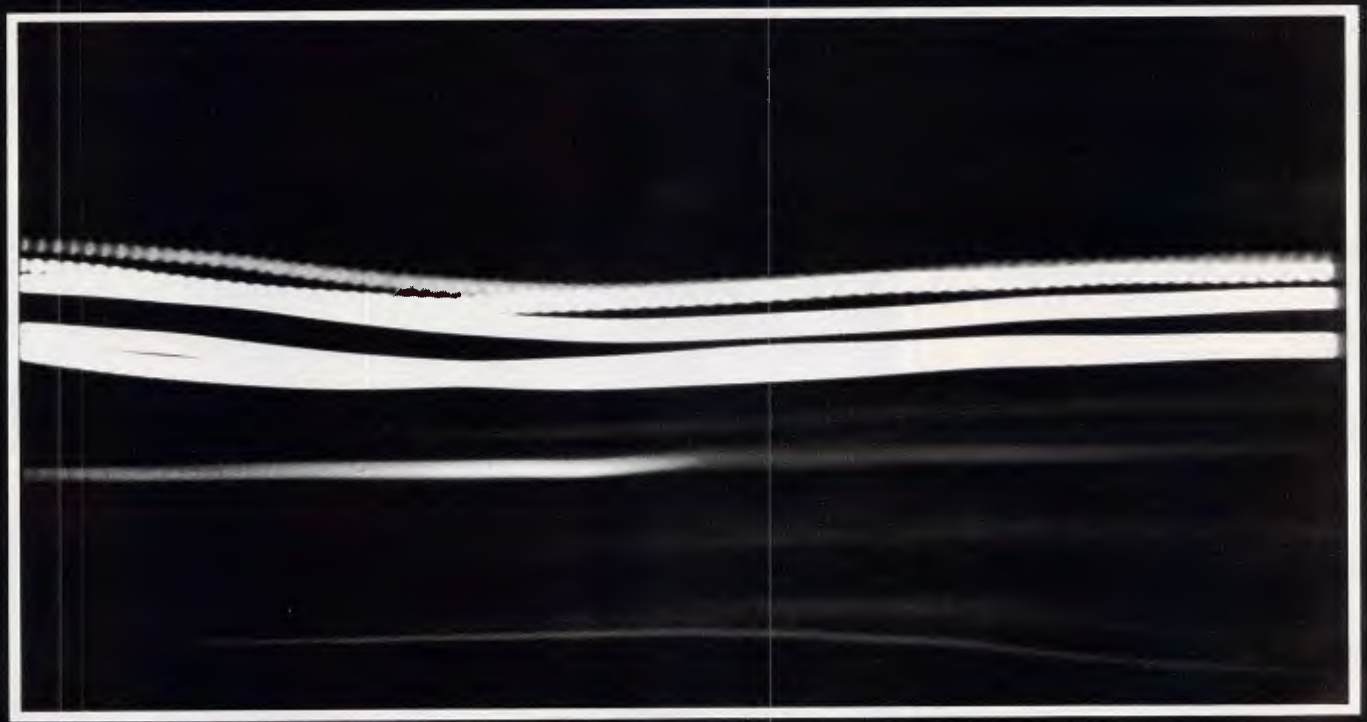

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From micro to music

Commodore's Sound Expander is a mixture of hardware and software which quite literally turns your computer into a stand-alone synthesiser. The hardware part of the package takes the form of a module which plugs into the cartridge port of your micro. Known as an FM Sound Expander, this rather uninteresting device apparently use technology similar to that found in more expensive 'hi-tech' synthesisers.

Inside this 20th-century musical box is a board strewn with seven chips, a mass of resistors and three interfaces.

Of the chips adorning the board, the largest is custom-built from Yamaha (a name synonymous with electronic keyboards, and giving a hint as to the system's pedigree). On the left-hand side of the board is a 16-pin interface, via which you can connect an external keyboard to the module; a larger edge connector, for interfacing to a MIDI, resides in the middle; and an audio output socket sits over to the right.

The software supplied with the module comes on either a disk or a cassette, depending on the set-up of your system, and contains a program to bring out the full potential of the FM hardware without taxing users' abilities to program. In fact, no programming is required at all.

An audio lead to put Sound Expander's produce through a Commodore monitor, a flimsy though comprehensive user's guide, and a leaflet full of chord stickers, are supplied with the software.

Before delving into Sound Expander's facilites and suggesting what you can expect to achieve with them, I'll describe the various methods of making music with the system. As I have previously stated, Commodore's Sound Expander can turn your 64 or 128 into a semi-professional synthesiser — that is, the micro can be used as a musical instrument if a suitable keyboard is added.

There are three keyboards at your disposal: the computer's own qwerty keyboard; a keyboard overlay; and a recently launched full-size 49-note keyboard which plugs into the 16-pin connector on the side of the hardware module.

The latter keyboard is by far the best for aspiring Rick Wakemans, and can be used with Sound Studio as well as Sound Expander. If you don't mind forgoing the luxury of the full-size keyboard, you can use the micro's qwerty keyboard or the keyboard overlay.

Software

The hardware module is the heart of the Sound Expander system, but can only be brought to life by the software provided with the package.

Loading the software produces a display showing a music stave in the middle of the screen, and a menu bar along the top of the screen, giving a choice of Set-up, Synth, Rhythm, Riff or Disk (disk version only). Playing a few notes on the keyboard at this juncture produces a rather nice vibraphone sound. As the notes are played, they're simultaneously displayed on the music stave.

Like most modern programs, the headings on the menu bar refer to a series of pull-down menus. Either a joystick or the function keys F1, F3 and F7 can be used to make selections.

The Synth menu is the most interesting in the early stages, because it allows you to change the musical instrument being reproduced when you hit a note. For instance, the default instrument is a vibraphone, but that can be changed to a guitar, one or two different organs, a flute, or one of three synths, to name but eight of the 12 sounds available.

The Synth menu also features an option to change the pitch of a voice by one octave, which is useful if you have some idea of musical tones.

Two further choices in the Synth menu are Ensemble and LH Voices. Selecting Ensemble allows you to enrich a sound, but this has the more noticeable effect of only letting you play four notes at once instead of the original eight. I'll deal with LH Voices when I cover the Set-up menu.

The 12 sounds (instruments) in the Synth menu can be slightly altered using the '?/' and '>.' keys. Pressing '?/' makes a sound brighter, while '>.' has the opposite effect, making the sound mellower. Pressing either of thse keys in conjunction withthe Shift key performs fine tuning or sharpening or flattening of the pitch, depending on whether you press the '?/' or the '>.' key, respectively.

The Set-up menu is concerned less with sounds than the way in which notes and chords are played when a key is pressed. (For this section, I'll assume that the optional full-size keyboard is being used).

Normal is the first option in Set-up mode. When this is selected, the same sound can be played over the full length of the keyboard.

One of the most useful Set-up functions is called One-Fingered Chord; this takes us into the realms of pseudo-musicianship, and is one of the reasons why some so-called musicians sound as good as they do.

Basically, One-Fingered Chord facilitates the playing of a three-note chord with only one key. When the function is selected, you need only press a single key at the lower end of the keyboard to produce the chord plus bass. On the full-size keyboard, this is a major chord which can then be changed to a minor chord by holding down a key to the left at the same time. Sounds simple, doesn't it? In fact, this is one of the ways in which some keyboard players in synthesiser-based pop groups get around deficiencies in their ability.

A really effective part of Sound Expander is its rhythm section. The package contains 12 pre-set rhythms as diverse as disco, rock 'n' roll, swing, march and waltz. Needless to say, these are all found under the Rhythm heading.

If a rhythm is used together with One-Fingered Chord, a complete accompaniment arrangement can be played in the selection chord. As the rhythm plays, the corresponding notes dance back and forth across the onscreen music stave. Even though I can't play a musical keyboard, I found that just being able to select a chord and hear a rhythm played with it is quite satisfying.

Chords need not only be played as described above, but can also be 'fingered'. A fingered chord is one that's made up of several notes and is not played by pressing one key alone. In this case, playing a three or four-note chord at the lower end of the keyboard produces a pre-set inversion of that chord plus bass.

Rhythms similar to those already mentioned can be played in Fingered Chord mode, except this time they're not initialised until a three or four-note chord is played.

Normally, a chord will cease to sound when you let go of the keys. However, Memory prolongs the chord, releasing it only when another is played.

Splitting the keyboard

In this review, whenever I have mentioned one-fingered chords or fingered chords, I have referred to them as being played at the lower end of the keyboard. However, selecting either of the respective modes automatically splits the keyboard. 'Splitting the keyboard' actually means that the keyboard is divided into two sections, either one having a different voice to the other (bearing in mind that in Normal

Sound Expander's vocal repertoire

Sound Studio's Editor function menus

The complex Step-time Sequencer

mode the same sound can be played over the entire keyboard).

Two keyboard voices can be selected from the Synth menu. The voice for the upper part of the keyboard is selected in the normal way, while the voice for the lower part comes from the LH Voices option. Clicking on LH Voices produces a sub-menu which contains all the different instruments found in Synth. For practical reasons, the split keyboard option is only available when the optional full-size keyboard is being used.

A couple of other little goodies in Set-up mode allow you to alter the way notes are displayed on the onscreen stave, and change the pitch of the keyboard by a maximum of six semitones up and five semitones down. Unless you have a trained ear for music, I doubt whether you'll refer to this option very much.

Other rhythms

I have already touched on the subject of rhythms, but two other features worth a mention are Intro and Outro. These are rhythm breaks which can be initiated by pressing the cursor up/down key and the cursor left/right key, respectively, while a rhythm is playing. As you've probably guessed, Intro is an introduction and can be used as a method of counting yourself in to a tune. Alternatively, an Outro rounds off a piece.

'Riff' is a term used to describe a constantly repeated phrase in jazz or rock music, typically played as a background to a solo improvisation.Over the years, guitarists such as Bo Diddly and Ritchie Blackmore have been responsible for some of the more memorable and often-copied riffs in rock music. In fact, it's the guitar riff which makes some songs what they are. You only have to listen to Deep Purple's *Smoke On The Water* to appreciate a riff's solid contribution to a rock piece.

Realising the importance of the riff, Commodore has included a riff machine in the Sound Expander package. This consists of several riff titles, each of which is made up of 12 pre-programmed riffs that can be sequenced together in any order.

When you select a riff title from the riff machine menu, the program assigns each of the 12 pre-programmed riffs to 12 individual keys on the keyboard. To sequence the riffs, you press the keys in the order that you want them to be played; pressing the first key will set the riff into action.

In what looks like a piece of blatant discrimination against cassette users, Commodore has given disk owners an additional set of riffs, alternative synth voices and more demonstration tunes.

Sound Expander is a superb add-on which has been aimed firmly at the home music market. All the sounds created with it compare favourably with those from a Casio CZ-101, although Sound Expander's efforts are accompanied by background hiss at times (perhaps that can be cured if you output the sound through the amplifier of a hi-fi system).

Name that tune

Commodore's other package, Sound Studio, is rather different from Sound Expander in that it's both a synthesiser and a home recording studio. I won't dwell on the Sound Studio in too much detail here, because it really needs a feature all of its own to do it justice. Instead I'll take a brief look at Sound Studio Editor, one of the program's major, and most powerful, facets.

Sound Studio Editor provides users with the facilities to create a multi-track arrangement, using the micro's built-in sound chip. Sounds can be played into the computer via a keyboard, one channel at a time, then played back and edited onscreen.

The computer only allows three channels to be used; but by linking the computer to a MIDI keyboard and using it as the sound source, you could double the number of channels to six. You could even let the computer play six MIDI keyboards simultaneously.

Sound Studio Editor comprises two menus: one containing the main editing functions; and the other containing the options for real-time recording. Real-time recording is the most interesting feature, as it allows you to input tracks by playing them on a keyboard, and it is done through a menu accessed from the Editor. Here, you'll find options to record and play back your tracks.

To record a track, you simply specify a number between one and three (or one and six if you're using a MIDI keyboard), then start playing. When you are finished, you can listen to the track by selecting 'play'.

When you have recorded a track, you can have any previously recorded tracks playing at the same time. However many tracks you record, it's still possible to listen to each one individually by selecting a track with the Playback Track Select function.

Step-time recording is rather different from real-time recording, in that tracks can be entered note by note. These tracks can then be edited in much the same way as the tracks recorded in real time.

Conclusion

Sound Studio is a powerful piece of complex software which, although it's aimed at home users, I would not recommend to Commodore owners who lack a sound knowledge of music and how it's constructed.

Together, Sound Studio, Sound Expander and the full-size keyboard make up a formidable music package. Each system is a high-quality package which other companies will be hard-pressed to beat.

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With cries of 'Fore!' and 'Good shot, sir!' Stephen Applebaum tees off for this month's games selection. Games for the Atari ST and the Macintosh are featured.

The tartan trousers brigade

GAME: Golf Construction Set
MACHINE: Commodore 64/128
SUPPLIER: ECP
PRICE: $39.95

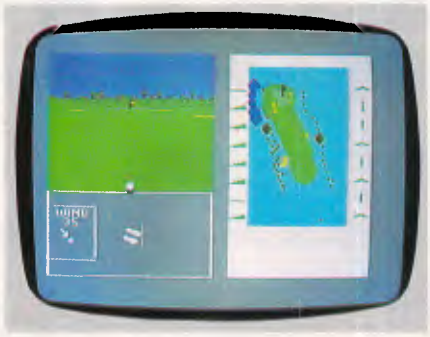
When Ariolasoft announced that it would be launching a golf simulation, I was unimpressed. With other golf games, if you take away the walk around the course, the fresh air and the nice scenery, there's little else left to enjoy. There's the golf, but the less said about that, the better.

Before I offend too many golfing readers, I must come clean and admit that for all my prejudices against golf, and the clubhouse, Golf Construction Set is a skilful paradigm of one aspect of the sport simulation genre.

Golf Construction Set is as close as you'll get to the real thing, on a home computer, at the present time. The disk version comes on one floppy, complete with four pre-programmed courses: the Belfry, Sunningdale, Wentworth Old course and Royal St George's; all of which have been lovingly reproduced, right down to the smallest undulations of the various greens.

Such fidelity means that playing a round in Golf Construction Set is no pitch 'n putt, but a full-blown, full-blown club tour of four of England's grandest professional courses.

Initially, novices will find the formidable layout of these circuits too hazardous to allow them to make any appreciable difference to their default handicap of 28. As a result, Ariolasoft has deferentially included a practice mode which, although it doesn't allow a handicap to be decremented indefinitely, does give novices a chance to input a lower handicap to simulate the standard of play encountered at a professional level, and play the various courses,



without having to enter a competition.

Two forms of competition have been incorporated into Golf Construction Set, the difference between them being the way in which the winner is decided. In Tournament mode, the winner is the player who has taken the least amount of shots over 18 holes.

The victor in Match mode, on the other hand, is the one who has amassed the greater number of winning holes — that is, the competitor who's put the ball in the hole before his opponent, the greater number of times.

The final scores in both modes differ quite dramatically, depending on the course and the weather conditions. Of the four courses, the most accessible when you're just starting out is the Belfry.

After loading Golf Construction Set and before 'walking' to the first tee, players are asked to satisfy several conditions. These include choosing a course and either pre-set or customised weather conditions. On Royal St George's it's advisable to alter the weather conditions to suit your experience, as the course is dogged by inclement weather, characterised by capricious winds.

Before teeing off, players are requested to select three clubs which they must leave behind in the clubhouse for the game's duration. A full bag contains five woods, nine irons, a pitching wedge, a sand wedge and a putter. Experience told me to foresake the two and four woods, plus the two iron, which proved to be a reasonably shrewd choice.

Most selections made in Golf Construction Set can be negated via a whimsically named Oops function. However, this has not yet been implemented at the club selection phase, so you are stuck with your first choice of rejected clubs. Golfers who accidentally leave the one wood, or driver, will find themselves at a distinct disadvantage on most of the holes, as it's necessary to achieve good distance from the majority of tee shots.

At the first tee, the display divides into three windows. The top-left window is a golfer's-eye-view down the fairway; while below is a box containing the contents of the player's bag, and information on the prevailing weather conditions. Other useful snippets of data are the number of the hole, its par, stroke index and length.

The largest window contains an annotated plan view of the current hole, and takes up much of the right-hand side of the display. This window contains the characters representing trees, lakes, bunkers, and so on, as well as special symbols down the sides of the window showing the drastic changes in gradient of the fairway and the green.

When you've selected a club from your bag, you must tell Golf Construction Set the general direction in which you wish to hit the ball, by moving a cursor on the aforementioned plan view — this also affects the view in the top-left window, which changes to display the new view. Only the ball's flight path is affected by

this option; factors such as distance and duration can be influenced by adding or decreasing the amount of loft on the ball.

'Loft' implies the angle of attack at the point of contact between the club-head and the ball. Although you can't alter the angle at impact exactly, you can select whether you hit the ball above or below its centre. Striking it above its centre gives the ball a low trajectory, while a low hit pitches it high.

If used properly, loft can successfully help you overcome strong headwinds or send the ball scudding along on a good tailwind. The effects of a cross-wind, however, can only be mitigated by applying the correct amount of fade to a ball.

'Fade' means that the ball will veer to the left or the right towards the end of its flight. A small pair of feet, displayed on screen, are moved to indicate the severity and direction of fade that you wish to use.

Finally, you're ready to take your shot. For this, the bottom of the screen displays a silhouette of a golfer who can be made to swing his club by pressing the fire button on the joystick. He continues to idly swing his club until you press the button again. The power of the shot depends on how far you let him swing back the club before you press the button a second time.

The flight of the ball is indicated by a dot moving across the plan view, and there is a 3D version of the same thing, as seen by the golfer.

On the green, the golfer's-eye-view changes to show an aerial shot of the pin. A cross-cursor appears, which you move to indicate where you want the ball to go when putted. Small symbols at the sides of the window indicate the lie of the green. Quite often, it's necessary to overcompensate on the power of a putt to overcome the gradient of some greens.

When you successfully put the ball down the hole, the program asks if you want to save the round for continuation at a later date. You're not obliged to, and can simply move on to the next hole.

When all 18 holes have been completed, a scorecard is displayed and your new handicap is calculated. Improvements in handicap can be saved onto disk.

Even were it only to contain the four pre-programmed courses, Golf Construction Set would be worth its asking price. But, in addition to these courses, Ariolasoft has provided a utility which allows you to design and save your own customised courses. This utility is easy to use, and allows everything featured in the game's four courses to be included in your own designs.

Golf Construction Set is, I'm happy to report, one of the best games to appear from Ariolasoft, guaranteed to keep house-bound golfers occupied.

An ordinary tale of country folk

GAME: The Black Cauldron
MACHINE: Atari ST
SUPPLIER: Ozi Soft
PRICE: $49.95

The Walt Disney studio has been responsible for some of the greatest moments in cinema history. Its *metier* has always been the full length animated feature, but in recent years these films have become a rare occurrence, due mainly to the phenomenal sums of money required to finance such a venture.

Disney's last attempt to recapture the magic of its golden years was the cartoon extravaganza, *The Black Cauldron.* Although this tale of good and evil contains much of the charisma and prodigious technical pazazz of its forebears, it lacks the winsom naivity which endeared earlier productions to their audiences.

For all *The Black Cauldron's* faults, Sierra On-Line has deemed it worthy of being turned into a game based around the film's flimsy plot. Whether the company thought the film strong enough to warrant a game, or used it because of the expedient of having the Walt Disney name on the packaging, is difficult to assess. Nonetheless, Sierra On-Line has produced a surprisingly good game, considering the film's chaste scenario and insipid characters.

Sierra's The Black Cauldron can be viewed as a follow-up to the company's King's Quest II, an earlier excursion into animated adventure territory. Both games are examples of a relatively new breed of adventure which relies on the player's ability to manipulate a joystick or a mouse, rather than typing accuracy.

In the game you play the part of Taran, a country boy under the patronage of an old savant called Dallben. At the beginning of the game you are happily going about the daily ritual of feeding Dallben's prize pig, Hen Wen, when the animal suddenly has what can only be described as an epileptic fit. Realising the significance of the affliction, Dallben produces a bowl of water into which he presses the animal's snout.

The result is an ethereal vision, importing to Taran and Dallben the Horned King's plan to kidnap Hen Wen and use her psychic powers to find the whereabouts of the Black Cauldron. Far from helping the Horned King fulfil any culinary aspirations, the Black Cauldron would provide him with no less than unspeakable power.

Thus informed, Taran follows Dallben's advice and takes Hen Wen to the demesne of the Fair Folk. Unfortunately, Taran's expeditious departure from the farm didn't give the doting Dallben enough time to tell him the whereabouts of the Fair Folk's cottage, leaving Taran and Hen Wen to run the gauntlet of the Horned King's Gwythaints (dragons).

After securing Hen Wen in the protection of the Fair Folk, safe in the knowledge that they won't have turned her into sandwich filling by the time he returns, Taran sets off to defeat the Horned King.

That, then, is the basic story of The Black Cauldron, and the ritual you must go through before really getting into the game.

SCREENPLAY

Like its forerunner, King's Quest II, The Black Cauldron is composed of a plethora of lavishly colourful pictures which can be navigated freely by the game's principal character, Taran. As you'd expect, Taran is under player control; he can be motivated with a joystick or the Atari mouse. Of the two, the joystick is much the better option, as the mouse tends to send our hero off-course.

As I have stated, Sierra has designed its graphic adventures so that they can be played without recourse to the computer's keyboard. Four basic commands cover almost every action in the game, and can be accessed by moving a cross-cursor over the Taran character and clicking once on the mouse's right hand button. This produces a small window containing the words DO, USE, LOOK and RETURN.

If you were to press the right hand mouse button twice, instead of once, you would open a full screen window giving Taran's inventory. The objects presented here are the ones referred to by the command USE.

The Black Cauldron's outstanding feature is its graphics. There are too many screens to store in the ST's memory, so Sierra has employed the old method of accessing individual screens when they are required. In the past this has made Sierra's adventures painfully slow, especially on the Commodore 64. Luckily the ST isn't dogged by slow access speeds, so the time which must be spent loading a screen is negligible.

Dallben's farm is depicted as a quaint, thatched cottage exuding smoke from its stone chimney. Inside is a flaming log fire over which is hanging a cauldron of hot, bubbling gruel — Hen Wen's dinner. Outside, next to a little straw-thatched barn, is a small pen and Hen Wen's abode. By taking the cauldron out to the pen, you can coax Hen Wen out of her 'hut' to eat the gruel.

Over the past year, we've seen companies constantly breaking new ground in the way adventure games are presented. Along with Mindscape, producer of the highly original Deja Vu, Sierra On-Line is part of a small group of companies which have seen the light early, and have taken full advantage of the immense possibilities offered by 16-bit technology. Even though it's streets ahead of similar programs, The Black Cauldron is still only a harbinger of things to come.

Machines such as the ST, the Amiga and the Macintosh have given us something to smile about, just when the home games market was in peril of stagnation.

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Illustration by Dolores Fairman

Wise moves

In the first part of our series on A1 research and development, David Levy presents chess and poetry as arguments for, and proof of, computer 'intelligence'.

This is the first of a series of articles on Artificial Intelligence, a branch of computing which is becoming very important and enormously popular. These articles do not require any prior knowledge of the subject, nor do they assume any understanding of computers or programming. They are intended for anyone who would like to learn how computers think, and anyone who is interested in knowing the extent to which computers are able to compete against man in various intellectual endeavours. The subsequent articles will each describe a particular area of AI.

In this article, I'll present the somewhat philosophical question of whether or not computers can genuinely be called 'intelligent'.

I once heard intelligence defined as: 'That which is measured by an IQ test'! Almost every dictionary and encyclopaedia has its own definition of the word 'intelligence', but it isn't important which definition is used for the purpose of this article — each reader may assume his or her own definition of the word. In fact, it is sufficient to state that when we consider intelligence in a computer program, what we mean is some kind of accomplishment which, if it were performed by a human being, would lead us to assume that a particular human being was 'intelligent'. A simple example is the game of chess. If you tell someone that you are a Chess Master, he will usually consider you to be highly intelligent, so it is reasonable to argue that the two computer programs which have been officially awarded the title of Master by the United States Chess Federation must also be highly intelligent.

Strangely enough, not everyone accepts this argument, for reasons which I believe to be emotive rather than logical. I have encountered numerous intelligent people who do not *want* to believe that any type of computer system could possibly exhibit genuine intellectual prowess. Yet these same people will agree without reservation that a human who plays chess well, composes music, writes poems, or can prove theorems in logic, *must* be intelligent. I suspect that such people are harbouring a subconscious fear of the day when a computer will prove itself intellectually superior to mankind. A friend of mine who is an International Master at chess, on being asked how he felt about being one of the first titled players to lose a game to a computer, said: 'This is something completely outside my frame of reference.' Yet even the lowly pocket calculator, which can be purchased for $10 or less, is capable of performing arithmetic feats several times faster than any human being, and arithmetic is certainly an intellectual endeavour, so why not accept that computing machines can also be superior to man in other areas of intellectual endeavour?

The English mathematician Alan Turing, who was one of the founding fathers of computer science theory, proposed a test to determine whether a computer program could justifiably by called *intelligent*.

Put simply, the Turin test works like this, You sit in a room with some kind of terminal — perhaps a telex machine. Using this terminal, you can communicate with whoever or whatever is in each of two other rooms. You know that in one of the rooms you are communicating with a computer program, and in the other room with a human being. You can interrogate each of them, and if, after the interrogation, you are unable to determine which is the computer program and which is the human being, then the program can justifiably be said to be intelligent.

One of the earliest examples of a program passing the Turing test was 'Doctor' — this simulated the interrogation of a psychoanalyst. One woman who was exposed to the program via a computer terminal, and who was told afterwards that she had been talking to a computer, is reported to have said: 'That's impossible. It must be human. Only a human being would understand me so well.'

Aspects of intelligence

There are two important aspects of intelligence which should be distinguished, and it is interesting to consider whether computer programs can successfully compete with humans in both of them. I am referring to the ability to achieve an impressive result and the ability to achieve creativity. In chess, there is no doubt that the best computer programs can achieve an impressive result, as a number of human Masters and even a few Grandmasters are able to testify. But is the way in which the best computer programs play chess aesthetically pleasing to a chess expert, and stylistically similar to human players? The answer is emphatically 'Yes!'

Black to move

The above position occurred in a game between two computer programs at the 1978 North American Computer Championships. Black was already well on top, but the combination with which he (or it) concluded the game would be described by most chess experts as beautiful. Black first sacrificed a rook: 1 . . . Rh8xh2!

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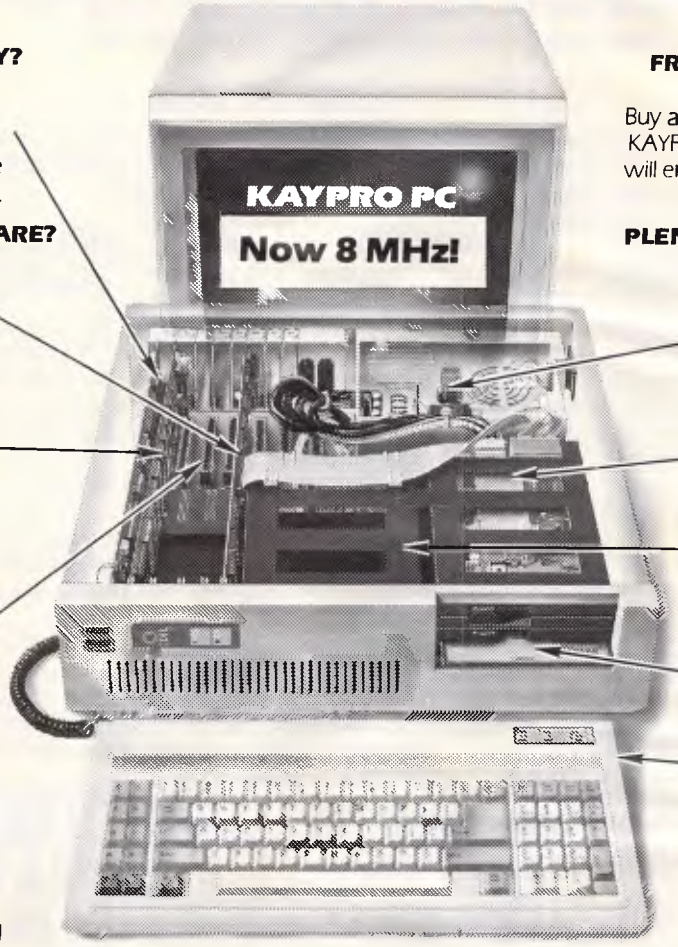

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This move threatens mate by 2 . . . Qe7-h4 and 3 . . . Rh2-h1 mate.

2 Kg1xh2

Another possibility, also 'seen' by the computer, is 2 Nc3xe4 Qe7-h4 3 Ne4-g3 Qh4xg3! 4 f2xg3 Nd4-f3 mate. This is a beautiful variation, and would have ended the game in a manner which would make any Grandmaster proud.

2 . . . Qe7-h4+

3 Kh2-g1 Ne4-g3!

Again threatening mate with the queen at h1, and if 4 f2xg3 Nd4-f3 mate.

4Qd1-h5

The only way to prolong the game.

4 . . . g6xh5

5 f2xg3 Nd4-f3 mate

It could be argued that because the program had 'seen' to the end of the game at the moment when it made the rook sacrifice, this combination cannot really be described as brilliant or beautiful. It could also be argued, for the same reason, that it is unfair to use this example to try to prove that the winning program performed in a human-like way. For those sceptics among you, read on.

The West German Grandmaster Helmut Pfleger once gave a simultaneous exhibition against a few dozen opponents, three of whom were, in fact, computer programs. The chess players sitting at three of the boards had earpieces, through which they were told what moves to make on their boards. People in the balcony were watching the games and feeding Pfleger's moves into three different computer programs. At the end of the exhibition, Pfleger was asked if he had noticed anything special about any of the games. He had not. He was then told that three of his opponents had been computer programs, and asked whether he could guess which ones. He could not. When it was revealed to him that one of his victors, in a consistently-played game, had been a program, he was incredulous. Surely, if computer programs can play chess well, and in an aesthetically pleasing and human-like style, then it must be said that these programs have passed the Turing test and they should be acknowledged to be intelligent.

There are subjects less specialised than chess in which the average person is more likely to be able to express a valid opinion regarding aesthetic achievement: take poetry, for example.

Consider these two short poems:

Woman, why do you create your face
In the fountains of New York?
'The fountains are gracious,
And the nightmares guard them.'
and
Late and the getting later moon calls
After a poet who grabs at the sky,
And on his knees, stumbling drunk,
Prays for Li Po's immortal soul.

One of these poems was written by a computer program and one by a human being. As an experiment, I showed both poems to guests at a recent party, and asked them which they preferred. I did not tell them that one of the poems was computer-generated, although some people guessed as much. Of the 19 people who expressed a preference, nine chose the first poem and 10 the second.

The party guests were not experts on poetry, but that doesn't matter. After all, a creative art is well performed if it appeals to people, so the fact that two poems are almost equally popular suggests that they are almost equally 'good'. If a computer program is capable of writing poems which are 'as good as' those written by acknowledged human poets, then surely the program must itself be acknowledged as a poet, and therefore it must be intelligent.

'. . . when we consider intelligence in a computer program, what we mean is some kind of accomplishment . . .'

Do computers think?

The simplest answer to this question is 'No', *but does it really matter?* It is the result which is important, and the intellectual acrobatics which produce the result, either in man or machine, are irrelevant in assessing the achievement. Programs which play games well usually do so by analysing a vast number (often running into millions) of different possibilities, whereas human experts will normally examine 100 possibilities, or even fewer. The computer program will rely, for its analysis of a game situation, on some kind of numerical model that helps measure the merit of the situation, whereas a human player will often use intuition to differentiate between good positions and poor ones.

We can, therefore, see that the way in which computer programs think about chess and other games is totally different from the way in which human experts do so, yet the result is very often the same. The human master and the strongest program will play the same move in a chess game perhaps 75 per cent of the time, or even more often, and when the two differ in their choice, there will usually be little difference between the true merits of the different moves.

The implications

The goals of AI researchers include producing a program which can play chess as well as a human World Champion; creating 'expert systems' which can provide answers to everyday problems within specific environments; finding methods for automatic deductive reasoning; and developing systems which can listen to, and understand, human speech. If these goals can be achieved to perfection, the world will suddenly become a very different place. The Prime Minister's home computer would be able to defend any Australian ally with the minimum loss of life on our side, for is chess not a model of strategic warfare? Mr Keating's programmable pocket calculator could plan and print out how the economy should be run for the following year while he was in the car on his way to Parliament House to deliver the Budget speech — his expert system, programmed with all the rules of economics and human behaviour, would be more accurate than he could ever hope to be. Every court case in the land could be decided by an electronic 'judge', programmed with the legal precedents, the laws and the facts of the case — the judge would ask questions, listen to the answers, make deductions, consider the arguments, and pronounce judgment and sentence.

It all sounds rather far-fetched, doesn't it? But 100 years ago, if my great-grandfather had told your great-grandfather that within a century there would be men on the moon, your ancestor would almost certainly have ridiculed him. Developments in modern technology are moving so very much faster now than they did then, and so much funding is being poured into Artificial Intelligence research in the US (mainly by the military) and in Japan, that I can see all these predictions turning to reality within the first few decades of the 21st century.

If you would like to know how computers are being programmed to 'think', make sure you read next month's article.

Answer

The author of the first poem was a computer program written by Marie Boroff. The poem was published in Computer Poems, *edited by Richard W Bailey, Potagannissing Press, Drummond Island, Michigan.*

The second poem was written by John Fairfax, and published by Sidgwick & Jackson Ltd in his collection Bone Harvest Done, *which was the author's fourth published collection of verse.* END

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At your service

This month Peter Tootill and Steve Withers look at the videotex system, Elderlink and the prospect of cheaper modems.

Elders Pastoral has been running a videotex system called Farmlink for some time, but it has obviously been aimed mainly at the company's rural clients. Elders has now decided to rename the system and market it more widely, with particular emphasis on the financial applications.

Timothy Ryan (who works on the research and development side of Elders' rural information services department) explained that Elderlink's biggest technical advantage over Viatel is that the system runs on a Vax supermini, which can run a number of different application 'behind' the videotex facade, without the need for gateways. An example of this is the share portfolio system. Apart from giving access to fairly up-to-date sharemarket information (prices are 30 minutes behind the markets') a user can record his or her portfolio and very quickly and easily view the current position of the relevant shares. From the demonstration we saw (and our own experiments), it certainly seems more convenient than a similar service on Viatel.

Apart from the rural information (like stock prices and a wide variety of calculators), Elderlink has much in common with Viatel — games, teleshopping, and the like. In some cases, identical frames can be found on the two services. One major difference is that Elderlink charges depend only on connect time —there are no frame charges.

It seems to us that Elderlink and Viatel are not really competing with each other at present. Farmers, graziers, and the like are well served by Elderlink, which is clearly weaker in other areas (notably in computer-related material). Financial information is an important exception, and is an area where the private sector is giving Telecom a run for its money. If Elders targets other areas as effectively, the results will be interesting, to say the least.

Modems

We recently commented on the (high) price of modems. A reader living in Canberra contacted us to point out that this is due largely to the 30 per cent tariff imposed on such items, and that this rate would be reduced to 2 per cent on July 1. So, by the time you read this, modems should be considerably cheaper — but the change might not be reflected in the advertisements in this issue, as they were prepared around the same time as this column.

Just to show that Australian companies can compete overseas, we were glad to read (on Viatel) that Datacraft has won a contract with the Tokyo office of an international bank for the supply of $US50,000 worth of short haul modems. Apparently the Telelink modem allows speech and data to be passed simultaneously over lines switched by a PABX, making it a pretty useful item.

System news

Last month we mentioned a new system in Melbourne for fantasy role-playing gamers. TI Comm is now on-line and details are shown below. This month (for some reason) all of the new systems are in Melbourne. Surely it's just a coincidence?

We have heard of an interesting developent in the UK. A user group for IBM PCs (and compatibles) operates a multi-user bulletin board consisting of three PC compatibles and an IBM PC/AT, each running Fido software, and networked together. There are six phone lines, with plans to establish regional nodes connected via PSS (the equivalent of Austpac) to reduce the phone bills. In the longer term, dedicated data lines are being considered for these links. We were also intrigued by the proposed solution to keeping the 300-odd megabytes of public domain software on-line: the group is producing a CD-ROM containing the whole lot!

If you have a genuine interest in the CD-ROM, it might be worth contacting The Compulink User Group, 67 Woodbridge Road, Guildford, Surrey GU1 4RD, United Kingdom; phone the Compulink BBS on either 0011 44 483 573337 (4 lines, V21 and V23) or 0011 44 483 553338 (2 lines, V22 and V22bis).

Readers of this column will be interested to know that under the sponsorship of AED, an attempt is being made to compile and maintain a definitive list of Australian bulletin boards and related systems. We hope to participate in this effort as it should help to provide accurate information for all users.

This month's information providers were John Halkiadakis (you're becoming a regular, John!), Alan Williamson, and the anonymous sysop of TI Comm.

Corrections and updates

Victoria

68000 Information Exchange. (03) 579 0934. P. Robert Nagy. 24 hours daily. Amiga, Atari, Macintosh.

ABE Computers. (03) 288 3599. M. 24 hours daily. V21, V22. $10 membership.

Down Under Software. (03) 429 8079. P. 24 hours daily. V22, V22bis, V23. Also on (03) 429 5819 for V21 and V23.

Pacific Island. (03) 890 2174. P. Craig Bowen. 24 hours daily.

PC Oasis #1. (03) 848 3331. P. Alan Williamson. 24 hours daily. Includes on-line sales.

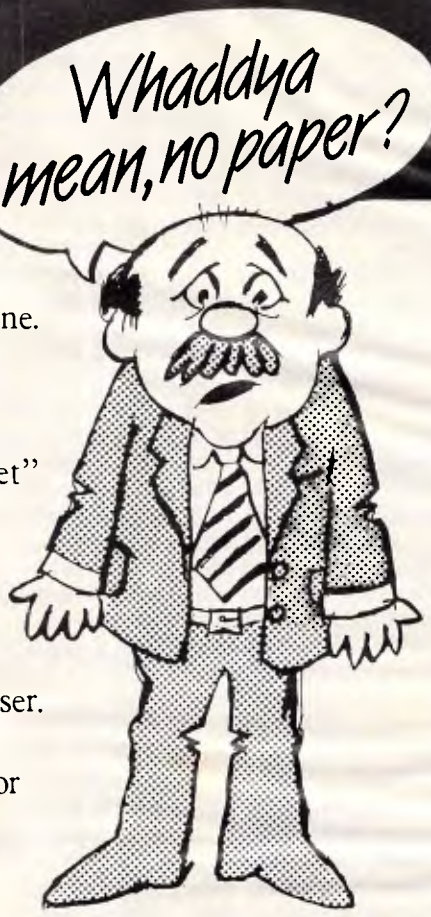
PC Oasis #2. (03) 898 3922. P. Craig Wilson. 24 hours daily. Includes on-line sales.

Public Resource #1 Permanently offline.

Thunder-Net Amiga. (03) 791 1124. P. Blue Thunder, Fozzie Bear, and The Wizard. 24 hours daily. General and Amiga users.

Ti Comm FRP BBS. (03) 379 5123. P. Anonymous. 6pm-midnight weekdays, 8am-midnight weekends. Lead or participate in fantasy role-playing games. END

Chances are when you get your new computer, there'll be something missing.



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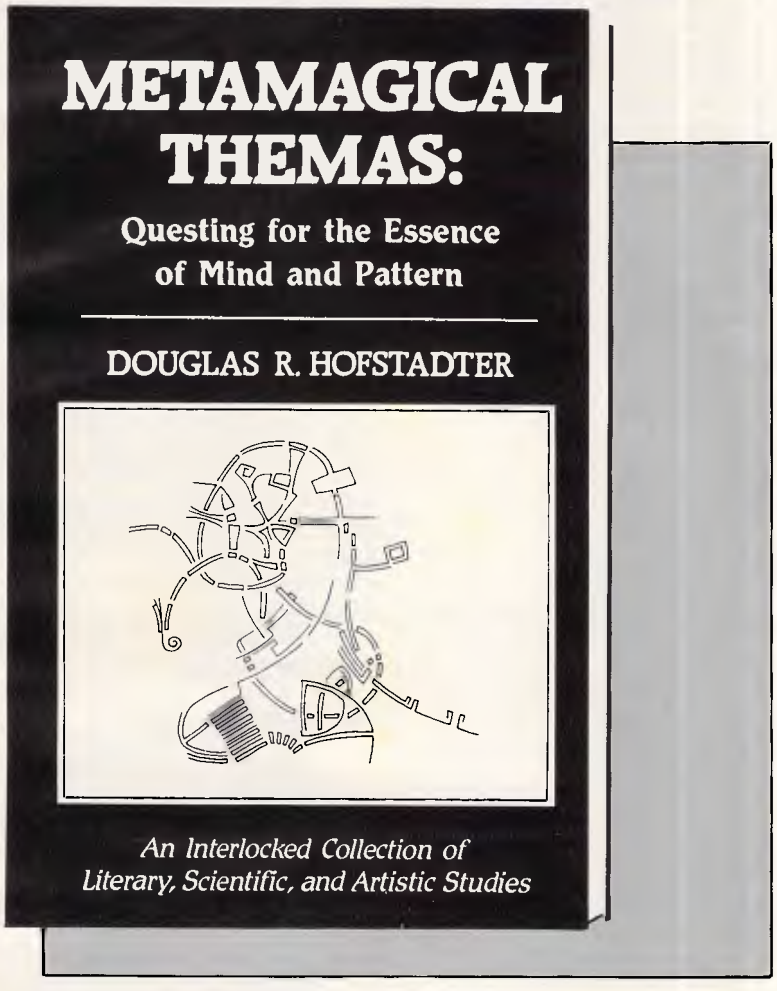
There's one man's view of life in 2024 and an American's view of how the Russians do their spying in this month's book choice, reviewed by David Taylor.



Mad as a Hofstadter

None but the highest of brows should tackle this dense and hefty tome: a kind of Old Hofstadter's Almanac of essays by a Pulitzer Prize-winning polymath, recently given *carte blanche* in the indulgent columns of *Scientific American*.

The result is a brain-twisting rummage through some thornier thickets of scientific, literary and artistic thought, often combining the author's passions for mathematics, music and philosophical fireworks.

And, of course, for feisty phrases like *Metamagical Themas*, which gets a questing essay all to itself.

We're in the coruscating company of one who is best known for *Godel, Escher, Bach* ('a metaphorical fugue on minds and machines') and one who perseveres in swerving pursuit of patterns in perception, pointers toward the nature and nub of intellect, cognition, or, come to that, having fun with Rubik's Cube, unscrambling DNA and why lately we seem hellbent on blowing ourselves to thermonuclear bits.

Don't imagine it's an easy read. But it is, if you can take it, a teasing and entertaining one: as for instance where Hofstadter, contemplating exaggerated claims often made for Artificial Intelligence, asks us to acknowledge what vexing complexity there is in the letter 'a' — on the face of it so simple and elementary an object for any smart-thinking machine to grasp, yet in practice one which may readily be represented in umpteen typographical fonts and styles, never mind human handwriting flourishes, all so subtly different as to defy precise geometrical analysis.

Figure that one out and you still have 25 letters to crack, and that's just the English alphabet. So see how long it takes you to teach a machine to pick out faces in a crowd, Hofstadter says.

And God forbid, quips he, that we ask a computer to come up with a formula which represents the essence of Bach. 'But even though I find the prospect repugnant,' Hofstadter adds, 'I am greatly attracted by the effort to do as much as possible in that direction. Indeed, how could anyone hope to approach the concept of beauty without deeply studying the nature of formal patterns and their organisations and relationships to Mind? How can anyone fascinated by creativity and beauty fail to be intrigued by the notion of a 'magical formula' behind it all, chimerical though the idea certainly is . . . or fail to see in computers the ultimate tool for exploring their essence?'

Myself, I can quite easily fail on that, but I wouldn't deny that Hofstadter is a captivating live-wire who, whether he's musing on life's pith and moment or just joshing with The Magic Domino, commands and holds attention. If by chance you're questing for a thought-provoking book of snippets to read on the loo, this one's a winner.

Title: Metamagical Themas: Questing for the Essence of Mind and Pattern
Author: Douglas R Hofstadter
Publisher: Viking/Penguin
Price: $50

Crystal balls

I rather fancy Tuscany, myself, though it might as well be Timbuktu. Tahiti appeals to many, it would seem, while others favour some mountainous retreat, perhaps, or a life beside the sun-kissed Med. The fact is, *anywhere* will do (though I don't see Wagga Wagga at the top of anyone's list).

The speculation is this: *where in the world would you want to live (and work) given absolute freedom to choose?* It sounds like an idle dream. It *is* a dream, right enough, says Normal Macrae, but maybe it's not that idle. The days of the office are numbered, he asserts; universal use of computers and modems will soon see to that. And if the office is gone, then its white-collar workers will soon be off, too. They can work from home, from desk-top terminals, work down phone lines, from anywhere they please.

Such is Normal Macrae's vision of what he calls 'the third great transport revolution of modern times (successor to the railways and motorcars).' By the early years of the 21st century — which is not long, now — *telecommuting* will no longer be a science fiction word. People whose work required them only to use their brains (which in the rich, developed countries already means most people) will no longer have to put up with the rat-race and the rush-hour. So they won't.

Some of them will live out in space, Macrae carries on, getting into his futuristic stride. Then we'll discover intelligent beings on other planets, he says (there's no stopping Norman now) who, by about 2024, will send greetings and some matey advice across the cosmos.

Back on Earth, meanwhile, central government will have been discredited, and war acknowledged to be pointless. Energy will be limitless, famine conquered too, and poverty sorted out through the benevolent auspices of *Centrobank*. We shall all be fit as fleas, since genetic engineering and wonder drugs will do away with illness. The arts will flourish, but crime and anti-social behaviour will wither away. And so on.

Isn't science wonderful? It sure is — and science fiction is even better. Nothing if not optimistic, he's my kind of crystal ball-gazer, is Norman.

Actually, he's deputy editor of the English magazine, *The Economist* and not, therefore, completely off his chump. Readers are teased by his actual analysis of the way the world has gone since 1974 and then plunged into his fevered, yet just about plausible, prognosis of the way we'll all stumble along towards 2024. Daft as you like, but unsettling besides and entertainingly done. All in all, a much livelier read than *The Economist*.

Title: The 2024 Report (A Concise History of the Future 1974-2024)
Author: Norman Macrae
Publisher: Sidgwick & Jackson/ Hutchinson
Price: $24.95

Clock and skulduggery

Despite that nice Mr Gorbachev, with his jaunty trilby and engaging smile, it would seem that the Russians are up to no good. Jay Tuck, an all-American fact-finding journalist based in Hamburg, says you would not credit what goes on. The shifty KGB will pinch anything, he says, especially if it's marked Top Secret.

I'm sure he's right, but not quite so sure whether I want to read all about it. What we have here is a dossier of murky and nefarious tales which might just as well be spy fiction. There are corpses in the snow, eccentric inventors selling secrets to the Russkies via labyrinthine backdoor routes, corrupt and clandestine trade in high-tech through a maze of mysterious middlemen, creepy labs in secret Soviet cities under the iron fist of 'Directorat T', and gung-ho US counter-insurgency agents operating 'Operation Exodos'.

I'd have liked more sultry temptresses called Natasha, perhaps, but otherwise it's all there in the best Le Carre tradition. The unfortunate chap gunned down in the snow, by the way, turns out to be a French agent who had penetrated the innermost circles of the KGB. His name, *zut alors*, is Bernard Nut. And as straight-faced Mr Tuck quite rightly says: 'Monsieur Nut was no ordinary spy.'

No doubt this is really a terribly serious issue — and the Americans certainly are now trying to crack down both on Russian espionage and on the trickier trade which smuggles their high technology out with the connivance of dissaffected dealers or just greedy crooks. Nevertheless, because Mr Tuck cannot resist the ooh-er style of whatever-next writing, his book comes over as a caper . . . *'I don't know what's in the crates that I shove around every day. Maybe guns, maybe heroin, maybe even a dead horse. I don't know and I don't care. It isn't healthy to ask too many questions in this business.'*

Nor, I'd imagine, to read too many now-it-can-be-told books in this vein.

Title: High-Tech Espionage: How the KGB smuggles NATO's strategic secrets to Moscow
Author: Jay Tuck
Publisher: Sidgwick & Jackson/ Hutchinson
Price: $38.95

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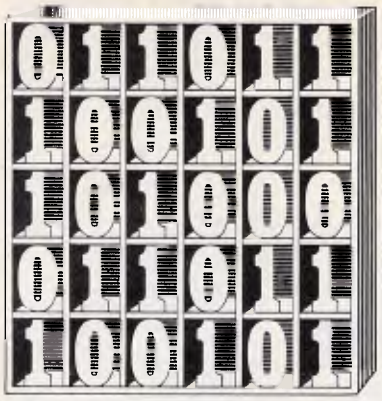

David Barrow presents more documented machine code routines and useful information for the assembly language programmer. If you have a good routine, an improvement or conversion of one already printed, or just a helpful programming hint, then send it in and share it with other programmers. Subroutines for any of the popular processors and computers are welcome but please include full documentation. All published code will be paid for. Send your contributions to Subset, APC, 2nd Floor, 215 Clarence Street, Sydney 2000.

6502 PARITY

Datasheet 1, PARBYT, is the best solution to the 8-bit parity problem posed in May's Sub Set.

The original parity routine calculates the parity of a 7-bit value by summing the data bits from a stacked copy of the value and placing the lowest order result bit in bit 7 of the value. At 24 program bytes, three stack bytes and up to 152 clock cycles, the routine was not efficient.

PARBYT, by Richard North achieves efficiency by eliminating stack workspace, which is slow to access, and by using the exclusive-or function to replace addition.

DATASHEET 1

```
;
;= PARBYT - Parity bit generation, 8-bit.
;
;JOB          To flag odd or even parity of an 8-bit value.
;ACTION       WHILE value > 0
;             [ Parity := even parity(value bit 0, parity).
;               Value := value DIV 2. ]
;
;CPU          6502
;HARDWARE     None.
;SOFTWARE     None.
;
;INPUT        A = 8-bit value.    C = 0: even parity requested.
;                                     1:  odd parity requested.
;OUTPUT       C = odd/even parity of A.
;             N = 1 if A < 0.  Z = 1 if A = 0.
;             No other registers or flags affected.
;ERRORS       None.
;REG USE      A P
;STACK USE    1
;RAM USE      None.
;LENGTH       10
;CYCLES       Min: 20. Max: 84.
;
;CLASS 1      *discreet       *interruptable      *promable
;******       *reentrant      *relocatable        *robust
;
;
PARBYT PHA              ;Save input 8-bit value.              48
;
PBLOOP BCC  PBNBIT      ;Skip if Cy reset else invert next    90 02
       EOR  #1          ;bit for correct additive result.     49 01
PBNBIT LSR  A           ;Move result bit out to Carry.        4A
       BNE  PBLOOP      ;Repeat while any set bits left.      D0 F9
;
       PLA              ;Restore value, setting N,Z flags.    68
       RTS              ;Exit with parity flagged in Cy.      60
;
```

Z80 EDIT AND MARK

The second Datasheet, Z80ED from Cormac Duffin, is a Z80 emulation of the IBM 370 instruction EDMK. If you are a little taken aback by this bolt from the Big Blue, you might perhaps see the routine as performing a similar but not identical task to the Basic command PRINT USING.

BCD strings can be compared digit by digit with a supplied pattern string to produce output edited at single digit precision. Any number of textual messages may be inserted at any point in the pattern string and these will be embedded in the output data. Numerical manipulation is limited to splitting the BCD string into separate output fields and replacing leading zeros by a given fill character.

DATASHEET 2

```
;
;= Z80ED -  BCD field edited ouput.
;
;JOB          To edit and output a packed Binary Coded Decimal
;             number string according to the control codes
;             contained in an input edit pattern string, giving
;             the ability to split the BCD string into separate
;             number fields, replace leading zeros by any
;             specified character and insert punctuation and text.
;ACTION       Read fill character from pattern.
;             Read next pattern byte.
;             WHILE byte NOT terminator
;             [ Read next BCD digit.
;               CASE on pattern byte
;               #0 Digit select
;               [ IF significance flag set
;                 THEN [ Output digit. ]
;                 ELSE [ IF digit NOT 0
;                          THEN [ Output digit. ]
;                          ELSE [ Output fill character. ] ]
;               #1 Switch on
;               [ Set significance flag.
;                 Output digit. ]
;               #2 Switch off
;               [ Clear significance flag.
;                 IF digit NOT 0
;                 THEN [ Output digit. ]
;                 ELSE [ Output fill character. ] ]
;               #3+ message character
;               [ IF significance flag set
;                 THEN [ Output byte. ]
;                 ELSE [ Output fill character. ] ]
;               Read pattern byte. ]
;
;CPU          Z80
;HARDWARE     RAM for edit pattern, BCD field and output field.
;SOFTWARE     None.
;
;INPUT        A = packed BCD field byte length.
;             DE addresses BCD field first byte.
;             HL addresses output field first byte.
;             IX addresses edit pattern first byte.
;             The edit pattern is composed of 5 special characters
;             and any valid ASCII or terminal control characters:-
;               FC:  Fill char. Pattern 1st byte - any ASCII char
;                    used to replace non-significant digits.
;               DS:  Digit select (code 00). Indicates that a BCD
;                    digit be output, if significant.
;               SS:  Significance starter (code 01). Indicates
;                    that current and subsequent digits be output.
;               SO:  Switch off (code 02). Indicates that current
;                    and subsequent non-significant digits be
;                    be replaced by the fill character.
;               SC:  Stop character (code FF). Pattern terminator.
;               ASCII: non-control codes embedded in the pattern
;                      are directly output if the significance
;                      switch is ON or replaced by the fill
;                      character if significance switch is OFF.
;OUTPUT       A and IX are unchanged.
;             DE addresses BCD field + 1.
;             HL addresses the byte preceding the first character
;                of the last output significant character field.
;             Z set: succesfully edited output.
;             Z reset: field length error - pattern control codes
;                      not equal in number to BCD digits - the BCD
;                      field is partially rotated.
;ERRORS       The BCD digits could be multipally output if the
;             number of digit select characters is an exact
;             multiple of the BCD digit length.
;             Output of number strings exceeding 127 digits will
;             cause count and significance switching errors.
;REG USE      AF DE HL IX
;STACK USE    8
;RAM USE      None.
;LENGTH       96
;CYCLES       Not given.
;
;CLASS 2      *discreet       *interruptable      *promable
;*****-       *reentrant      *relocatable        -robust
;
;
;...Assign BCD check and edit pattern control values.
;
```

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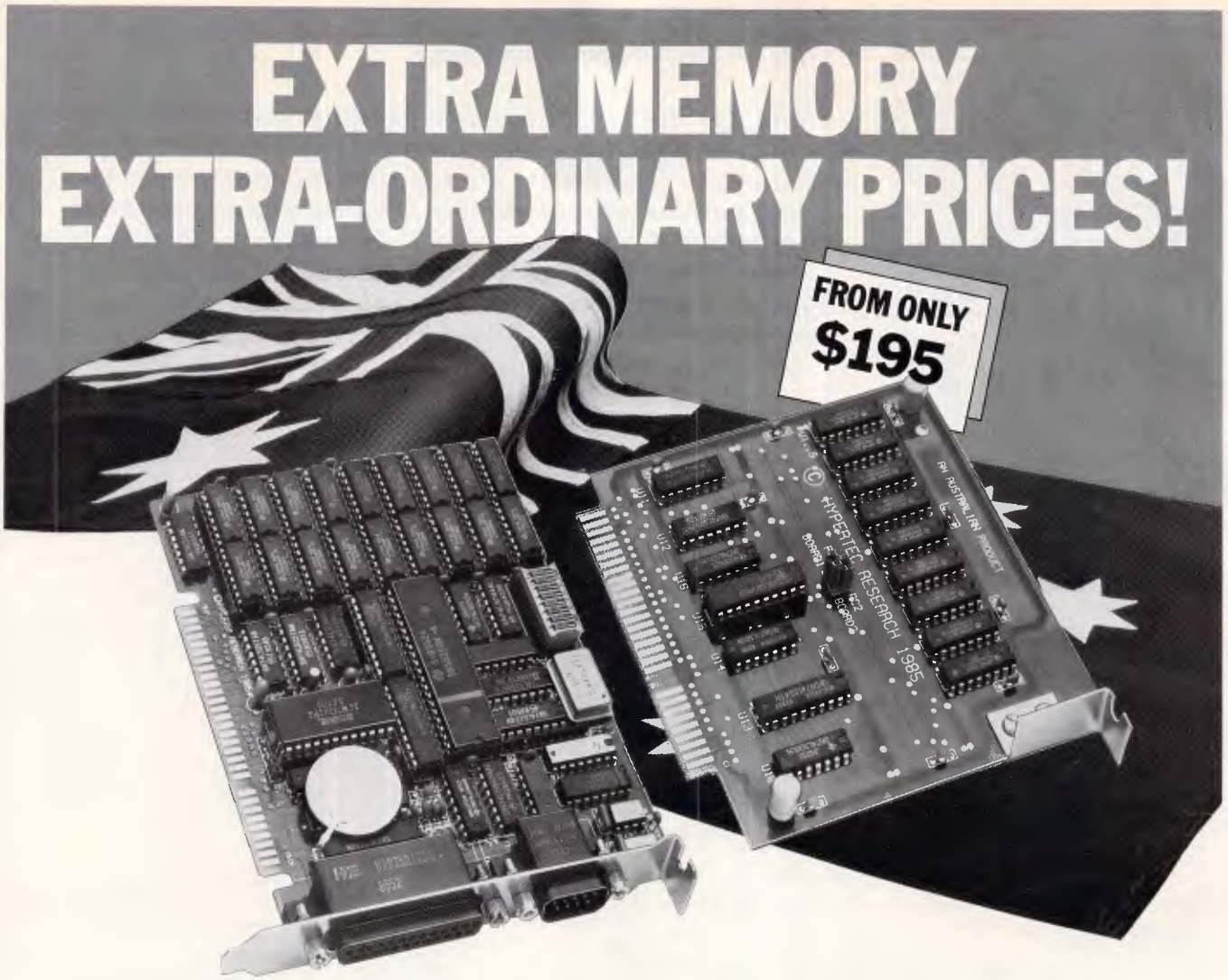

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2372/FP/Little

```
CK      EQU  3FH          ;Check value; 'F' is a non-BCD character.
DS      EQU  0            ;Digit select.
SS      EQU  1            ;Significance starter.
SO      EQU  2            ;Switch off.
SC      EQU  0FFH         ;Stop character.
NS      EQU  30H          ;Non-significant digit; '0'.
;
Z80ED   PUSH IX           ;Save edit pattern pointer        DD E5
        PUSH BC           ;and BC.                          C5
        LD   B,A          ;Set B to BCD byte length.        47
FELP    INC  DE           ;Move BCD field pointer to        13
        DJNZ FELP         ;location BCD field + 1 and       10 FD
        PUSH DE           ;save that address.               D5
;
        LD   B,A          ;Set B to BCD field byte length.  47
        LD   C,(IX+00H)   ;Set C = filler character.        DD 4E 00
        LD   DE,CK*256+1  ;Set D = BCD check char and set   11 01 3F
                          ;E = 1 for final HL position.
        DEC  HL           ;For 1st inc of output pointer.   2B
;
;...Shift one digit out from packed BCD field, shifting last
;...digit back in. BCD field will be completely rotated by end
;...of Z80ED only if pattern length matches digit length.
;
GETDGT  EX   (SP),HL      ;Get BCD + 1 address in HL        E3
        PUSH HL           ;and save it.                     E5
        LD   A,D          ;Move last digit into A.          7A
        LD   D,B          ;Save BCD length in D.            50
;
NXTBCD  DEC  HL           ;Shift BCD field down memory by   2B
        RLD               ;one digit, leave last digit at   ED 6F
        DJNZ NXTBCD       ;end, get next digit into A.      10 FB
;
        LD   B,D          ;restore BCD length and move      42
        LD   D,A          ;new digit to D.                  57
        POP  HL           ;Restore BCD + 1 address...       E1
        EX   (SP),HL      ;to stack, restoring HL.          E3
;
;...Get next edit pattern character.
;
PATERN  INC  HL           ;Address next output byte         23
        INC  IX           ;and next edit pattern byte.      DD 23
        LD   A,(IX+00H)   ;Read next edit pattern byte      DD 7E 00
        CP   SC           ;and test for stop character,     FE FF
        JR   Z,END        ;exiting if at pattern end.       28 29
;
        INC  E            ;Else inc count, assuming switch  1C
        CP   SO+1         ;on, check for a control char     FE 03
        JR   C,DGTSEL     ;(0,1,2) skipping if so.          38 09
;
;...A is not edit control char, so must be a message char.
;
        LD   (HL),A       ;Output message from pattern.     77
        BIT  7,E          ;Test switch, if ON leave char    CB 7B
        JR   NZ,PATERN    ;and loop for next byte.          20 EC
;
        DEC  E            ;Switch is OFF, so replace        1D
        LD   (HL),C       ;message by filler character      71
        JR   PATERN       ;and loop for next byte.          18 E8
;
;...A is an edit control char (0, 1 or 2).
;
DGTSEL  CP   SO           ;Is it 2 (signif. switch)?        FE 02
        JR   NZ,SWTEST    ;Skip if not, else switch off     20 01
        LD   E,A          ;and reset count to 1st char.     5F
;
SWTEST  LD   (HL),D       ;Assume switch ON, output BCD     72
        BIT  7,E          ;digit, then test switch and      CB 7B
        JR   NZ,GETDGT    ;if ON, go get next digit.        20 D1
;
        CP   SS           ;Is it 1 (signif. start)? Set     FE 01
        JR   Z,SETON      ;switch ON if so.                 28 05
;
        LD   A,D          ;Switch is OFF, get digit and     7A
        CP   NS           ;test if significant, skipping    FE 30
        JR   Z,NOTSIG     ;out if a '0'.                    28 04
;
SETON   SET  7,E          ;Turn ON significance switch      CB FB
        JR   GETDGT       ;and go get next digit.           18 C4
;
NOTSIG  DEC  E            ;Digit is '0' and switch OFF so   1D
        LD   (HL),C       ;dec count, replace digit by      71
        JR   GETDGT       ;filler char and get next digit.  18 C0
;
END     LD   C,D          ;Save last digit.                 4A
        LD   D,00H        ;Subtract digit count from        16 00
        RES  7,E          ;output pointer to address byte   CB BB
        SBC  HL,DE        ;preceding last output number.    ED 52
        LD   A,C          ;Get last digit and set Z to      79
        CP   CK           ;show complete BCD rotation.      FE 3F
        LD   A,B          ;restore BCD length to A.         78
        POP  DE           ;Restore BCD field + 1 address.   D1
        POP  BC           ;Restore BC and                   C1
        POP  IX           ;Edit pattern pointer.            DD E1
        RET               ;Exit, output complete.           C9
```

Z80 SHELLSORT

SHELLZ (Datasheet 3) is an unpretentious sorting routine from John Kerr. John believes it to be quite efficient but when pressed for an indication of its speed would only say that: 'It sorts twenty fruits' or philosophers' names in almost no time!'

DATASHEET 3

```
;-----------------------------------------------------------------------
;= SHELLZ - Shell Interchange Sort
;-----------------------------------------------------------------------
;JOB         To sort an array of strings into ascending order.
;ACTION      Calculate end-of-array address
;            Initial increment >= array size * separation
;            REPEAT
;            [ Increment = increment / 2.
;              REPEAT
;              [ DE = start-of-array.
;                HL = DE + increment.
;                Flag = 0.
;                REPEAT
;                [ IF string1 > string2 THEN
;                  [ Swap descriptor1, descriptor2.
;                    Flag = 1. ]
;                  DE = DE + increment.
;                  HL = HL + increment. ]
;                UNTIL HL > end-of-array. ]
;              UNTIL flag = 0. ]
;            UNTIL increment = separation.
;-----------------------------------------------------------------------
;CPU         Z80
;HARDWARE    RAM containing array of string descriptors; 1st byte
;            is string length, 2nd & 3rd bytes are the address of
;            the first character in the string; address bytes are
;            in conventional lohi order.
;SOFTWARE    None.
;-----------------------------------------------------------------------
;INPUT       BC = number of elements in array.
;            DE = address of 1st string descriptor in array.
;            HL = separation between descriptors, [illegible]
;OUTPUT      Array sorted into ascending order.
;            DE, HL unchanged. BC = HL. IX addresses last string
;            descriptor (end-of-array). AF changed [illegible]
;ERRORS      No checks for BC < 2, HL < 3 or memory wraparound.
;REG USE     AF BC DE HL IX
;STACK USE   14
;RAM USE     None.
;LENGTH      112
;CYCLES      Not given.
;-----------------------------------------------------------------------
;CLASS 2      -discreet       *interruptable      *promable
;-****-       *reentrant      *relocatable        -robust
;-----------------------------------------------------------------------
;
SHELLZ PUSH DE          ;Save inputs.                       D5
       PUSH HL          ;                                   E5
       DEC  BC          ;End-of-array = DE + (BC-1)*HL.     0B
;
LAST   SRL  B           ;Get bit from BC into Cy.           CB 38
       RR   C           ;                                   CB 19
       JR   NC,PWR2     ;                                   30 03
;
       EX   DE,HL       ;If set, add current multiple       EB
       ADD  HL,DE       ;of separation into DE.             19
       EX   DE,HL       ;                                   EB
;
PWR2   LD   A,B         ;Check for BC = 0.                  78
       OR   C           ;                                   B1
       ADD  HL,HL       ;Multiply separation by 2.          29
       JR   NZ,LAST     ;Loop back if BC not zero.          20 F2
;
       POP  BC          ;BC = separation.                   C1
       PUSH DE          ;                                   D5
       POP  IX          ;IX = end-of-array.                 DD E1
       POP  DE          ;DE = start-of-array.               D1
;
SORT   RR   H           ;Halve increment.                   CB 1C
       RR   L           ;                                   CB 1D
;
SCAN   PUSH DE          ;Save start-of-array.               D5
       PUSH HL          ;Save increment.                    E5
       ADD  HL,DE       ;HL addresses 2nd descriptor.       19
       PUSH AF          ;Cy is interchange flag.            F5
       PUSH IX          ;Save end-of-array.                 DD E5
;
PASS   PUSH BC          ;Save separation and the            C5
       PUSH DE          ;pointers to the two                D5
       PUSH HL          ;string descriptors.                E5
;
       LD   B,(HL)      ;Get descriptor2 into B,DE.         46
       INC  HL          ;                                   23
       LD   A,(HL)      ;                                   7E
       INC  HL          ;                                   23
       LD   H,(HL)      ;                                   66
       LD   L,A         ;                                   6F
       EX   DE,HL       ;                                   EB
;
       LD   C,(HL)      ;Get descriptor1 into C,HL          4E
       INC  HL          ;                                   23
       LD   A,(HL)      ;                                   7E
       INC  HL          ;                                   23
       LD   H,(HL)      ;                                   66
       LD   L,A         ;                                   6F
;
       INC  B           ;Check for either string length     04
       INC  C           ;being zero, the null string is     0C
       JR   ENTR        ;'less' than all other strings.     18 08
;
CSTR   LD   A,(DE)      ;Compare strings.                   1A
       CP   (HL)        ;                                   BE
       JR   C,SWAP      ;Swap if string1 > string2.         38 09
       JR   NZ,SKIP     ;No swap if string1 < string2.      20 1B
       INC  DE          ;Characters are equal, point        13
       INC  HL          ;to next byte in each string.       23
```

SUBSET

```
;
ENTR    DEC   C          ;Strings agree so far - check      0D
        JR    Z,SKIP     ;lengths. Swap if string2 is       28 16
        DJNZ  CSTR       ;finished and string1 is not.      10 F3
;
SWAP    LD    B,+3       ;Set interchange flag (this is     06 03
        LD    HL,+8      ;Cy in the stacked AF, F is 8      21 08 00
        ADD   HL,SP      ;bytes above (SP) in memory).      39
        LD    (HL),B     ;                                  70
;
        POP   HL         ;Retrieve pointers to              E1
        POP   DE         ;string descriptors.               D1
        PUSH  DE         ;                                  D5
        PUSH  HL         ;                                  E5
;
EXIR    LD    A,(DE)     ;Swap the 3-byte descriptors.      1A
        LD    C,(HL)     ;                                  4E
        LD    (HL),A     ;                                  77
        LD    A,C        ;                                  79
        LD    (DE),A     ;                                  12
        INC   DE         ;                                  13
        INC   HL         ;                                  23
        DJNZ  EXIR       ;                                  10 F7
;
SKIP    POP   HL         ;Retrieve pointers.                E1
        POP   DE         ;                                  D1
        POP   BC         ;Retrieve separation.              C1
;
        ADD   HL,BC      ;Update pointers.                  09
        EX    DE,HL      ;                                  EB
        ADD   HL,BC      ;                                  09
;
        EX    (SP),HL    ;Compare 2nd pointer to the        E3
        SBC   HL,DE      ;end-of-array address to see       ED 52
        ADD   HL,DE      ;if this pass is complete.         19
        EX    (SP),HL    ;                                  E3
        EX    DE,HL      ;                                  EB
        JR    NC,PASS    ;No - continue with pass.          30 BD
;
        POP   IX         ;Take end-of-array from stack.     DD E1
        POP   AF         ;Get interchange flag.             F1
        POP   HL         ;HL = current increment.           E1
        POP   DE         ;Retrieve start-of-array.          D1
        JR    C,SCAN     ;Another pass if flag set.         38 B0
;
        SBC   HL,BC      ;Compare current increment to      ED 42
        ADD   HL,BC      ;the unit separation and loop      09
        JR    NZ,SORT    ;back if not yet equal.            20 A7
        RET              ;Exit.                             C9
;
```

Man vs Mainframe? Kevin O'Connell is the referee.

How do you set about beating a chess computer or a chess program playing on a big computer?

The best advice is still: 'Get out of book' as soon as possible and then keep everything very simple. The 'book' is the computer's possibly exhaustive knowledge of opening theory which consists of a simple IF... THEN... IF... THEN... sequence, although this can be very deep indeed.

Here is an example of an amateur player following just this advice and winning, fairly easily, against one of the strongest programs in the world running on a Cray.

White: PG Bakker. Black: Cray Blitz. Opening: Queen's Pawn.

1	d2-d4	d7-d5
2	Ng1-f3	Bc8-f5
3	c2-c3	

This takes the computer out of its book knowledge.

3	...	Nb8-d7
4	Bc1-f4	c7-c5
5	e2-e3	Qd8-b6
6	Qd1-b3	Qb6×b3

This is none too good. 6... e7-e6 was better.

7	a2×b3	

7	...	Bf5×b1

In a very simple position, Black plays a move that no human would ever consider. True, the white rook is pulled, temporarily, off the half-open a-file, but this is only achieved at the cost of conceding the bishop pair to White.

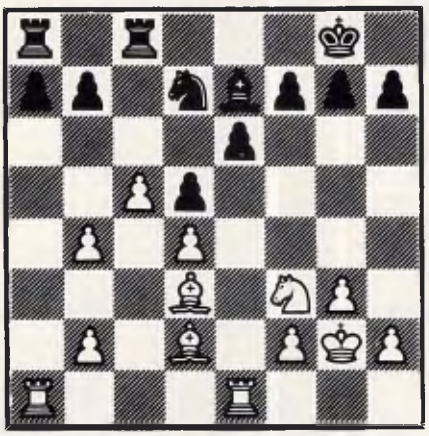
8	Ralxb1	c5×d4
9	e3×d4	e7-e6
10	Bf1-d3	Ng8-f6
11	0-0	Nf6-h5
12	Bf4-d2	Bf8-d6
13	g2-g3	Nh5-f6
14	Rf1-e1	0-0
15	Rb1-a1	

White has a very clear advantage and it is extremely difficult for Black to find anything constructive to do.

15	...	Bd6-c7
16	c3-c4	

White wants to take advantage of his queen-side pawn majority (3 v 2 on the a,b and c-files).

16	...	Rf8-c8
17	Kgl-g2	Bc7-d6
18	c4-c5	Bd6-e7
19	b3-b4	



19	...	a7-a6

Black's task is extremely difficult, but this makes it easier for White to convert his pawn majority.

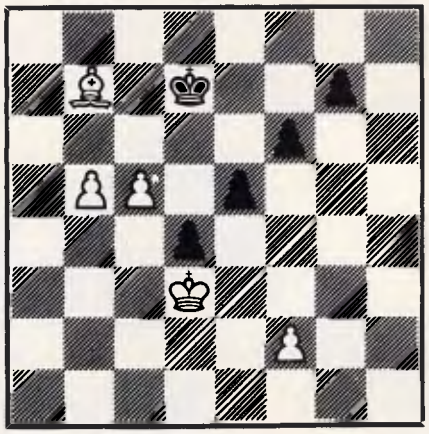
20	b4-b5	a6×b5
21	Bd3×b5	h7-h6
22	b2-b4	Kg8-f8
23	h2-h4	Kf8-e8

This is the end, losing material to the following, positional, combination. Unfortunately for computers, positional combinations tend to run to large numbers of ply which make them too deep for the computers to see.

24	Nf3-e5	Rc8-d8
25	g3-g4	Ra8×a1
26	Re1×a1	Ke8-f8
27	g4-g5	h6×g5
28	h4×g5	Nd7×e5
29	g5×f6	Be7×f6
30	d4×e5	Bf6×e5
31	Ra1-a7	Rd8-b8
32	Kg2-f3	Be5-d4
33	Bb5-a4	Bd4-e5
34	Bd2-f4	Be5×f4
35	Kf3×f4	f7-f6
36	Ba4-d7	

This is stronger than 36 b4-b5, which would allow the black king to get into the game.

36	...	e6-e5+
37	Kf4-e3	d5-d4+
38	Ke3-d3	Kf8-e7
39	Bd7-c6	Ke7-e6
40	Ra7×b7	Rb8×e6
41	Bc6×b7	Ke6-d7
42	b4-b5	



42	...	1-0 (Black resigns)

White not only has the overwhelming material superiority of bishop v pawn, but the connected passed b and c-pawns are bound to force their way through to queen. END

'In the event of a nuclear holocaust, he's the official war artist.'

DIARY DATA

Readers are strongly advised to check details with exhibition organisers before making travel arrangements to avoid wasted journeys due to cancellations, printers' errors, etc.

Munich, Germany	8th International Conference on Computer Communication. Contact: ICCC '86, C/- PO Box 900429, D-8000, Munich 90, West Germany	September 15-19, 1986
Dallas, Texas	Networld '86 Contact: John Barraclough (801) 226 8238	September 16-18, 1986
Gold Coast	ACC '86 Contact: Riddell Exhibition Promotions (03) 429 6088	September 16-20, 1986
Melbourne	ACC '86 Contact: Riddell Exhibition Promotions (03) 429 6088 CANCELLED	September 23-26, 1986
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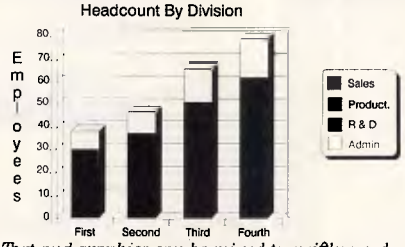

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BENCHMARKS

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 GUSUB220
170 FORL=1 TO 5
180 NEXTL
190 IF K<1000 THEN 140
200 PRINT "E"
210 END
220 RETURN
```

```
100 REM Benchmark7
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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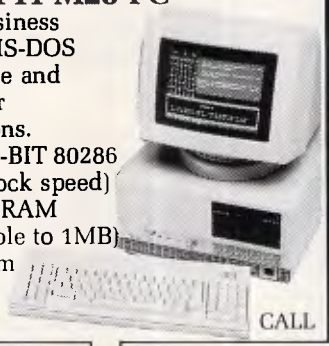

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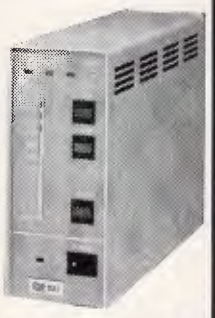

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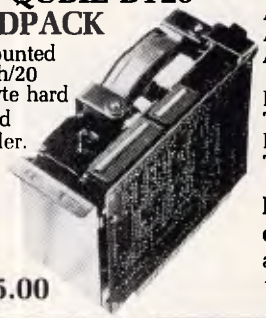

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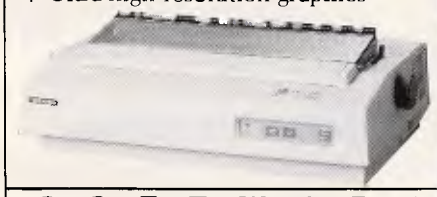

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USER GROUPS INDEX

Below is a list of updates and additions to the full User Group Index published in the June issue of APC. The next full listing will appear in the December issue of APC.

NEW SOUTH WALES

The Pocket Computer User Club meets on the first Wednesday of each month (except January) at Woodstock Community Centre, Church Street, Burwood NSW at 7.30pm. For more details write to: The Secretary, PO Box 2220, North Parramatta NSW 2151.

The Katoomba Commodore Computer User Group meets every second Tuesday at Katoomba High School commencing at 7.30pm. For more information write to: The Secretary, Katoomba Commodore Computer User Group, 10 Roseberry Street, Wentworth Falls NSW 2782.

The Commodore User Group (ACT) meets on the first Monday of each month at Melba High School and on the third Monday of each month at the Woden Town Centre Library. For more details contact: Commodore User Group (ACT), PO Box 599, Belconnen ACT 2616.

VICTORIA

The Yarra Valley Commodore User Group meets on the first Tuesday of each month at the Melba Hall, corner of Market and Castella Streets, Lilydale at 8pm. Enquiries should be directed to the Secretary, Dorothy Millard (03) 725 0682 or the Librarian, Jon Hall (03) 725 0176. Correspondence should be addressed to: The Yarra Valley Commodore User Group, PO Box 176, Lilydale Vic 3140.

TASMANIA

A Microsoft User Group has recently been formed in Tasmania. The Group is mainly concerned with 16-bit machines such as IBM compatibles. For more details contact Brett Russell, PO Box 182, Ulverstone Tas 7315.

WESTERN AUSTRALIA

For more details about the Bondwell Australia Users Group, write to: The Secretary, Terry Doney, PO Box 79, Gosnells WA 6110. Tel: (09) 398 6303.

END

LAZING AROUND

Brain-teasers courtesy of JJ Clessa.

No answers — no prizes. Which number, when multiplied by three, gives the same result as if it were added to 20?

Prize puzzle

The four-digit number 4151 has the property that the number is equal to the sum of the fifth powers of its digits — $4151 = 4^5 + 1^5 + 5^5 + 1^5$.

Find the smallest five digit number which has this property — equal to the sum of the fifth powers of its digits. Answers, on postcards only please, to reach *APC*, 2nd Floor, 215 Clarence Street, Sydney NSW 2000, no later than 15 September 1986.

May prize puzzle

The May puzzle was more difficult than usual — or perhaps it was less interesting. Whatever the reason, only 75 entries were received. The correct solution was 255-1702, since: 255 is 11111111_2, or 3333_4, or 313_9, or 212_{11}, or FF_{16}; and 1702 is 898_{14}, or 787_{15}, or 616_{16} — all of which are palindromic.

The winner, chosen at random, is John Hambley of Canberra. Congratulations John — your prize is on its way.

END

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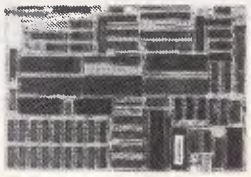

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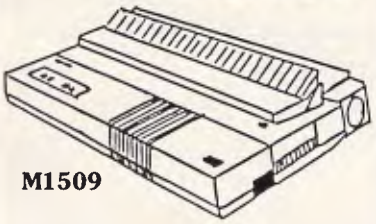

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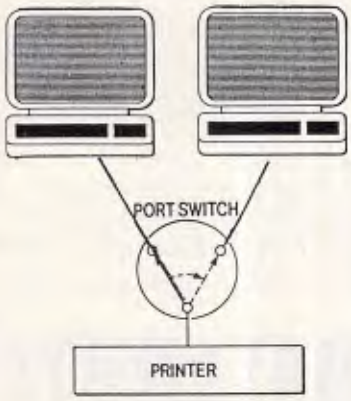

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NUMBERS COUNT

Mike Mudge examines S_k — sets and their extension.

Sets (ti) for which $t_i t_j + k$ is always a square. . . s_k — sets and some possible extensions

Definition (i) An S_k — set of size n is a set (t_1, t_2, ... tn) of distinct positive integers such that $t_i t_j + k$ is the square of an integer whenever i = j; k being constant.

For example, (1,2,5,) is an S_{-1} — set of size 3 since $1 \times 2 - 1 = 1^2$,

$1 \times 5 - 1 = 2^2$ & $2 \times 5 - 1 = 3^2$.

(1,79,98) is a P_2 — set of size 3 since $1 \times 79 + 2 = 9^2$,

$1 \times 98 + 2 = 10^2$ & $79 \times 98 + 2 = 88^2$.

Definition (ii) AC_k — set of size n is similarly defined using the condition that $t_i t_j t_p + k$ is the cube of an integer whenever i = j = p.

It should be observed that these definitions are capable of modification in many natural ways; typical illustrations being

(a) $t_i t_j + k$ is the cube of an integer,

(b) $t_i + t_j + k$ is the square of an integer,

(c) $t_i + t_j + t_p$ is the cube of an integer.

Definition (iii) An S_k — set is 'extendable' if there exists a positive integer, y say, not a member of S_k such that the union of y and S_k is still an S_k — set.

For example, the S_1 — set (1,3,8) of size 3 can be extended using the integer y = 120 to generate the S_1 — set (1,3,8, 120) of size 4.

It has been shown (A Baker and H Davenport, *Quart Journal Math* Oxford Ser (3) v 20, 1969, pp129-137) that no further extension of this S_1 — set is possible.

The extendability of C_k — sets is similarly defined.

Problem A Catalogue, according to their size, all possible S_k — sets with elements less than some given N_0.

Problem B Investigate the 'extendability' of these S_k — sets using integers y up to some given $Y_{max.}$

Problem C Repeat (A) & (B) above for C_k — sets. . . . of which none are known to the author.

Problem D Modify definitions (i) & (ii) above and attempt (A), (B) and (C) as appropriate.

Some reference to the theoretical literature on these matters may be helpful. Details of the history of this problem are to be found in P Heichelheim's; *The Study of positive integers (a,b) such that ab + 1 is a square.* Fibonacci Quarterly. v17, 1979, pp269-274, also LE Dickson; *History of the Theory of Numbers*, vol II, pp513-520.

Readers are invited to submit their attempts at some (or all) of the above problems to: Mike Mudge, *C/- APC*, 2nd Floor, 215 Clarence Street, Sydney NSW 2000. Submissions, which must reach me by 25 September 1986, will be judged using suitably vague criteria, and a prize will be awarded to the 'best' contribution received by the closing date.

Please note that submissions can only be returned if a suitable stamped, addressed envelope is provided.

January review

This subject area produced responses ranging from 'What a load of rubbish!' to 'In order to produce a genuine program to perform two-way arithmetic, it seems one would have to start from Peano's axioms and communicate with the computer in machine-language. . .

Detailed computer programs received were minimal. This month's prize-winner is A Sumner; congratulations.

END

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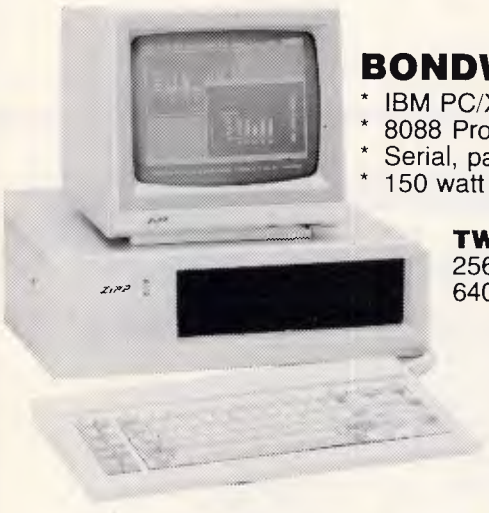

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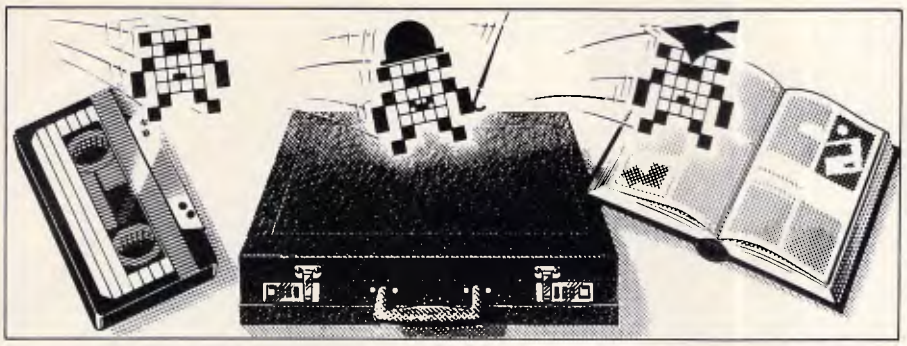

Games

Scientific/mathematic

Business

Toolkit/utilities

Educational/Computer Aided Learning

Owen Linderholm selects the best of readers' programs. For details on submitting your own, see the end of this section.

My opening theme will be familiar to regular readers — the quality of program submissions and their originality has to be very much improved. Despite previous rantings and ravings on this subject, I am still receiving silly programs which do no more than plot graphs or play hangman. Even if these programs have been written for new machines such as the Amiga or the Atari ST range, the usual principles apply, and there is no novelty for anyone. *Please* — if you intend to send a program to Program File, make sure it's original, interesting and high-quality!

Despite the fact that the box at the end of Program File states clearly that stamped, addressed envelopes must accompany submissions, many people continue to ignore this. It is standard practice in all forms of publishing to dispose of unwanted submissions if they don't have an SAE with them, and this practice is now in effect at *APC*.

Occasionally, I have had to spend almost half a day dealing with the administration of the programs which arrived the previous day. Consequently, I have little time to devote to evaluating submissions, and so I can't always give them the attention they deserve.

Programs should be as easy to convert to other machines as possible. The exception to this is when a program makes use of a micro's special facilities or introduces new facilities, such as a new command. Otherwise, there is no excuse for the lack of common commands and clearly labelled machine-dependent parts of code — I/O commands, graphics and string handling are especially applicable here. There is no reason why easy conversion shouldn't apply to machine code programs, too. As long as BIOS or ROM calls are explained with a comment to show what they do, another programmer can make a stab at converting a program, even for an entirely different processor.

It should be noted that several home computers differ widely from the standard computer Basic. Further details about precise language differences can be found in the *APC* Basic Converter Chart which last appeared in NSW in April and, in all other states, the month before. There are some commands which operate in a radically different fashion from machine to machine: these deal with disk files (and cassette files); getting a character from the keyboard and storing it in a string; printing; error trapping; and a few of the more obscure string-handling commands.

If you want to convert a program to run on another machine or write a program which can be easily converted, the above-mentioned areas are the ones to watch out for. The program should be very carefully documented.

Another major problem with graphics programs is screen size. Practically no micro offers similar screen height and width to another micro, so all plotted output has to be transformed by a function which makes the output run correctly on a different-sized screen. Conversion from a large screen to a smaller screen is simple, as all plotted points will be mapped onto one or more new points to be plotted. If the screen size to be converted from is oldxsize × oldysize, and the screen to be converted to is newxsize × newysize, then a point (x,y) will be mapped to a point (x*newsxsize/oldxsize,y*newysize/oldysize). Problems only arise if the screen being mapped to is larger than the original screen; then, an image created by separately plotting a number of points will be spread out and will contain gaps. This problem can be avoided by using the machine's built-in plotting and filling routines, which will fill in all intermediate points. This only leaves the problem of graphics which only use single-dot plotting commands, but these are rarely used to produce anything but discrete images such as plotted graphs.

By now, all regular *APC* readers should be aware of Microtex 666. The six month combined *APC*/Microtex subscription offer is a good way to take advantage of the increased number of Microtex facilities at a reduced price. 'Newsprint' and 'Yankee Doodles' are both on-line before *APC* is available each month from newsagents and those programs indicated in Program File as being available on Microtex also usually appear on-line before *APC* is published. The most exciting news on Microtex 666, though, is that the 'Atlantis International Great Galactic Conflict' is only a couple of months away (the second test game is about to begin as this is being written — early July — with virtually all the enthusiastic supporters of the first game back for more). Several new projects are also underway at Microtex: watch Steve Withers' 'Communications' column in future issues for news.

This issue's Program of the Month is for the Amstrad PCW8256. It shows how to access point-plotting graphics from Amstrad's Basic. While it doesn't apply to other machines in any way, it is important because it adds a much-needed feature to the new Amstrad.

which can be called from within Basic as if it were an ordinary command). This RSX sets a single bit of the screen memory on or off. When this routine is available, others can be written, in Basic or machine code, to provide other plotting facilities.

The second program is a rather strange one, written in Turbo Pascal and intended for MS-DOS machines. It's a 6502 emulator and works so well that the author, after writing a few routines to imitate BBC ROM calls, was able to dump the code for Acornsoft Lisp to a disk and run it. Amazingly, the program

One of the problems with PCW8256 Basic is that it provides no way of producing graphics on screen. PLOT RSX provides exactly what is needed — a simple way of plotting points. The program produces assembly code for an RSX command (a machine code routine works completely, albeit slowly. Using Apple's ROM routines it should be equally easy to run Apple II programs on MS-DOS machines. (We'll probably be sued for saying that...) It should be possible to convert Pascal 6502 Emulator to run on other machines without too much difficulty.

One type of program which I don't normally consider is a tape directory program, purely because it always seems sensible to me to put one program on one side of a cassette, and write the program names on a label and keep them filed manually. However, one program this month enables you to keep a cassette filing system. It's for the Epson HX20 which uses microcassettes — these are expensive, so it makes sense to keep several programs on one side of a cassette. The program is equivalent to a disk directory, but will also automatically position the tape at the start of a selected file.

For IBM or compatible computers, or any machine which runs Microsoft Basic, G Haigh has produced a set of programs which offer an alternative to the standard iterative methods for calculating the roots of polynomial equations.

The only program allows anyone with only a daisywheel printer for text output to add graphics printing. There's one problem, however — it's very slow!

And finally, for the Atari 520ST Bernard Fromsom makes use of the Gem system on this 68000-based machine to produce a Reverse Polish Notation calculator on-screen emulator.

Program of the Month
Amstrad PCW8256 PLOT RSX

by Ron Yorston

This CP/M RSX allows you to plot to the screen from Locomotive Basic, one of the major omissions from the language as it's supplied. The assembly code for the RSX is given in the first listing, and should be typed in and saved as the file plot.asm. It can be assembled to the file plot.com with the following sequence of commands:

```
rmac plot
link plot[op]
ren plot.rsx=plot.prl
gencom plot[null]
```

The second listing should be entered as the Basic program plot.bas and saved. The following set of commands will then set up Basic to use the plot commands (the programs plot.bas and plot.com should both be on the same disk as the Basic):

```
plot
basic
load "plot"
run
new
```

The plotting RSX will now be installed in memory. Basic programs which use the plot utility should have the line 'plot=HIMEM+1:set%=0:clear%=1:toggle%=2' near the beginning, and *definitely* before any Memory command.

The function is called by a line of the form 'CALL plot(x%,y%,action%)', where x% is the x coordinate of the point to be plotted, y% is the y coordinate, and action% is the plotting action to be performed. The coordinates run from (0,0) to (719,247). It's up to the user to ensure that a point plotted is on-screen, although some error checking is provided.

The action variable can take a value of 0, 1 or 2. If it's 0, the point is turned on; if it's 1, the point is turned off; and if it's 2, the point is reversed. The third listing gives an example of how to use the plotting routine. Hard copy of the onscreen graphics can be provided if the Extra and PTR keys are pressed together.

```
;
; RSX to set bit in screen memory
;  H contains action byte:  0  set bit
;                           1  clear bit
;                           2  toggle bit
;  L contains y coordinate (0 <=  L <= 247 )
; DE contains x coordinate (0 <= DE <= 719 )
;
;
wboot:  equ     1
scrrun: equ     000e9h
;
        cseg
        db      0,0,0,0,0,0
        jmp     start
next:   db      0c3h
        dw      0
prev:   dw      0
remov:  db      0ffh
nbank:  db      0
        db      'SCRSBTXY'
loader: db      0
        db      0,0
start:
        mov     a,c
        cpi     76
        jz      begin
        jmp     next
begin:
        push    h
        lhld    wboot   ;form firmware exec address
        lxi     b,87
        dad     b
        shld    cjfirm
        pop     h
        lxi     b,code
        call    entfw
        dw      scrrun
        ret
;
code:                   ;perform operation in screen memory
        mvi     a 3     ;restrict range of x to 0..1023
        ana     d
        mov     d,a
        push    h       ;save action byte
        mvi     h,0     ;restrict range of y to 0. 255
        dad     h       ;fetch roll table pointer
        lxi     b,0b600h
        dad     b
        mov     c,m     ;get address from table
        inx     h
        mov     b,m     ;BC contains pixel row pointer

        mov     a,c     ;mask off low order bits of pointer
        ani     0f8h
        mov     l,a
        mov     h,b     ;put it in HL
        dad     h       ;shift masked pointer left
```

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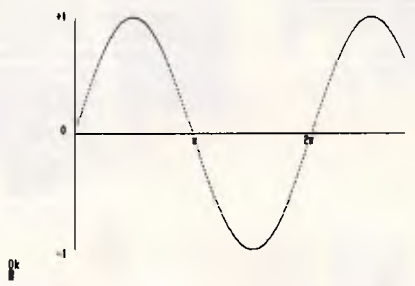
```
        dad     d       ;add x to masked pointer
        mov     a,l     ;mask off low order bits from x
        ani     0f8h
        mov     l,a
;
        mov     a,c     ;get low order bits of pixel row pointer
        ani     7
        ora     l       ;add low order bits into HL
        mov     l,a     ;HL now contains memory address of bit
;
        mov     a,e     ;get low order bits of x
        ani     7
        inr     a
        mov     b,a     ;B contains rotate count
;
        xra     a       ;clear A
        stc             ;set carry bit
loop:   rar             ;form mask by shifting carry
        db      010h    ;djnz loop
        db      0fdh    ;(not available in this assembler)
                        ;mask in A, address in HL
        pop     b       ;fetch action byte
        mov     c,a     ;save mask in C
        mov     a,b
        cpi     0       ;check action byte
        jnz     not0
        mov     a,c     ;action byte = 0
        ora     m       ;set bit in memory
        mov     m,a
        ret
;
not0:
        cpi     1
        jnz     not1
        mov     a,c     ;action byte = 1
        cma             ;clear bit in memory
        ana     m
        mov     m,a
        ret
;
not1:
        cpi     2
        rnz             ;unknown action, return
        mov     a,c     ;action byte = 2
        xra     m       ;toggle bit in memory
        mov     m,a
        ret
;
entfw:  db      0c3h
cjfirm: dw      0
        end
```

```
 10 REM load machine code for plotting function at top of memory
 20 memtop=HIMEM-16
 30 MEMORY memtop
 40 FOR i=memtop+1 TO memtop+14
 50      READ x
 60      POKE i,x
 70 NEXT i
 80 DATA &hd5,&h5e,&h23,&h56,&h0a,&he1,&h6e,&h67
 90 DATA &h0e,&h4c,&hcd,&h05,&h00,&hc9


100 REM demo program to plot a graph
110 REM set up plotting
120 plot=HIMEM+1 : set%=0 : clear%=1 : toggle%=2
130 :
140 REM clear screen
150 PRINT CHR$(27);"E"
160 :
170 REM draw axes
180 :
190 x%=100
200 FOR y%=20 TO 200
210    CALL plot(x%,y%,set%)
220 NEXT y%
230 :
240 y%=110
250 FOR x%=100 TO 600
260    CALL plot(x%,y%,set%)
270 NEXT x%
280 :
290 REM plot a graph
300 :
310 FOR z%=0 TO 500
320     x%=z%+100
330     y%=110-SIN(z%*0.0174533)*90
340     CALL plot(x%,y%,set%)
350 NEXT z%
360 :
370 REM label axes
380 :
390 PRINT CHR$(27);"Y";CHR$(32+14);CHR$(32+35);CHR$(27);CHR$(24)
400 PRINT CHR$(27);"Y";CHR$(32+14);CHR$(32+56);"2";CHR$(27);CHR$(24)
410 PRINT CHR$(27);"Y";CHR$(32+13);CHR$(32+10);"0"
420 PRINT CHR$(27);"Y";CHR$(32+2);CHR$(32+9);"+1"
430 PRINT CHR$(27);"Y";CHR$(32+25);CHR$(32+9);"-1"
```



Pascal 6502 Emulator

by Mark Needham

MICROTEX 666

This program is available electronically through Microtex 666's software downloading service. It is accessed through Viatel page *66637#.

This program has been written in Turbo Pascal for the IBM PC. It should be possible to convert it to run on other machines with other 'flavours' of Pascal. It emulates every instruction and addressing mode of a standard 6502, including the bug for indirect jumps over a page boundary.

The Emulator has a full disassembler and assembler, so 6502 code can be typed in directly to the memory locations. The bottom 32k of the 64k addressable by the 6502 can be used; the top 32k cannot. The Emulator detects JSRs and JMPs to this area, which it assumes holds ROM routines, and calls a special routine called DOSPECIAL to emulate them. An Include file is given which emulates some of the BBC Micro's OS calls.

To run a normal 6502 program, enter the code using the byte editor or the assembler, move the program counter to the first location, and enter 6 to run the program. The program can be stopped by a BRK instruction or by pressing ESC. S will single-step through the program.

The emulator consists of two programs and two include files. CRAT6502.PAS creates a file of 6502 mnemonics and address modes for each of the 256 opcodes; this file is loaded by EMUL6502.PAS, which is the main code which emulates the

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6502 microprocessor. COMMON.INC is an include file required by both files.

The 6502 emulator only processes the bottom 32k of memory, so the Pascal code must handle all accesses above 8000 hex. An include file must be used to emulate calls to the top 32k. The include file, SPECIAL.INC, holds the example BBC Micro OS calls which are all that are needed to run the Acornsoft Lisp interpreter on the emulator.

A list of commands accepted by the emulator is given before the program listings.

```
        case a of        ( EXAMPLE SPECIAL.INC WHICH EMULATES BBC MICRO )
        -12 : begin
                writeln('OSBYTE Call: A = ',Areg);                ( FFF4 )
                case Areg of
                131 : begin Xreg := 0; Yreg := $19 end;     ( get PAGE  )
                132 : begin Xreg := 0; Yreg := $7c end;     ( get HIMEM )
                end;
              end;
        -15 : begin                  ( FFF1 )
                case Areg of
                0 : begin            ( KEYBOARD INPUT )
                     readln(s); s := s + chr(13); Param := Xreg + (Yreg shl 8);
                     buffer := M[Param] + (M[succ(Param)] shl 8);
                     for loop := 0 to length(s)-1 do
                       M[buffer+loop]:=ord(s[loop+1]);
                     ClrCarry; Yreg := length(s)
                    end;
                3 : begin            ( RETURN INTERVAL TIMER)
                     buffer := Xreg + (Yreg shl 8);  M[buffer] := 1;
                     for loop := 1 to 4 do M[buffer+loop] := $ff
                    end;
                else writeln('OSWORD : A = ',Areg,' X = ',Xreg,' Y = ',Yreg);
                end
              end;
        -18,-29
            : begin      ( FFEE )  ( WRITE CHARACTER TO SCREEN )
                if Areg = 13 then writeln
                else if Areg = 12 then clrscr
                  else if Areg = 127 then write(chr(8))
                    else if (Areg > 31) and (Areg < 128) then write(chr(Areg))
              end;
        -41 : writeln('OSBGET Call')
        else writeln('Unknown Call = ',D2H(a,4))

      end;
      DoCommand(RTS,Implied)     ( END OF SPECIAL.INC FILE )
```

```
{ Included in CRAT6502.PAS and EMUL6502.PAS (ADN is AND as AND is reserved) }

type Instructions = (ADC,ADN,ASL,BCC,BCS,BEQ,BIT,BMI,BNE,BPL,BRK,BVC,BVS,
                     CLC,CLD,CLI,CLV,CMP,CPX,CPY,DEC,DEX,DEY,EOR,INC,INX,
                     INY,JMP,JSR,LDA,LDX,LDY,LSR,NOP,ORA,PHA,PHP,PLA,PLP,
                     ROL,ROR,RTI,RTS,SBC,SEC,SED,SEI,STA,STX,STY,TAX,TAY,
                     TSX,TXA,TXS,TYA,UND);
     modeType = (Immed,Abs,Page0,Accum,Implied,IndX,
                 Indy,ZeroX,ZeroY,AbsX,AbsY,Relat,Indir,Unknown);
     strfield = string[80];
     DescStr = string[3];
     FileDef = record
                 inst  : Instructions;
                 mode  : ModeType;
                 Desc  : DescStr
               end;
{ End of COMMON.INC file }



program CreateData;   { THIS PROGRAM CREATES THE DATA FILE FOR EMUL6502 }

{$i Common.inc }

var File6502 : file of FileDef; Rec6502  : FileDef; r,check  : integer;
```

```
procedure s(a : integer; b : Instructions; c : ModeType; d : DescStr);
begin
  with Rec6502 do begin inst := b; mode := c; desc := d; end;
  check := check + a; seek(File6502,a); write(File6502,Rec6502)
end;
        {  INITIALISE 256 UNKNOWN COMMANDS }
begin
  writeln('IBM Turbo PASCAL 6502 Emulator Table Creation Procedure.');
  assign(File6502,'data6502.rel');
  rewrite(File6502); seek(File6502,0);
  Rec6502.inst := UND;  Rec6502.mode := Unknown; Rec6502.Desc := 'BYT';
  check := 0;      { ADDS UP ALL OPCODES TO CHECK YOUR TYPING }
  for r := 0 to 255 do write(File6502,Rec6502);

  s($6d,ADC,Abs, 'ADC');    s($7d,ADC,AbsX,'ADC');   s($79,ADC,AbsY,'ADC');
  s($65,ADC,Page0,'ADC');   s($61,ADC,IndX,'ADC');   s($71,ADC,IndY,'ADC');
  s($75,ADC,Zerox,'ADC');   s($69,ADC,Immed,'ADC');
  s($2d,ADN,Abs,'AND');     s($3d,ADN,AbsX,'AND');   s($39,ADN,AbsY,'AND');
  s($25,ADN,Page0,'AND');   s($35,ADN,ZeroX,'AND');  s($31,ADN,IndY,'AND');
  s($29,ADN,Immed,'AND');   s($21,ADN,IndX,'AND');
  s($0e,ASL,Abs,'ASL');     s($1e,ASL,AbsX,'ASL');   s($06,ASL,Page0,'ASL');
  s($16,ASL,ZeroX,'ASL');   s($0a,ASL,Accum,'ASL');

  s($90,BCC,Relat,'BCC');   s($b0,BCS,Relat,'BCS');  s($f0,BEQ,Relat,'BEQ');
  s($30,BMI,Relat,'BMI');   s($2c,BIT,Abs,'BIT');    s($24,BIT,Page0,'BIT');
  s($d0,BNE,Relat,'BNE');   s($10,BPL,Relat,'BPL');  s($00,BRK,Implied,'BRK');
  s($50,BVC,Relat,'BVC');   s($70,BVS,Relat,'BVS');

  s($18,CLC,Implied,'CLC'); s($d8,CLD,Implied,'CLD');
  s($58,CLI,Implied,'CLI'); s($bB,CLV,Implied,'CLV');
  s($cd,CMP,Abs,'CMP');     s($dd,CMP,AbsX,'CMP');   s($d9,CMP,AbsY,'CMP');
  s($c5,CMP,Page0,'CMP');   s($d5,CMP,ZeroX,'CMP');  s($d1,CMP,IndY,'CMP');
  s($c9,CMP,Immed,'CMP');   s($c1,CMP,IndX,'CMP');
  s($ec,CPX,Abs,'CPX');     s($e4,CPX,Page0,'CPX');  s($e0,CPX,Immed,'CPX');
  s($cc,CPY,Abs,'CPY');     s($c4,CPY,Page0,'CPY');  s($c0,CPY,Immed,'CPY');

  s($ce,DEC,Abs,'DEC');     s($de,DEC,AbsX,'DEC');   s($c6,DEC,Page0,'DEC');
  s($d6,DEC,ZeroX,'DEC');   s($ca,DEX,Implied,'DEX');s($88,DEY,Implied,'DEY');

  s($4d,EOR,Abs,'EOR');     s($5d,EOR,AbsX,'EOR');   s($51,EOR,IndY,'EOR');
  s($59,EOR,AbsY,'EOR');    s($45,EOR,Page0,'EOR');  s($41,EOR,IndX,'EOR');
  s($55,EOR,ZeroX,'EOR');   s($49,EOR,Immed,'EOR');

  s($ee,INC,Abs,'INC');     s($fe,INC,AbsX,'INC');   s($c8,INY,Implied,'INY');
  s($e6,INC,Page0,'INC');   s($f6,INC,ZeroX,'INC');  s($e8,INX,Implied,'INX');

  s($4c,JMP,Abs,'JMP');     s($6c,JMP,Indir,'JMP');  s($20,JSR,Abs,'JSR');

  s($ad,LDA,Abs,'LDA');     s($bd,LDA,AbsX,'LDA');   s($b1,LDA,IndY,'LDA');
  s($b9,LDA,AbsY,'LDA');    s($a5,LDA,Page0,'LDA');  s($a1,LDA,IndX,'LDA');
  s($b5,LDA,ZeroX,'LDA');   s($a9,LDA,Immed,'LDA');
  s($ae,LDX,Abs,'LDX');     s($be,LDX,AbsY,'LDX');   s($b6,LDX,ZeroY,'LDX');
  s($a2,LDX,Immed,'LDX');   s($a6,LDX,Page0,'LDX');
  s($ac,LDY,Abs,'LDY');     s($bc,LDY,AbsX,'LDY');   s($a4,LDY,Page0,'LDY');
  s($b4,LDY,ZeroX,'LDY');   s($a0,LDY,Immed,'LDY');
  s($4e,LSR,Abs,'LSR');     s($5e,LSR,Absx,'LSR');   s($46,LSR,Page0,'LSR');
  s($56,LSR,ZeroX,'LSR');   s($4a,LSR,Accum,'LSR');
  s($ea,NOP,Implied,'NOP');

  s($0d,ORA,Abs,'ORA');     s($1d,ORA,AbsX,'ORA');   s($19,ORA,AbsY,'ORA');
  s($05,ORA,Page0,'ORA');   s($15,ORA,ZeroX,'ORA');  s($11,ORA,IndY,'ORA');
  s($09,ORA,Immed,'ORA');   s($01,ORA,IndX,'ORA');

  s($48,PHA,Implied,'PHA'); s($08,PHP,Implied,'PHP');
  s($68,PLA,Implied,'PLA'); s($28,PLP,Implied,'PLP');

  s($2e,ROL,Abs,'ROL');     s($3e,ROL,AbsX,'ROL');   s($26,ROL,Page0,'ROL');
  s($36,ROL,ZeroX,'ROL');   s($2a,ROL,Accum,'ROL');
  s($6e,ROR,Abs,'ROR');     s($7e,ROR,AbsX,'ROR');   s($66,ROR,Page0,'ROR');
  s($76,ROR,ZeroX,'ROR');   s($6a,ROR,Accum,'ROR');
  s($40,RTI,Implied,'RTI'); s($60,RTS,Implied,'RTS');

  s($ed,SBC,Abs,'SBC');     s($fd,SBC,AbsX,'SBC');   s($f9,SBC,AbsY,'SBC');
  s($e5,SBC,Page0,'SBC');   s($f5,SBC,ZeroX,'SBC');  s($f1,SBC,IndY,'SBC');
  s($e9,SBC,Immed,'SBC');   s($e1,SBC,IndX,'SBC');
  s($38,SEC,Implied,'SEC'); s($f8,SED,Implied,'SED');
  s($78,SEI,Implied,'SEI');
  s($8d,STA,Abs,'STA');     s($9d,STA,AbsX,'STA');   s($99,STA,AbsY,'STA');
  s($85,STA,Page0,'STA');   s($95,STA,ZeroX,'STA');  s($81,STA,IndX,'STA');
  s($91,STA,IndY,'STA');
  s($8e,STX,Abs,'STX');     s($86,STX,Page0,'STX');  s($96,STX,ZeroY,'STX');
  s($8c,STY,Abs,'STY');     s($84,STY,Page0,'STY');  s($94,STY,ZeroX,'STY');

  s($aa,TAX,Implied,'TAX'); s($a8,TAY,Implied,'TAY');
  s($ba,TSX,Implied,'TSX'); s($8a,TXA,Implied,'TXA');
  s($9a,TXS,Implied,'TXS'); s($98,TYA,Implied,'TYA');
```

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```
  close(File6502); writeln; write('CHECKSUM ');
  if check <> 19563 then writeln('ERROR') else writeln('OK')
end.

{ End of CRAT6502.PAS }

program EMUL6502;       { 6502 EMULATOR PROGRAM WRITTEN IN TURBO PASCAL }

{$i Common.inc }    { Include file COMMON.INC }

   MemDef = record bvalue : byte end;

const Page1 = 256; CLE = #13; ret = #13; del = #8;

var
 disp      : boolean;                  M         : array[0..32767] of byte;
 File6502  : file of FileDef;          Data6502  : array[0..255] of FileDef;
 MemDump   : file of MemDef;           MemRec    : MemDef;
 Areg,Xreg,Yreg,PSR,SP,opcode                    : byte;
 s,t,spaces,HexCodes,Mnems,FileName              : strfield;
 PC,Branch,loop,temp,start,startAddr,EndAddr     : integer;

procedure SetNegative;  begin PSR := PSR or  128 end;
procedure ClrNegative;  begin PSR := PSR and 127 end;
procedure SetOverFlow;  begin PSR := PSR or   64 end;
procedure ClrOverFlow;  begin PSR := PSR and 191 end;
procedure SetBreak;     begin PSR := PSR or   16 end;
procedure ClrBreak;     begin PSR := PSR and 239 end;
procedure SetDecimal;   begin PSR := PSR or    8 end;
procedure ClrDecimal;   begin PSR := PSR and 247 end;
procedure SetInterrupt; begin PSR := PSR or    4 end;
procedure ClrInterrupt; begin PSR := PSR and 251 end;
procedure SetZero;      begin PSR := PSR or    2 end;
procedure ClrZero;      begin PSR := PSR and 253 end;
procedure SetCarry;     begin PSR := PSR or    1 end;
procedure ClrCarry;     begin PSR := PSR and 254 end;

function CarryClr    : boolean; begin CarryClr    := (PSR and 1)   =   0 end;
function CarrySet    : boolean; begin CarrySet    := (PSR and 1)   =   1 end;
function ZeroClr     : boolean; begin ZeroClr     := (PSR and 2)   =   0 end;
function ZeroSet     : boolean; begin ZeroSet     := (PSR and 2)   =   2 end;
function OverFlowClr : boolean; begin OverFlowClr := (PSR and 64)  =   0 end;
function OverFlowSet : boolean; begin OverFlowSet := (PSR and 64)  =  64 end;
function NegativeClr : boolean; begin NegativeClr := (PSR and 128) =   0 end;
function NegativeSet : boolean; begin NegativeSet := (PSR and 128) = 128 end;
function DecimalSet  : boolean; begin DecimalSet  := (PSR and 8)   =   8 end;

function CheckHex(a : char) : boolean;
begin CheckHex := ((a>='0') and (a<='9')) or ((a>='A') and (a<='F')) end;

function D2H(a,b : integer) : strfield;  { CONVERT TO HEX FOR DISPLAY }
begin
  s := '';
  for loop := 1 to b do
  begin s := copy('0123456789ABCDEF',(a and 15)+1,1)+s; a := a shr 4 end;
  D2H := s
end;

function Tab(a : integer) : strfield; begin Tab := copy(spaces,1,a) end;

function WrapAddr(a : integer) : integer;
begin if a = $7fff then WrapAddr := 0 else WrapAddr := succ(a) end;

function BITS(a : byte) : strfield;  { SETS BITS FOR STATUS REGISTER }
var mask : byte;
begin
  s := ''; mask := 128;
  for loop := 0 to 7 do
  begin
    if (a and mask)=mask then s:=s+'1' else s:=s+'0'; mask := mask shr 1
  end; BITS := s
end;

function FetchByte : byte;  { GET A BYTE FROM PC AND INC PC (WRAP AT $8000) }
begin
  if disp then HexCodes := HexCodes + D2H(M[PC],2)+' ';
  FetchByte := M[PC]; PC := WrapAddr(PC)
end;

procedure tomnem(s : strfield); begin if disp then Mnems := Mnems + s end;

procedure UpdateNandZ(ArithUnit : byte);  { SETS N AND Z FLAGS ON BYTE VALUE }
begin
  if (ArithUnit and 128)=128 then SetNegative else ClrNegative;
  if ArithUnit = 0 then SetZero else ClrZero
end;

function incbyte(b : byte) : byte; { WRAP BYTE (this probably not necessary) }
begin if b = 255 then incbyte := 0 else incbyte := succ(b) end;

function decbyte(b : byte) : byte; { (Nor this thinking about it) }
begin if b = 0 then decbyte := 255 else dectyte := pred(b) end;

procedure Push(p : byte);  { PUSH BYTE ON STACK THE DEC POINTER }
begin M[Page1 + SP] := p; SP := decbyte(SP) end;

function Pull : byte;       { INC STACK POINTER THEN PULL BYTE }
begin SP := incbyte(SP); Pull := M[Page1 + SP] end;

function WrapByte(b : integer) : byte; begin WrapByte := b mod 256 end;

function GetEA(AddressMode : ModeType) : integer; { MAIN ROUTINE }
var temp : byte; addr : integer;                  { TO GET ADDRESS OR BYTE }
begin
  case AddressMode of
  Abs   : begin
            addr:=FetchByte+(FetchByte shl 8); GetEA:=addr;
            tomnem('$'+D2H(addr,4))
          end;
  Indir : begin
            addr:=FetchByte+(FetchByte shl 8); tomnem('($'+D2H(addr,4)+')');
            if (addr mod 256)<>255 then GetEa := M[addr]+(M[succ(addr)] shl 8)
            else     { TO HANDLE JMP BUG. GOT TO THINK OF EVERYTHING ! }
            begin GetEA := M[addr]+(M[addr-255] shl 8); tomnem(' BUG !!!') end
          end;
  Page0 : begin temp:=FetchByte; tomnem('$'+D2H(temp,2)); GetEa:=temp end;
  AbsX  : begin
            addr:=FetchByte+(FetchByte shl 8); GetEa:=addr+Xreg;
            tomnem('$'+D2H(addr,4)+',X')
          end;
  AbsY  : begin
            addr:=FetchByte+(FetchByte shl 8); GetEA:=addr+Yreg;
            tomnem('$'+D2H(addr,4)+',Y')
          end;
  ZeroX : begin
            addr:=FetchByte; GetEA:=WrapByte(addr+Xreg);
            tomnem('$'+D2H(addr,2)+',X')
          end;
  ZeroY : begin
            addr:=FetchByte; GetEA:=WrapByte(addr+Yreg);
            tomnem('$'+D2H(addr,2)+',Y')
          end;
  IndY  : begin
            temp := FetchByte; GetEA := M[temp]+(M[incbyte(temp)] shl 8)+Yreg;
            tomnem('($'+D2H(temp,2)+'),Y')
          end;

  IndX  : begin
            temp:=FetchByte; tomnem('($'+D2H(temp,2)+',X)');
            temp:=wrapbyte(temp+Xreg); GetEA:=M[temp]+(M[incbyte(temp)] shl 8)
          end;
  Relat : begin
            temp := FetchByte;
            if temp>127 then addr := PC+(temp-256) else addr := PC + temp;
            tomnem('$'+D2H(addr,4)+' '); GetEA := addr
          end;
  Accum : begin GetEa := Areg; tomnem('A') end;
  Immed : begin temp:=Fetchbyte; GetEA:=temp; tomnem('#$'+D2H(temp,2)) end
  end
end;

procedure DoCommand(Instr : Instructions; mode : modeType);
var CarryToAdd,temp      : byte;
    EA,offset,sum1,sum2,temp1,temp2,Ans1,Ans2 : integer;
    OldCarry             : boolean;

  procedure DoSpecial(a : integer);
  var Inkey : char; Param,x,y,buffer : integer;
  begin
  {$i special.inc }
  end;

  procedure Compare;    { COMPARE TO BYTES AND SET FLAGS }
  begin
    if sum1 >= sum2 then SetCarry else ClrCarry;
    if sum1 = sum2 then SetZero else ClrZero;
    sum1 := sum1 - sum2;
    if (sum1 and 128)=128 then SetNegative else ClrNegative
  end;

  procedure BCDAddition;
  begin
    ClrZero; ClrNegative; ClrOverFlow; ClrCarry;
    temp1 := Areg mod 16; temp2 := temp mod 16;
```

```
        if (temp1<8) and (temp2<8) and (temp1+temp2+carrytoadd>7)
          then SetOverflow;
        ans1 := temp1+temp2+carrytoadd;
        if (ans1 mod 16) =0 then SetZero else ClrZero;
        CarryToAdd := 0; ClrCarry;
        if ans1 >9 then begin CarryToAdd:=1; SetCarry; Ans1:=Ans1-10 end;
        temp1 := Areg div 16; temp2 := temp div 16;
        if (temp1 < 8) and (temp2 <8) and (temp1+temp2+carrytoadd>7)
          then SetOverflow;
        Ans2 := temp1+temp2+carrytoadd;
        if (Ans2 mod 16)<>0 then ClrZero;
        if (Ans2 and 8)=8 then SetNegative;
        CarryToAdd := 0; ClrCarry;
        if Ans2 >9 then begin SetCarry; Ans2 := Ans2 - 10 end;
        Areg := (Ans2 shl 4) + Ans1
      end;

    begin               { ALL 6502 COMMANDS ARE CODED HERE EXCEPT RTI AND BRK }
      case Instr of
      ADC : begin
              if mode = Immed then temp := GetEA(mode)
              else temp := M[GetEA(mode)];
              if CarrySet then CarryToAdd := 1 else CarryToAdd := 0;
              if DecimalSet then BCDAddition
              else
              begin
                if Areg > 127 then Sum1 := Areg - 256 else Sum1 := Areg;
                if temp > 127 then Sum2 := temp - 256 else Sum2 := temp;
                Sum1 := Sum1 + Sum2 + CarryToAdd;
              if (Sum1 <-128) or (Sum1 > 127) then SetOverFlow else ClrOverFlow;
              if Areg+temp+CarryToAdd > 255 then SetCarry else ClrCarry;
              Areg := wrapByte(Areg+temp+CarryToAdd); UpdateNandZ(Areg)
            end
          end;
      ADN : begin  { THIS IS 'AND'. PASCAL USES 'AND' SO I CAN'T }
              if mode=Immed then temp := GetEA(mode) else temp := M[GetEA(mode)];
              Areg := (Areg AND temp); UpdateNandZ(Areg)
            end;
      ASL : begin
              if mode = Accum then temp := GetEA(mode)
              else begin EA := GetEA(mode); temp := M[EA] end;
              if (temp and 128)=128 then SetCarry else ClrCarry;
              temp := temp shl 1;
              if mode = Accum then Areg := temp else M[EA] := temp;
              UpdateNandZ(temp)
            end;
      BCC : begin Branch := GetEA(mode); if CarryClr then PC := Branch end;
      BCS : begin Branch := GetEa(mode); if CarrySet then PC := Branch end;
      BEQ : begin Branch := GetEA(mode); if ZeroSet  then PC := Branch end;
      BIT : begin
              temp := M[GetEA(mode)];
              if (temp and 128) =128 then SetNegative else ClrNegative;
              if (temp and 64)  = 64 then SetOverFlow else ClrOverFlow;
              if (temp and Areg)=  0 then SetZero else ClrZero
            end;
      BNE : begin Branch := GetEA(mode); if ZeroClr  then PC := Branch end;
      BMI : begin Branch := GetEA(mode); if NegativeSet then PC := Branch end;
      BPL : begin Branch := GetEA(mode); if NegativeClr then PC := Branch end;
      BVC : begin Branch := GetEA(mode); if OverFlowClr then PC := Branch end;
      BVS : begin Branch := GetEA(mode); if OverFlowSet then PC := Branch end;
      CLC : ClrCarry;
      CLD : ClrDecimal;
      CLI : ClrInterrupt;
      CLV : ClrOverFlow;
      CMP : begin
              sum1 := Areg;
              if mode=Immed then sum2 := GetEA(mode) else sum2 := M[GetEA(mode)];
              compare
            end;
      CPX : begin
              sum1 := Xreg;
              if mode=Immed then sum2 := GetEA(mode) else sum2 := M[GetEA(mode)];
              compare
            end;
      CPY : begin
              sum1 := Yreg;
              if mode=Immed then sum2 := GetEA(mode) else sum2 := M[GetEA(mode)];
              compare
            end;
      DEC : begin EA:=GetEA(mode); M[EA]:=decbyte(M[EA]); UpdateNandZ(M[EA]) end;
      DEX : begin Xreg := decbyte(Xreg); UpdateNandZ(Xreg) end;
      DEY : begin Yreg := decbyte(Yreg); UpdateNandZ(Yreg) end;
      EOR : begin
              if mode = Immed then temp := GetEA(mode) else temp := M[GetEa(mode)];
              Areg := (Areg XOR temp); UpdateNandZ(Areg)
            end;
      INC : begin EA:=GetEA(mode); M[EA]:=incbyte(M[EA]); UpdateNandZ(M[EA]) end;
      INX : begin Xreg := incbyte(Xreg); UpdateNandZ(Xreg) end;
      INY : begin Yreg := incbyte(Yreg); UpdateNandZ(Yreg) end;

      JMP : begin PC := getEA(mode); if PC < 0 then DoSpecial(PC) end;
      JSR : begin
              EA := WrapAddr(PC); Push(EA div 256); Push(EA mod 256);
              PC := GetEA(mode);  if PC < 0 then DoSpecial(PC)
            end;
      LDA : begin
              if mode=Immed then Areg := GetEA(mode) else Areg := M[GetEA(mode)];
              UpdateNandZ(Areg)
            end;
      LDX : begin
              if mode=Immed then Xreg := GetEA(mode) else Xreg := M[GetEA(mode)];
              UpdateNandZ(Xreg)
            end;
      LDY : begin
              if mode=Immed then Yreg := GetEA(mode) else Yreg := M[GetEA(mode)];
              UpdateNandZ(Yreg)
            end;
      LSR : begin
              if mode = Accum then temp := GetEA(mode)
              else begin EA := GetEA(mode); temp := M[EA] end;
              if (temp and 1) = 1 then SetCarry else ClrCarry;
              temp := temp shr 1;
              if mode = Accum then Areg := temp else M[EA] := temp;
              UpdateNandZ(temp)
            end;
      NOP : begin end; { DO NOTHING WHAT SO EVER }
      ORA : begin
              if mode=Immed then temp := GetEA(mode) else temp := M[GetEA(mode)];
              Areg := (Areg OR temp); UpdateNandZ(Areg)
            end;
      PHA : Push(Areg);
      PHP : Push(PSR);
      PLA : begin Areg := Pull; UpdateNandZ(Areg) end;
      PLP : PSR := Pull;
      ROL : begin
              if mode = Accum then temp := GetEA(mode)
              else begin EA := GetEA(mode); temp := M[EA] end;
              OldCarry := CarrySet;
              if (temp and 128)=128 then setcarry else ClrCarry;
              temp := temp shl 1;
              if OldCarry then temp := temp or 1;
              if mode = Accum then Areg := temp else M[EA] := temp;
              UpdateNandZ(temp)
            end;
      ROR : begin
              if mode = Accum then temp := GetEA(mode)
              else begin EA := GetEA(mode); temp := M[EA] end;
              OldCarry := CarrySet;
              if (temp and 1)=1 then setcarry else ClrCarry;
              temp := temp shr 1;
              if OldCarry then temp := temp or 128;
              if mode = Accum then Areg := temp else M[EA] := temp;
              UpdateNandZ(temp)
            end;
      RTI : begin PSR := Pull; PC := Pull + (Pull shl 8) end;
      RTS : PC := WrapAddr(Pull + (Pull shl 8));
      SBC : begin
              if mode = Immed then temp := GetEA(mode)
              else temp := M[GetEA(mode)];
              if CarrySet then CarryToAdd := 1 else CarryToAdd := 0;
              if DecimalSet then
              begin
                temp := 99-((temp div 16)*10+(temp mod 16));
                temp := ((temp div 10) shl 4) + (temp mod 10); BCDAddition
              end
              else
              begin
                if Areg > 127 then Sum1 := Areg - 256 else Sum1 := Areg;
                if temp > 127 then Sum2 := temp - 256 else Sum2 := temp;
                Sum1 := Sum1 - Sum2 + CarryToAdd - 1;
                if (Sum1 <-128) or (Sum1 > 127) then SetOverFlow else ClrOverFlow;
                if Areg-temp+CarryToAdd-1 < 0 then ClrCarry else SetCarry;

                 Areg := wrapByte(Areg-temp+CarryToAdd-1); UpdateNandZ(Areg)
               end
             end;
      SEC : SetCarry;
      SED : SetDecimal;
      SEI : SetInterrupt;
      STA : M[GetEA(mode)] := Areg;
      STX : M[GetEA(mode)] := Xreg;
      STY : M[GetEA(mode)] := Yreg;
      TAX : begin Xreg := Areg; UpdateNandZ(Areg) end;
      TAY : begin Yreg := Areg; UpdateNandZ(Areg) end;
      TSX : begin Xreg := Sp;   UpdateNandZ(Xreg) end;
      TXA : begin Areg := Xreg; UpdateNandZ(Areg) end;
      TXS : SP := Xreg;
      TYA : begin Areg := Yreg; UpdateNandZ(Areg) end
      end
```

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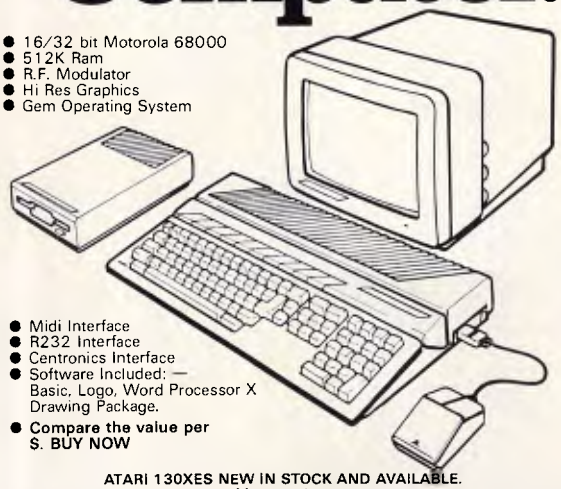

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```
end;

procedure ReadData;  ( THIS LOADS THE 6502 CODES CREATED BY CRAT6502.PAS )
begin
  assign(file6502,'data6502.rel'); reset(file6502); seek(file6502,0);
  for loop := 0 to 255 do read(File6502,Data6502[loop]);
  close(file6502)
end;

procedure InitRegisters;   ( INITIALISE ALL REGISTERS AND CLEAR MEMORY )
begin
  for loop:=0 to 32767 do M[loop]:=0;
  Areg:=0; Xreg:=0; Yreg:=0; PC:=0; SP:=$ff; PSR:=0
end;

procedure DisplayRegisters;  ( DISPLAY REGISTERS )
begin
  writeln; writeln('PC   SR NV-BDIZC AC XR YR SP');
  writeln(D2H(PC,4),'    ',BITS(PSR),' ',D2H(Areg,2),' ',
          D2H(Xreg,2),' ',D2H(Yreg,2),' ',D2H(SP,2));  writeln
end;

procedure SaveRec(a:byte); begin MemRec.Bvalue:=a; write(MemDump,MemRec) end;

function LoadRec : integer;
begin read(MemDump,MemRec); LoadRec := MemRec.Bvalue end;

procedure SaveMemory;  ( SAVE ENDADDR BYTES OF MEMORY FROM STARTADDR )
begin
  writeln('Writing ',D2H(EndAddr,4),' Bytes.');
  assign(MemDump,FileName); rewrite(MemDump); seek(MemDump,0);
  SaveRec(StartAddr mod 256); SaveRec(StartAddr div 256);
  SaveRec(EndAddr   mod 256); SaveRec(EndAddr   div 256);
  SaveRec(PC        mod 256); SaveRec(PC        div 256);
  for loop := StartAddr to StartAddr + EndAddr do SaveRec(M[loop]);
  close(MemDump)
end;

procedure LoadMemory(a : integer);  ( LOAD ENDADDR BYTES )
begin
  assign(MemDump,FileName); reset(MemDump); seek(MemDump,0);
  StartAddr := LoadRec+(LoadRec shl 8); EndAddr:=LoadRec+(LoadRec shl 8);
  PC        := LoadRec+(LoadRec shl 8); if a <> -1 then StartAddr := a;
  writeln('Loading ',D2H(EndAddr,4),' Bytes at ',D2H(StartAddr,4));
  for loop := StartAddr to StartAddr + EndAddr do M[loop] := LoadRec;
  close(MemDump)
end;

procedure SingleStep;   ( SINGLE STEP COMMAND AT PC )
begin
  disp := true;
  write(D2H(PC,4),' '); HexCodes := ''; opcode := fetchbyte;
  Mnems := Data6502[opcode].Desc+' ';
  if Data6502[Opcode].Mode = Unknown then tomnem('$'+D2H(Opcode,2))
  else with Data6502[opcode] do DoCommand(inst,mode);
  writeln(copy(HexCodes+spaces,1,10),Mnems); DisplayRegisters
end;

procedure UnAssemble;  ( DISASSEMBLE CODE BETWEEN TWO LOCATIONS )
var temppc,addr,temp : integer;
begin
  disp := true; tempPC := PC; PC := StartAddr;  ( DON'T LOSE PC )
  repeat
    write(D2H(PC,4),' '); HexCodes := ''; opcode := fetchbyte;
    Mnems := Data6502[opcode].Desc+' ';
    if Data6502[Opcode].mode = Unknown then tomnem('$'+D2H(Opcode,2))
    else temp := GetEA(Data6502[opcode].mode);
    writeln(copy(HexCodes+spaces,1,10),Mnems);
  until (PC > EndAddr) or (PC < StartAddr);
  PC := tempPC
end;

procedure Run6502; ( THIS RUNS THE CODE AT PC. PRESS ESC TO ABORT (IN THEORY))
var c : char;
begin
  disp := false; write('Running..'); opcode := fetchbyte;
  while opcode <> 0 do
  begin
    with Data6502[opcode] do DoCommand(inst,mode);
    if KeyPressed then
    begin
      read(Kbd,c); if c=#27 then begin opcode:=0; writeln('** ABORT **') end
    end;
    if opcode <> 0 then opcode := fetchbyte
  end;
  writeln; DisplayRegisters
end;

procedure DisplayMemory;    ( DISPLAY MEMORY BETWEEN 2 POINTS )
var i,j,k : integer;
begin
  writeln; StartAddr := (StartAddr div 16) shl 4;
  repeat
    s := D2H(StartAddr,4)+'  '; t := '';
    for j := 0 to 15 do
    begin
      k:=M[StartAddr+j]; s:=s+D2H(k,2)+' '; if j=7 then s:=s+'- ';
      if (k > 31) and (k<127) then t:=t+chr(k) else t:=t+'.'
    end; writeln(s+'  '+t); StartAddr:=StartAddr+16
  until (StartAddr > EndAddr)
end;

procedure interface;  ( MAIN ROUTINE TO PROCESS USER COMMANDS )
var ProgExit        : boolean;
    CLine,Com,Value : strfield;
    Command,Inkey   : char;
    Error           : array[1..10] of strfield;
    ComMode         : ModeType;
    loop,Er,cptr,Address,whoops,ByteValue,ComCount : integer;

  function ToUpper(s : strfield) : strfield;
  begin
    if s<>'' then for loop := 1 to length(s) do s[loop]:=Upcase(s[loop]);
    ToUpper := s
  end;
procedure SkipSpaces; begin while CLine[cptr]=' ' do cptr := succ(cptr) end;

procedure GetEquals;
begin
  Cptr:=succ(Cptr); SkipSpaces;
  if CLine[Cptr]<>'=' then Er:=2 else Cptr:=succ(Cptr)
end;

procedure GetAddress(x : integer);
var s : string[4]; c : char;
begin
  if x = 1 then Cptr := succ(Cptr);
  SkipSpaces; s := '';
  repeat
    c := CLine[Cptr];
    if c = chr(13) then Er := 1
    else
    begin
      if CheckHex(c) then begin s:=s+c; Cptr:=succ(Cptr) end else Er := 3
    end
  until (length(s) = 4) or (Er <> 0);
  if s[1] > '7' then Er := 8;
  if Er=0 then val('$'+s,Address,whoops)
end;

procedure GetFileName;
var c : char;
begin
  cptr := succ(cptr); SkipSpaces; FileName := '';
  if CLine[Cptr] <> '"' then Er := 9
  else
  begin
    Cptr := succ(Cptr);
    while (CLine[cptr] <> '"') and (CLine[cptr] <> CLE) do
    begin FileName:=FileName+CLine[Cptr]; Cptr := succ(Cptr) end;
    if CLine[cptr] = CLE then Er := 9
  end
end;

procedure GetRange(x : byte);
begin
  GetAddress(1);
  if (Er = 0) then
  begin
    StartAddr := Address; skipSpaces;
    if CLine[Cptr] <> ',' then Er := 5
    else begin GetAddress(1); if (Er = 0) then EndAddr := Address end
  end;
  if (Er = 0) and (x = 1) and (StartAddr > EndAddr) then Er := 6
end;

procedure GetByte;
var s : string[2]; c : char;
begin
  SkipSpaces; s := '';
  repeat
    c := CLine[Cptr];
    if c = chr(13) then Er := 1
    else
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```
      begin
        if CheckHex(c) then begin s:=s+c; Cptr:=succ(Cptr) end else Er := 3
      end
    until (length(s) = 2) or (Er <> 0);
    if (Er = 0) then val('$'+s,ByteValue,whoops)
  end;

  procedure Get8Bits;
  var s : string[8]; v : byte; c : char;
  begin
    SkipSpaces; s := '';
    repeat
      c := CLine[Cptr];
      if c = chr(13) then Er := 1
      else
      begin
        if (c = '0') or (c = '1') then
        begin s := s + c; Cptr := succ(Cptr) end else Er := 3
      end
    until (length(s) = 8) or (Er <> 0);
    if Er=0 then begin
                   temp := 128; v := 0;
                   for loop:=1 to 8 do
                   begin if s[loop]='1' then v:=v+temp; temp:=temp shr 1 end;
                   ByteValue := v
                 end
  end;

  procedure FillArea(a : byte);  { FILL MEMORY WITH ZEROS }
  begin for loop := StartAddr to EndAddr do M[loop] := a end;

  function KeyByte : byte;
  begin
    KeyByte:=0; GetEquals;
    if Er=0 then begin GetByte; if Er=0 then KeyByte := ByteValue end
  end;

  procedure Editor;
  var KeyExit,EditExit,Minusd : boolean;
      Inkey                   : char;
      c                       : string[2];
      whoops,t                : integer;
  begin
    StartAddr:=Address; writeln; write(D2H(StartAddr,4),'  ');
    EditExit:=false;
    repeat
      KeyExit:=false; c:=''; Minusd:=false; write(D2H(M[StartAddr],2),'.');
      repeat
        read(kbd,InKey); Inkey := UpCase(Inkey);
        case Inkey of
        '-'       : begin
                      KeyExit := true; Minusd := true;
                      if StartAddr = 0 then StartAddr := 32767
                      else StartAddr := pred(StartAddr);
                      writeln; write(D2H(StartAddr,4),'  ')
                    end;
        ret       : begin
                      EditExit := true; KeyExit := true;
                      if c <> '' then
                      begin
                        if length(c)=1 then c := '0'+c;
                        val('$'+c,t,whoops); M[StartAddr] := t
                      end
                    end;
                  : begin
                      KeyExit := true;
                      if c <> '' then
                      begin
                        if length(c)=1 then begin c := '0'+c; write(' ') end;
                        val('$'+c,t,whoops); M[StartAddr] := t
                      end else write('  ');
                      StartAddr := WrapAddr(StartAddr)
                    end;
        '0'..'9',
        'A'..'F' : if length(c)<2 then begin c:=c+Inkey; write(Inkey) end;
        del      : if length(c)<>0 then
                   begin
                     write(chr(8),' ',chr(8)); if length(c)=1 then c := ''
                     else c := c[1]
                   end
        end
      until KeyExit;
      if not(EditExit) and not(Minusd) then
      begin
        if StartAddr mod 8 = 0 then
          begin writeln; write(D2H(StartAddr,4),'  ') end else write('  ')
      end
    until EditExit; writeln
  end;
```

```
  procedure GetCom;  { GET 3 COMMAND CHARS AND VALIDATE }
  var ComOK : boolean;
  begin
    if length(CLine)<3 then Er := 1
    else
    begin
      Com := copy(CLine,1,3); ComCount := 0; ComOk := false;
      repeat
        if Data6502[ComCount].Desc=Com then ComOk:=true
        else ComCount := succ(ComCount)
      until ComOK or (ComCount = 256); if not(ComOK) then Er := 1
    end
  end;

  procedure GetMode;  { GET ADDRESS MODE AND VALIDATE }
  var mask : strfield;  c : char;
  begin
    ComMode := Unknown;
    if length(CLine)=4 then ComMode := Implied
    else
    begin
      delete(CLine,1,3); mask := ''; value := '';
      while CLine[1] <> CLE do
      begin
        c:=CLine[1];
        if CheckHex(c) then begin mask:=mask+'n'; value:=value+c end
        else mask := mask + c;
        delete(CLine,1,1)
      end;
      if mask = '@$nn'    then ComMode := Immed;
      if mask = '$nnnn'   then ComMode := Abs;       { Or Relative }
      if mask = '$nnnn,X' then ComMode := AbsX;
      if mask = '$nnnn,Y' then ComMode := AbsY;
      if mask = '($nn,X)' then ComMode := IndX;
      if mask = '($nn),Y' then ComMode := IndY;
      if mask = '($nnnn)' then ComMode := Indir;
      if mask = '$nn'     then ComMode := Page0;
      if mask = '$nn,X'   then ComMode := ZeroX;
      if mask = '$nn,Y'   then ComMode := ZeroY;
      if (mask = 'n') and (Value = 'A') then ComMode := Accum
    end
  end;

  procedure DoEr(a : integer; b : strfield);
  begin writeln(Tab(a),'^'); writeln(Tab(a),'Error ',b) end;

  procedure DropCode;
  var ComFound : boolean; Operand,OperandLo,OperandHi,Offset : integer;
  begin
    ComFound := false; ComCount := 0;
    val('$'+Value,Operand,whoops); val('$'+copy(Value,1,2),OperandLo,whoops);
    if length(Value)>2 then val('$'+copy(Value,3,2),OperandHi,Whoops);
    repeat
      with Data6502[ComCount] do
        if ((Desc = Com) and (Mode = ComMode)) or
           ((Desc = Com) and (Mode = Relat) and (ComMode = Abs))
        then ComFound := true else ComCount := succ(ComCount)
    until ComFound or (ComCount = 256);
    if ComFound then
    begin
      M[Address] := ComCount; Address := WrapAddr(Address);
      case Data6502[ComCount].Mode of
      Immed,IndX,IndY,Page0,ZeroX,ZeroY
        : begin M[Address]:=OperandLo; Address:=WrapAddr(Address) end;
      Indir,Abs,AbsX,AbsY
        : begin
            M[Address]:=OperandHi; Address := WrapAddr(Address);
            M[Address]:=OperandLo; Address := WrapAddr(Address)
          end;
       Relat
        : begin
            Offset := Operand - address -1;
            if (Offset < -128) or (Offset > 127) then
            begin DoEr(9,'Branch Too Far'); Address := pred(Address) end
            else begin M[Address] := Offset; Address := WrapAddr(Address) end
          end
      end
    end else DoEr(9,'Illegal Address Mode')
  end;

  procedure Assemble;
  var AssExit : boolean;
  begin
    AssExit := false;
    repeat
      write(D2H(address,4),' '); readln(CLine); CLine:=ToUpper(CLine)+chr(13);
      while (CLine<>'') and (pos(' ',CLine)<>0) do
```

```
          delete(CLine,pos(' ',CLine),1);
        if CLine = chr(13) then AssExit := true
        else
        begin
          Er := 0; GetCom;
          if Er = 0 then
          begin
            GetMode;
            if ComMode<>Unknown then DropCode else DoEr(9,'Unknown Addr Mode')
          end else DoEr(5,'Unknown Opcode')
        end
      until AssExit; Er := 0
    end;

begin
  Error[1] := 'Unexpected End of Line';       Error[2] := '= Expected';
  Error[3] := 'Illegal Character';            Error[4] := 'Unknown Command';
  Error[5] := 'Comma Expected';               Error[6] := 'Illegal Range';
  Error[7] := 'Bad Command. Type ? for help'; Error[8] := 'Range 0000..7FFF';
  Error[9] := '" Expected';
  ProgExit := false;
  repeat
    write('~'); readln(CLine);
    if length(CLine) <> 0 then
    begin
      CLine := ToUpper(CLine)+chr(13);
      Cptr := 1; SkipSpaces; Command := CLine[Cptr]; Er := 0;
      case Command of
    'A' : begin
          Cptr := succ(Cptr);
          case CLine[Cptr] of
            'C' : Areg := KeyByte;
            'S' : begin GetAddress(1); if Er=0 then Assemble end
          else Er := 4
          end
        end;
    'E' : begin GetAddress(1); if Er=0 then Editor end;
    'F' : begin
          GetRange(1);
          if (Er = 0) then
          begin
            SkipSpaces; if CLine[Cptr] <> ',' then Er := 5
            else begin
                   Cptr := succ(Cptr);
                   GetByte; if Er=0 then FillArea(ByteValue)
                 end
          end
        end;
    'G' : Run6502;    { RUN CODE FROM CURRENT PROGRAM COUNTER }
    'L' : begin
          GetFileName;
          if Er=0 then
          begin
            Cptr := succ(Cptr); SkipSpaces;
            if CLine[Cptr] = ',' then
              begin GetAddress(1); if Er=0 then LoadMemory(Address) end
            else LoadMemory(-1)
          end
        end;
    'M' : begin GetRange(1); if Er=0 then DisplayMemory end;
    'P' : begin
          Cptr := succ(Cptr);
          if CLine[Cptr] = 'C' then
          begin
            GetEquals;
            if Er=0 then begin GetAddress(0); if Er=0 then PC:=Address end
          end else Er := 4
        end;
    'Q' : begin
          write('Quit - Are You Sure (Y)es or (N)o ? ');
          repeat read(Kbd,Inkey); Inkey := Upcase(Inkey)
          until (Inkey = 'N') or (Inkey = 'Y');
          if Inkey = 'Y' then ProgExit := true else writeln
        end;
    'R' : DisplayRegisters;
    'S' : begin
          Cptr := succ(Cptr);
          case CLine[Cptr] of
          CLE : SingleStep;
          'P' : SP := KeyByte;
          'R' : begin
                  GetEquals;
                  if Er=0 then
                  begin GetBBits; if Er=0 then PSR := ByteValue end
                end;
          else Er := 4
          end
        end;
    'U' : begin GetRange(1); if Er=0 then UnAssemble end;
    'W' : begin
            GetFileName;
            if Er=0 then
            begin
              Cptr := succ(cptr); SkipSpaces;
              if CLine[Cptr] <> ',' then Er := 5
              else begin GetRange(0); if Er=0 then SaveMemory end
            end
          end;
    'X' : begin
            Cptr := succ(Cptr);
            if CLine[Cptr] = 'R' then Xreg := KeyByte else Er := 4
          end;
    'Y' : begin
            Cptr := succ(Cptr);
            if CLine[Cptr] = 'R' then  Yreg := KeyByte else Er := 4
          end;
    '?' : begin
            writeln(' IBM Turbo PASCAL 6502 Emulator Commands'); writeln;
            writeln(' AC = nn ............ Set Accumulator');
            writeln(' AS ssss ............ Assemble starting at ssss');
            writeln(' E ssss ............. Edit bytes from ssss');
            writeln(' F ssss,eeee,nn ..... Fill Memory ssss..eeee with nn');
            writeln(' G ................... Start Program from current PC');
            writeln(' L "name",ssss ...... Load memory (ssss optional)');
            writeln(' M ssss,eeee ........ Display Memory, ssss..eeee');
            writeln(' PC = nnnn .......... Set Program Counter');
            writeln(' Q ................... Quit 6502 Emulator');
            writeln(' R ................... Display Register contents');
            writeln(' S ................... Single Step from current PC');
            writeln(' SR = bbbbbbbb ...... Set Status Register');
            writeln(' SP = nn ............ Set Stack Pointer');
            writeln(' U ssss,eeee ........ UnAssemble Code ssss..eeee');
            writeln(' W "name",ssss,llll . Write llll bytes from ssss');
            writeln(' XR = nn ............ Set X register');
            writeln(' YR = nn ............ Set Y register'); writeln
          end
      else Er := 7
      end;
      if Er <> 0 then
      begin writeln(Tab(cptr),'^'); writeln(Tab(cptr),'Error ',Error[Er]) end
    end
  until ProgExit
end;

begin
  writeln('IBM Turbo PASCAL 6502 Emulator.  By Mark Needham (April 1986).');
  spaces := '                                                              ';
  ReadData; InitRegisters; DisplayRegisters; Interface
end.                                                    { end of EMUL6502.PAS}
```

Atari ST Calculator

by Bernard Fromson

This program produces a desk-top Reverse Polish Notation calculator on the screen of the Atari 520ST. The program is written in Basic, and illustrates how to use the Gem system from Basic.

The Gem operating system consists of the Virtual Device Interface which is responsible for all the graphic functions and I/O, and the Applications Environment System which provides the window and mouse interface. This program demonstrates how to set up and use an AES resource.

Resources are central to the use of AESs; they are tree-like structures which define objects to be drawn on-screen. Each node of the tree defines an object to be drawn. The tree used in this program is a simple one, and only uses a few object types.

Each object on the tree is defined by a 12-word block which takes the following format:

_Word 0: pointer to the next object in

the tree at the same level as the current object; this is −1 for the root object

Word 1: pointer to the first subordinate object

Word 2: pointer to the last subordinate object; both of these are set to −1 for an object at the lowest level of the tree

Word 3: object type; only two types are used in this example —

20=empty box

27=box holding single character

Word 4: specifies how an AES deals with an object; it consists of a series of flags — these are the ones used in the program:

bit 0 = object can be selected with the mouse

bit 1 = default to this when Return is pressed

bit 2 = exit from AES after selection

bit 4 = radio button type; when object is selected, all other objects at this level are released

bit 5 = last object in the tree

Word 5: status of object; 0=normal is used throughout this tree

Word 6: high byte specifies the character in the box for the buttons and 0 is for blank boxes; low byte gives thickness of border around the box

Word 7: colour of the box; hex 1180 specifies black-on-white border with black-on-white character inside

Word 8: x and

Word 9: y coordinates of object relative to the parent object at previous level in the tree

Word 10: w and

Word 11: h; width and height of the object

The tree is defined in the data lines 20010-20420. These are read into a string variable at lines 190-240 to fix them into memory at a known address.

A call to AES is made via a parameter block which consists of six four-byte words, each of which specifies the start address of an array which AES uses for its parameters. These arrays are:

control — specifies the operation code and number of items in the other arrays

global — various system constants, not changed in the program

gintin — input values to the call

addrin — input addresses used by the call

gintout — output values

addrout — output values

The Basic language has a system variable called GB which contains the address of an AES parameter block, and from which the addresses of the above arrays can be derived as in lines 10040-10190.

When the required values are in these arrays, AES is called using the Basic function GEMSYS(x) where x is the desired AES opcode.

The program only uses four AES calls. The opcodes for these and their functions are as follows:

opcode 51 — initialisation and restoration of the screen are all done by this one routine

opcode 42 — this draws the resource specified by the tree passed to it

opcode 22 — waits for the mouse to enter a specified area of the screen and returns control to caller

opcode 50 — activates AES to watch the mouse and wait for an event

VDI — a single VDI call is used at line 9110 to write a number directly to the calculator screen.

```
100   rem ***************************************************
110   rem * This is a reverse polish logic calculator with four *
120   rem * element stack that demonstrates the possibility of  *
130   rem * using GEM function calls from within the BASIC      *
140   rem * language on the ATARI 520 ST                       *
150   rem *                                                    *
160   rem * programmer : Bernard Fromson                       *
170   rem *      date   : 17th April 1986                       *
180   rem ***************************************************
185   rem get the gem bits
186   gosub getgem
187   rem
188   rem and now read in the object tree to a string variable
189   rem
190   read n
200   tree$=space$(255)
210   place=varptr(tree$)
220   for i=0 to 12*n-1
230   read m:poke place+2*i,m
240   next i
241   rem *
242   rem * now go and perform the GEM calls to draw the object
243   rem * this requires to reserve the screen area, draw the exploding
244   rem * box and then draw the object (the calculator)
245   rem *
246   gosub setup
900   siz=0:pt=0
910   dim stack$(4):stkptr=1
920   nwnum=0
930   enterd=1
990   rem ****************************************************
991   rem * The main body of the program works by making a GEM *
992   rem * call to activate the calculator and then reading   *
993   rem * the number of the pressed key from the GEM output  *
994   rem * array.                                            *
995   rem ****************************************************
1000  getin:
1005  poke control+2,1:poke control+4,2:poke control+6,1
1010  poke control+8,0:poke gintin,0:poke addrin£,place
1020  gemsys(50)
1030  code=peek(gintout)
1040  if code=18 then gosub setdn:end
1050  if code<=10 then goto digit
1060  if code =11 then goto decpt
1070  if code=12 then goto enter
1080  if code=13 then goto plus
1090  if code=14 then goto minus
1100  if code=15 then goto times
1110  if code=16 then goto divide
1120  if code=19 then gosub clrs:goto getin
1130  if code=20 then goto chsgn
1500  finish:gosub display
1510  goto getin
1990  rem *
1991  rem * There now follow the sections of code that deal with the
1992  rem * individual calculator buttons
1993  rem *
1994  rem * When accepting a new digit first check to make sure there
1995  rem * isn;t a number on the screen that is waiting to be stacked
1996  rem *
2000  digit: rem accept a new digit
2005  if nwnum=1 then nwnum=0:siz=0:pt=0:gosub stackup:gosub clrs
2006  if enterd=1 then enterd=0:siz=0:pt=0:gosub clrs
2010  if siz>=6 then goto getin
2015  if siz=0 and code=10 and pt=0 then goto getin
2020  siz=siz+1
2030  if code=10 then code=0
2040  num$=num$+chr$(code+48)
2050  goto finish
2060  decpt:rem insert decimal point
2070  if nwnum=1 then nwnum=0:siz=0:pt=0:gosub stackup
2075  if enterd=1 then enterd=0:siz=0:pt=0:gosub clrs
2080  if pt=1 then goto getin
2090  pt=1:num$=num$+".":goto finish
2100  enter:stack$(stkptr)=num$
2110  gosub stackup
2120  enterd=1
2130  goto getin
2135  rem *
2136  rem * and now for the mathematical functions
2137  rem *
2200  plus:
2210  gosub getxy
2220  ans=x+y
2230  goto restack
2250  minus:
2260  gosub getxy
2270  ans=x-y
2280  goto restack
2300  chsgn:
2310  if left$(num$,1)="-" then goto mkpos
2320  num$="-"+num$
2330  goto finish
2340  mkpos:num$=right$(num$,len(num$)-1)
```

```
2350  goto finish
2400  times:
2410  gosub getxy
2420  ans=x*y
2430  goto restack
2500  divide:
2510  gosub getxy
2520  if y=0 then goto zerodiv
2530  ans=x/y
2540  goto restack
2690  rem *
2691  rem * subserving the mathematical functions are these two routines
2692  rem * that get the current x and y values and then adjust the stack
2693  rem * and put the result back in it
2694  rem *
2700  getxy:
2710  y=val(num$)
2720  xptr=stkptr-1
2730  if xptr=0 then xptr=4
2740  x=val(stack$(xptr))
2745  stkptr=xptr
2750  return
2800  restack:
2810  if abs(ans)>999999 then goto oflow
2815  if abs(ans)<.000001 then ans=0
2820  num$=str$(ans)
2830  stack$(stkptr)=num$
2835  nwnum=1
2840  goto finish
2990  rem *
2991  rem * a few error messages
2992  rem *
3000  zerodiv:num$="ERROR-DIV 0":gosub display:goto pause
3010  oflow:num$="OVERFLOW":gosub display:goto pause
3200  pause:
3210  for inx=1 to 2000:next inx
3220  gosub clrs
3230  goto finish
4000  stackup:
4010  stkptr=stkptr+1:if stkptr=5 then stkptr=1
4030  return
6990  rem *
6991  rem * The setup routine does the four required GEM calls
6992  rem * to reserve,explode and display then wait for the mouse
6993  rem * to enter the calculator before starting
6994  rem *
7000  setup:
7010  poke control+2,9:poke control+4,1:poke control+6,1:poke control+8,0
7020  poke gintin,0:poke gintin+2,150:poke gintin+4,160:poke gintin+6,30
7030  poke gintin+8,20:poke gintin+10,20:poke gintin+12,20:poke gintin+14,280
7040  poke gintin+16,280
7060  gemsys(51)
7070  poke gintin,1:gemsys(51)
7071  poke control+2,6:poke control+4,1:poke control+6,1:poke control+8,0
7072  poke gintin,0:poke gintin+2,1:poke gintin+4,30:poke gintin+6,30
7073  poke gintin+8,270:poke gintin+10,260
7074  poke addrin£,place
7075  gemsys(42)
7076  poke control+2,5:poke control+4,5:poke control+6,0
7077  poke gintin,0:poke gintin+2,30:poke gintin+4,30:poke gintin+6,270
7078  poke gintin+8,260:gemsys(22)
7080  return
7090  rem *
7091  rem * Setdn does the implode and restores the screen
7092  rem *
7100  setdn:
7110  poke control+2,9:poke control+4,1:poke control+6,1:poke control+8,0
7120  poke gintin,2:poke gintin+2,150:poke gintin+4,160:poke gintin+6,30
7130  poke gintin+8,20:poke gintin+10,20:poke gintin+12,20:poke gintin+14,280
7140  poke gintin+16,280
7160  gemsys(51)
7170  poke gintin,3:gemsys(51)
7180  return
8990  rem *
8991  rem * This routine will display the current value of num$ directly
8992  rem * into the calculator screen area, by using the VDI call to
8993  rem * write. (see PCW April 1986 program file)
8994  rem *
9000  display:
9030  chrs=len(num$)
9040  poke contrl,8:poke contrl+2,1
9050  poke contrl+6,chrs+1
9060  poke ptsin,180-8*chrs:poke ptsin+2,100
9070  for inx=1 to chrs
9080  poke intin+2*inx,asc(right$(num$,chrs+1-inx))
9090  next inx
9100  poke intin+2+2*chrs,32:poke intin,32
9110  vdisys(1)
9120  return
9190  rem *
9191  rem * To clear the screen set num$ to blanks then use display
9192  rem *
9200  clrs:
9210  num$=space$(10)
9220  gosub 9030
9225  num$="":siz=0:pt=0
9230  return
10000 rem ******************************************************
10010 rem *  Get addres of basic aes parameter block and then *
10020 rem *  the addresses of the individual parameter arrays *
10030 rem ******************************************************
10040 getgem:
10120 af=gb
10130 control=peek(af)
10140 global=peek(af+4)
10150 gintin=peek(af+8)
10160 gintout=peek(af+12)
10170 addrin£=peek(af+16)
10180 addrout=peek(af+20)
10190 return
20000 rem ******************************************************
20001 rem *     This is the data to define the object tree      *
20002 rem ******************************************************
20009 data 21
20010 rem the stem is a box
20020 data -1,1,20,20,0,16,004,&h1100,40,40,240,250
20030 rem sub 1 is number 1
20040 data 2,-1,-1,27,21,0,&h3102,&h1180,40,160,20,30
20050 rem sub 2 is number 2
20060 data 3,-1,-1,27,21,0,&h3202,&h1180,70,160,20,30
20070 rem sub 3 is number 3
20080 data 4,-1,-1,27,21,0,&h3302,&h1180,100,160,20,30
20090 rem sub 4 is number 4
20100 data 5,-1,-1,27,21,0,&h3402,&h1180,40,120,20,30
20110 rem sub 5 is number 5
20120 data 6,-1,-1,27,21,0,&h3502,&h1180,70,120,20,30
20130 rem sub 6 is number 6
20140 data 7,-1,-1,27,21,0,&h3602,&h1180,100,120,20,30
20150 rem sub 7 is number 7
20160 data 8,-1,-1,27,21,0,&h3702,&h1180,40,80,20,30
20170 rem sub 8 is number 8
20180 data 9,-1,-1,27,21,0,&h3802,&h1180,70,80,20,30
20190 rem sub 9 is number 9
20200 data 10,-1,-1,27,21,0,&h3902,&h1180,100,80,20,30
20210 rem sub 10 is number 0
20220 data 11,-1,-1,27,21,0,&h3002,&h1180,70,200,20,30
20230 rem sub 11 is char . (dec. pt.)
20240 data 12,-1,-1,27,21,0,&h2e02,&h1180,40,200,20,30
20250 rem sub 12 is char up arrow for enter (default)
20260 data 13,-1,-1,27,23,0,&h0104,&h1180,98,198,24,34
20270 rem sub 13 is char +
20280 data 14,-1,-1,27,21,0,&h2b02,&h1180,130,80,20,30
20290 rem sub 14 is char -
20300 data 15,-1,-1,27,21,0,&h2d02,&h1180,130,120,20,30
20310 rem sub 15 is char x
20320 data 16,-1,-1,27,21,0,&h7802,&h1180,130,160,20,30
20330 rem sub 16 is char divide
20340 data 17,-1,-1,27,21,0,&hf602,&h1180,130,200,20,30
20350 rem sub 17 is blank screen
20360 data 18,-1,-1,20,0,0,002,&h1100,40,40,140,30
20370 rem sub 18 is close for off
20380 data 19,-1,-1,27,21,0,&h0504,&h1180,0,0,25,30
20390 rem sub 19 is C for clear
20400 data 20,-1,-1,27,21,0,&h4302,&h1180,160,80,20,30
20410 rem sub 20 is change sign
20420 data 0,-1,-1,27,53,0,&hf102,&h1180,160,120,20,30
```

Epson HX20 Tape-Man

by Amanda Parfitt

This tape manager program saves itself at the start of each tape, and maintains a directory of files on the tape as they are added. The listing has been kept short to leave more room in the HX20 for other prog-

rams. The program can be loaded into any one of the five program areas, but ideally should be kept only in one area to establish a standard procedure.

When run, the program displays a menu which asks whether a new tape is being used, whether one is returning from saving a file, or whether to go straight to the main menu. If it's a new tape, Tape-Man asks for the title and the side of the tape being used, rewinds it, saves itself at the beginning and writes the initial directory. This can be considered equivalent to formatting a disk.

When returning from saving a file, the program has to update the directory and save it to tape before moving to the main menu. This allows you to load a file, save a file or print the directory. At this point, the program will have read the current directory and will know all the details about the programs on the tape.

When the load option is selected, the program asks for the file name, winds the tape to just before the correct file and ends, allowing the user to log-in to the appropriate program before accessing the file.

The save option causes the program to find the next free space on the tape, and asks the user for the program area. The program logs into that area and ends, allowing the user to save the required file with the tape already correctly positioned. The user should then run the program again to allow it to update the directory at the start of the tape.

The final option prints a brief or lengthy directory of the tape. It then returns to the main menu.

Variables

The program allows up to 20 files on one side of a tape. Some of the variables used are as follows:

NDT — array holding name, date and time of saving each file

SFT — array holding start tape count, finish tape count and file type

D — array holding the names of the months

```
>LIST
   10  TITLE "TAPE-MAN"
   20  CLEAR 650,700
   30  WIDTH 20,4
   40  CLS
   50  PRINT "**** TAPE-MAN ****"
   60  PRINT "By  Amanda Parfitt"
   70  DEFINT T,S,F
   80  DEFSTR Z,D,N
   90  DIM NDT(20,2),SFT(20,2),D(11)
  100  L1$="************************"
  110  L2$="oooooooooooooooooooooooo"
  120  FOR J=0 TO 11
  130    READ D(J)
  140    NEXT J
  150  DATA "Jan","Feb","Mar","Apr","May","Jun"
  160  DATA "Jul","Aug","Sep","Oct","Nov","Dec"
  170  PRINT "Press any key..."
  180  Z=INKEY$
  190  IF Z="" THEN 180
  200  CLS
  210  PRINT "New Tape.........1"
  220  PRINT "Return from SAVE..2"
  230  PRINT "Main Menu.........3"
  240  Z=INKEY$
  250  IF Z="" OR VAL(Z)>3 THEN 240
  260  ON VAL(Z)+1 GOTO 240,270,1580,420
  270  CLS
  280  INPUT "Name of Tape         ";NT
  290  INPUT "Side of Tape ";NS
  300  CLS
  310  PRINT "*** Please Wait ***"
  320  PRINT "* Saving Tape-Man *"
  330  WIND
  340  SAVE"TAPE-MAN"
  350  T=2
  360  SFT(1,0)=0:SFT(1,1)=TAPCNT:SFT(1,2)=0
  370  SFT(2,0)=400:SFT(2,1)=900:SFT(2,2)=256
  380  NDT(1,0)="TAPE-MAN":GOSUB 1680:NDT(1,2)=TI$
  390  GOSUB1660
  400  NDT(1,1)=D:NDT(2,0)="DIR":NDT(2,1)=D:GOSUB 1680:NDT(2,2)=TI$
  410  GOSUB1130
  420  IF Z="3" THEN GOSUB1260
  430  CLS
  440  PRINT "Load a File.......1"
  450  PRINT "Save a File.......2"
  460  PRINT "Print Directory...3"
  470  Z=INKEY$
  480  IF Z="" OR VAL(Z)>3 THEN 470
  490  ON VAL(Z)+1 GOTO470,510,610,720
  500  END
  510  CLS
  520  INPUT "Name of File         ";NF
  530  JJ=-1
  540  FOR J=1 TO T
  550    IF NF=NDT(J,0) THEN PRINT NF;" found":JJ=J
  560    NEXT J
  570  IF JJ=-1 THEN PRINT NF;" not found":GOTO 430
  580  WIND SFT(JJ,0)
  590  PRINT "** TAPE-MAN ENDS **"
  600  END
  610  CLS
  620  PRINT "Finding free space    Please  Wait"
  630  IF T=2 THEN WIND 1000 ELSE WIND SFT(T,1)+100
  640  CLS
  650  PRINT "LOGIN & SAVE file"
  660  PRINT "Then RUN Tape-man"
  670  PRINT "LOGIN to what area"
  680  Z=INKEY$
  690  IF Z="" OR VAL(Z)>5 OR VAL(Z)<1 THEN 680
  700  LOGIN VAL(Z)
  710  END
  720  CLS
  730  PRINT "Full Directory....1"
  740  PRINT "Brief Directory...2"
  750  Z=INKEY$
  760  IF Z="" OR VAL(Z)>2 OR VAL(Z)<1 THEN 750
  770  CLS
  780  GOSUB 1660
  790  GOSUB 1680
  800  IF VAL(Z)<>1 THEN GOTO 1020
  810  PRINT "** Full Directory **"
  820  LPRINT L1$
  830  LPRINT "Directory of ";NT
  840  LPRINT "Side ";NS;" @ ";D;" ";TI$
  850  LPRINT NDT(1,1);" to ";NDT(T,1)
  860  FOR J=1 TO T
  870    LPRINT L2$
  880    LPRINT "File Name : ";NDT(J,0)
  890    LPRINT "Tape Count:";SFT(J,0);"-";SFT(J,1)
  900    LPRINT "File Type : ";
  910    Z1="BASIC-ASCII"
  920    IF SFT(J,2)=0 THEN Z1="BASIC"
  930    IF SFT(J,2)=256 THEN Z1="DATA"
  940    IF SFT(J,2)=2 THEN Z1="OBJECT"
  950    LPRINT Z1
  960    LPRINT "Date Saved: ";NDT(J,1)
  970    LPRINT "Time Saved: ";NDT(J,2)
  980    NEXT J
  990  LPRINT L2$
 1000  LPRINT L1$
 1010  GOTO 430
 1020  PRINT "* Brief Directory *"
 1030  LPRINT L1$
 1040  LPRINT "Directory of ";NT
 1050  LPRINT "Side ";NS;" @ ";D;" ";TI$
```

```
1060  LPRINT NDT(1,1);" to ";NDT(T,1)
1070  LPRINT L2$
1080  FOR J=1 TO T
1090    LPRINT NDT(J,0);TAB(10);NDT(J,1);TAB(18);SFT(J,0)
1100    NEXT J
1110  LPRINT L1$
1120  GOTO 430
1130  CLS
1140  PRINT "Saving New Directory"
1150  PRINT "   Please  Wait"
1160  NDT(2,1)=NDT(T,1)
1170  NDT(2,2)=NDT(T,2)
1180  WIND 400
1190  OPEN"O",#1,"CAS0:DIR"
1200  PRINT#1,NT,NS,T
1210  FOR J=1 TO T
1220    PRINT#1,NDT(J,0),NDT(J,1),NDT(J,2),SFT(J,0),SFT(J,1),SFT(J,2)
1230    NEXT J
1240  CLOSE#1
1250  RETURN
1260  CLS
1270  PRINT "Loading Directory"
1280  PRINT "   Please Wait"
1290  WIND400
1300  OPEN "I",#1,"CAS0:DIR"
1310  INPUT#1,NT,NS,T
1320  FOR J=1 TO T
1330    INPUT#1,NDT(J,0),NDT(J,1),NDT(J,2),SFT(J,0),SFT(J,1),SFT(J,2)
1340    NEXT J
1350  SFT(2,1)=TAPCNT
1360  CLOSE#1
1370  SFT(2,1)=TAPCNT
1380  RETURN
1390  NDT(0,0)=""
1400  P=0
1410  FOR J=0 TO 10
1420    ZC=CHR$(PEEK(822-J))
1430    IFJ>2 AND ZC<>" " THEN P=1
1440    IF ZC<>" " OR P=1 THEN NDT(0,0)=ZC+NDT(0,0)
1450    IF J=2 AND LEN(NDT(0,0))<>0 THEN NDT(0,0)="."+NDT(0,0)
1460    NEXT J
1470  SFT(0,1)=TAPCNT
1480  GOSUB 1660
1490  NDT(0,1)=D
1500  GOSUB 1680:NDT(0,2)=TI$
1510  SFT(0,2)=PEEK(823)+PEEK(824)
1520  RETURN
1530  FOR J=0 TO 2
1540    NDT(T,J)=NDT(0,J)
1550    SFT(T,J)=SFT(0,J)
1560    NEXT J
1570  RETURN
1580  GOSUB 1390
1590  GOSUB 1260
1600  IF SFT(T,1)<1000 THEN SFT(0,0)=1000 ELSE SFT(0,0)=SFT(T,1)+100
1610  SFT(2,1)=TAPCNT
1620  T=T+1
1630  GOSUB 1530
1640  GOSUB 1130
1650  GOTO 430
1660  D=MID$(DATE$,4,2)+D(VAL(LEFT$(DATE$,2))-1)+RIGHT$(DATE$,2)
1670  RETURN
1680  TI$=LEFT$(TIME$,2)+MID$(TIME$,4,2)+"hrs"
1690  RETURN

&-LINES&-      &-REMARKS&-

120-160    Set up months names

200-260    Initial Menu options

270-410    New Tape (formatting)

420        Read Directory if Main Menu is selected
           from Initial Directory

430-490    Main Menu

510-600    Load a File

610-710    Save a File

720-1120   Print Directory

1130-1250  Save Directory

1260-1380  Load Directory

1390-1520  Get details after Save

           Name of last file saved is from memory

           locations 822-812 (reverse)

           File type is determined from memory

           locations 823-824

1530-1570  Copy file info from dummy

1580-1650  Return from save

1660-1670  Date subroutine

1680-1690  Time subroutine
```

Microsoft Basic Polynomial Root Finding

by GG Haigh

This set of programs provides an alternative to the standard iterative methods for calculating the roots of polynomial equations. The methods given improve on Newton's method, the time-honoured choice, in two ways: the speed at which the root is found; or accuracy. Newton's method has the disadvantage that it can quite often diverge from a root, rather than converging onto it.

Newton's method makes a linear approximation to the root in its presumed vicinity. The result of this approximation should be another approximation which is closer to the correct result. This process is repeated until the difference between successive approximations is negligible. The only problem arises when the linear approximation is further away from the root than the original estimate; the process then diverges and moves away from the root, failing to solve the problem.

A more accurate approach is to make the approximation by a curve, rather than by a straight line, and this set of programs gives three alternative methods for doing this. The methods chosen must be curves which can have only one possible solution, and there are three intrinsic functions provided on micros that satisfy this criterion: the rectangular hyperbola; logarithms; and exponential functions. The last two of these are, mathematically speaking, almost identical, but lead to quite different root-determining formulae.

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As usual, we include notes on designing your own characters and graphic symbols. We also include a utility program which lets you design your characters on the screen and print the character and code your printer requires in bit-image graphics mode.

FLASHPRINT MARK II is easy to use. Simply load it and specify the table of printer commands you require. It is then ready to intercept your special commands whenever you print. From any program. Even from the Print/Screen key.

$88 FLASHPRINT MARK II requires PC- or MS-DOS. A special version is required for the NEC APC III. Please add $5 for packing and air mail delivery.

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Modern printers have dozens of commands. Until now it has been impossible to send all of these codes from a Wordstar file. Most printer demonstrations are in computer code, not Wordstar.

New **FLASHPRINT/4** changes the world of Wordstar and printers. Now you can print anything — even large letters.

Print BIG and little and ... and anything your printer can/print!!

FLASHPRINT is supplied with command files for several popular printers. But you can chose the command and the coding your printer needs.

We even include notes on designing your own characters such as boats, cars and graphic symbols.

FLASHPRINT requires no special knowledge and Wordstar requires absolutely no installation. You simply copy **FLASHPRINT** and a printer table on to your normal Wordstar disk and run it.

There's more. **FLASHPRINT/4** includes **FLASHKEY**. This allows any Wordstar character (including control characters) to be a function. That's 127 function keys on your computer. Functions can contain hundreds of bytes. **FLASHKEY** also allows key translation. You can create a Dvorak keyboard or change Wordstar's clumsy commands.

$68 **CP/M-80 version** is available in more than 100 formats. Please add $6 for Microbee 3.5-inch and 8-inch IBM standard to cover additional costs. Requires Wordstar version 2.26, 3.0 or 3.3. The **MS/PC-DOS version** is normally 360K 5.25-inch disk for Wordstar V3.3. Please include $5 for packing and postage.

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FLASHPRINT/4 will change the way you use Wordstar.

The price to pay for the improvement in performance over Newton's method is that both the first and second derivatives have to be calculated. In return, the methods converge more quickly to the root and are more certain to converge at all.

The formulae are as follows, where the function is referred to as y; its first derivative as y'; its second derivative as y''; the first estimate of the root as r; and the newly calculated value as x.

For the rectangular hyperbola method:
x=r+1/(y''/y'/2-y'/y)

For the exponential method:
x=r+y'/y''*LOG(1-y*y''/(y'*y'))

For the logarithmic method:
x=r+y'/y''*(1-EXP(y*y''/(y'*y'))

The above formulae are derived from the initial formulae for these functions.

As an alternative, a program for the standard difference method is also given for comparison. There is no difficulty in devising functions that these programs cannot cope with, but Newton's method similarly cannot cope. Other numerical analysis tools are required for these programs.

```
 10 CLS:PRINT:PRINT"                CALCULATION OF THE REAL ROOTS OF AN EQUATION "
 20 PRINT"                  ----------------------------------------------":PRINT
 30 PRINT" This programme calculates the real roots of an equation,y=f(x),by iter
ation of"
 40 PRINT"a hyperbolic approximation to f(x).It requires the first and second der
ivatives of the function.":PRINT
 50 PRINT"First enter the three functions y,y' and y'' by moving the cursor past
"
 60 PRINT"each '='sign, typing each function in BASIC form and pressing [CR] afte
r each"
 70 PRINT"line entry.Then press:-":PRINT
 80 PRINT "                      [RUN 100] [CR]":PRINT
 90 LIST 100-120
100          DEF FNA(X)=                                '<-----enter y
110          DEF FNB(X)=                                '<-----enter y'
120          DEF FNC(X)=                                '<-----enter y''
130 PRINT
140 INPUT "Enter your initial estimate of a root---> ",X:M=0
150 F=X
160 X=X+1/(FNC(X)/FNB(X)/2-FNB(X)/FNA(X))
170 IF ABS(X/F-1)<.01 THEN 200 ELSE IF M>10 THEN 260
180 M=M+1
190 GOTO 150
200 PRINT
210 PRINT "                                  ROOT = ";X:PRINT
220 INPUT "Calculate another root?Enter Y or N---> ",A$
230 IF A$="N" OR A$="n" THEN 280
240 IF A$="Y" OR A$="y" THEN 130
250 PRINT"Use y,Y,n or N":GOTO 220
260 PRINT"Query the presence of a root near this estimate"
270 FOR I=1 TO 2000:NEXT:GOTO 140
280 END
Ok
```

```
                CALCULATION OF THE REAL ROOTS OF AN EQUATION
                --------------------------------------------

 This programme calculates the real roots of an equation,y=f(x),by iteration of
a hyperbolic approximation to f(x).It requires the first and second derivatives
of the function.

First enter the three functions y,y' and y'' by moving the cursor past
each '='sign, typing each function in BASIC form and pressing [CR] after each
line entry.Then press:-
                      [RUN 100] [CR]

100          DEF FNA(X)= X^4+6*X^3-X^2-3*X+.5           '<-----enter y
110          DEF FNB(X)= 4*X^3+18*X^2-2*X-3             '<-----enter y'
120          DEF FNC(X)= 12*X^2+36*X-2                  '<-----enter y''
Ok

RUN 100

Enter your initial estimate of a root---> -10

                                ROOT = -6.081095

Calculate another root?Enter Y or N---> y

Enter your initial estimate of a root---> 10

                                ROOT =  .6601876

Calculate another root?Enter Y or N---> y

Enter your initial estimate of a root---> -2

                                ROOT = -.7460333

Calculate another root?Enter Y or N---> y

Enter your initial estimate of a root---> .2

                                ROOT =  .1669408

Calculate another root?Enter Y or N---> n
Ok
```

```
10 CLS:PRINT:PRINT"                CALCULATION OF THE REAL ROOTS OF AN EQUATION"
20 PRINT"                  ----------------------------------------------":PRINT
30 PRINT"    This programme calculates the real roots of an equation,y=f(x)."
40 PRINT" The method is derived from a hyperbolic approximation to the function
and,"
50 PRINT" using finite differences, does not require differentiation of the func
tion.":PRINT
60 PRINT" First enter the function by moving the cursor past the '=' sign and ty
ping"
70 PRINT" the function in BASIC form. Then press:-":PRINT
80 PRINT"                    [CR]  [RUN 100]  [CR]":PRINT
90 EDIT 100
100       DEF FNY(X) =                                      '<-----enter y
110 PRINT
120 PRINT
130 INPUT"          Enter your initial estimate of a root---> ",X:M=0
140 F=X
150 A=FNY(X)
160 B=FNY(X+.01)
170 C=FNY(X+.02)
180 X=X-.02/(C*(B-A)/A/(C-B)-1)
190 IF ABS(X/F-1)<.01 THEN 220 ELSE IF M>10 THEN 280
200 M=M+1
210 GOTO 140
220 PRINT
230 PRINT"                          ROOT = ";X:PRINT
240 INPUT"          Calculate another root? Enter Y or N----> ",A$
250 IF A$="N" OR A$="n" THEN 300
260 IF A$="Y" OR A$="y" THEN 120
270 PRINT" Use y,Y,n or N":GOTO 240
280 PRINT" Query the presence of a root near this estimate"
290 FOR I=1 TO 2000:NEXT:GOTO 130
300 END
```

```
 10 CLS:PRINT:PRINT"                CALCULATION OF THE REAL ROOTS OF AN EQUATION "
 20 PRINT"                  ----------------------------------------------":PRINT
 30 PRINT" This programme calculates the real roots of an equation,y=f(x),by iter
ation of"
 40 PRINT"an exponential approximation to f(x).It requires the first and second
        derivatives of the function.":PRINT
```

```
50 PRINT"First enter the three functions y,y' and y'' by moving the cursor past
 ":
60 PRINT"each '='sign, typing each function in BASIC form and pressing [CR] afte
r each.":
70 PRINT"line entry.Then press:-":PRINT
80 PRINT"                [RUN 100] [CR]":PRINT
90 LIST 100-120
100         DEF FNA(X)=                          '<-----enter y
110         DEF FNB(X)=                          '<-----enter y'
120         DEF FNC(X)=                          '<-----enter y''
130 PRINT
140 INPUT "Enter your initial estimate of a root---> ";X:M=0
150 F=X
160 X=X+FNB(X)/FNC(X)*LOG(1-FNA(X)*FNC(X)/(FNB(X))^2)
170 IF ABS(X/F-1)<.01 THEN 200 ELSE IF M>10 THEN 260
180 M=M+1
190 GOTO 150
200 PRINT
210 PRINT "                              ROOT = ";X:PRINT
220 INPUT "Calculate another root?Enter Y or N---> ";A$
230 IF A$="N" OR A$="n" THEN 280
240 IF A$="Y" OR A$="y" THEN 130
250 PRINT"Use y,Y,n or N":GOTO 220
260 PRINT"Query the presence of a root near this estimate"
270 FOR I=1 TO 2000:NEXT:GOTO 140
280 END

10 CLS:PRINT:PRINT"          CALCULATION OF THE REAL ROOTS OF AN EQUATION "
20 PRINT"  ------------------------------------------------------------":PRINT
30 PRINT" This programme calculates the real roots of an equation,y=f(x),by iter
ation of"
40 PRINT"a logarithmic approximation to f(x).It requires the first and second de
rivativesof the function.":PRINT
50 PRINT"First enter the three functions y,y' and y'' by moving the cursor past
 ":
60 PRINT"each '='sign, typing each function in BASIC form and pressing [CR] afte
r each.":
70 PRINT"line entry.Then press:-":PRINT
80 PRINT"                [RUN 100] [CR]":PRINT
90 LIST 100-120
100         DEF FNA(X)=                          '<-----ENTER Y
110         DEF FNB(X)=                          '<-----ENTER Y'
120         DEF FNC(X)=                          '<-----ENTER Y''
130 PRINT
140 INPUT "Enter your initial estimate of a root---> ";X:M=0
150 F=X
160 X=X+FNB(X)/FNC(X)*(1-EXP(FNA(X)*FNC(X)/(FNB(X))^2))
170 IF ABS(X/F-1)<.01 THEN 200 ELSE IF M>10 THEN 260
180 M=M+1
190 GOTO 150
200 PRINT
210 PRINT "                              ROOT = ";X:PRINT
220 INPUT "Calculate another root? Enter Y or N---> ";A$
230 IF A$="N" OR A$="n" THEN 280
240 IF A$="Y" OR A$="y" THEN 130
250 PRINT"Use y,Y,n or N":GOTO 220
260 PRINT"Query the presence of a root near this estimate"
270 FOR I=1 TO 2000:NEXT:GOTO 140
280 END
```

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.

Check through the previous Program listings to see the kind of programs we prefer. As a rough guide, original ideas are always welcome, as are good implementations of utilities and applications. Obviously the programs should be well-written, easy to understand, and preferably not too long (remember that other readers have to type them in).

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.

We will try to return submissions if they are accompanied by a stamped addressed envelope of the appropriate size, but please keep a copy of everything. Programs are paid for at the rate of $20 per page of published listing.

Send to APC Programs, Att. Stephen Crowley, P.O. Box 666, Fitzroy 3065.

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APC

CHIP CHAT

Nymphs and nodules: there is something about International Resource Development Inc that inspires respect.

IRD, you will remember, is the company which informed us in May ('Chipchat', page 197) about the rush to buy hands-free security systems now that AIDS is abroad (and even here in Australia.

Now the company hurries to tell us about the future of life under the sea.

'Future "aquaspace" colonies may include a nodule mine staffed entirely by young ladies, an energy-conversion farm occupied exclusively by bridge Grand Masters, and a bioculture farm run by compulsive gamblers,' burbles IRD. 'Just spend $US985 on the report and you can read why — but we can tell you for free that it is part of a solution to the loneliness and isolation experienced by workers engaged in deep-ocean commercial activities, as well as in extended trips in outer space.'

Going deeper and deeper into the inner space of sheer lunacy, IRD's Mike Pine opines that 'the concept is not new. As long ago as 100 BC there were colonies such as the Amazons, consisting of groups of people who chose not to live in the general hetero-geneous community.' The Amazons, of course, lived deep in the jungle, not underwater, but to Pine, there is little difference between the situations.

The functions of today's space agencies, he says, will soon be expanded to encompass the frontiers of the deep oceans as well as those of space.

And the functions of IRD will soon, doubtless, be expanded to encompass the frontiers of the funny farm.

Light on the feet, heavy on the irony . . . look, there's something about Californians that just — well, can you see where I'm coming from? These people jump from jacuzzi® to en-suite sauna-rama™ in two shakes of a Diners' Card (probably™), pausing only for 20 push-ups and a half-marathon along the beach at Clint Eastwood's Carmel. They avoid 'red meat', possibly because they don't know that chickens have blood too, and get mellow on a (definitely®) Paul Masson carafe of unpleasant white wine mixed with gassy club soda that has probably been recycled via the digestions of half the population of Sacramento.

And now, at last, they can plug their running shoes into their yuppie computers.

One can forgive Puma, maker of trainers to the upwardly mobile, for putting a custom gate array chip into the heel of its new products. One can even forgive the company — just — for bundling a software program that will read the gate array's output into an Apple IIe, a Commodore 64 or 128, or an IBM PC.

But words fail us when it comes to the company's English. Words do not, unfortunately, fail Puma.

'Serious runners know it takes more than great running shoes to improve performance. It takes know-ledge. Now Puma gives you both. With the RS Computer Shoe. The first training shoe to combine advanced foot-wear technology with com-puter technology.' The. Short sentences. Are to make you think. That what Puma is saying. Is. Important.

It is not.

Just so logo . . . In the US, companies have vice presi-dents like a dog has fleas.

CHIP CHAT

The VP catering is involved in a knock-down-drag'-em-out battle for supremacy with the VP human and coffee resources. The VP of marketing communications only speaks to the VP of public and commercial relations with a loaded gun in his hand. And the VP of comfort station perquisites does his best to sabotage the VP toilet tissue procurement.

This explains the growth of desk-top publishing and presentation graphics in that great nation, where the massed ranks of VPs — yes-men and nodders to a sharkskin-suited man — carry out their office warfare with reports, projections and optimistic statistical summaries aimed at the ignoramuses at chief executive officer level.

Imagine, then, the scene at heavy-metal database producer Micro Data Base Systems Inc. For in its corporate HQ, dominating the skyline from its prestigious address at PO Box 248 in booming Lafayette, Indiana, the VPs have been having a typical fracas.

It is all to do with the company's corporate logo, the face it puts before the world, rather than the more important VP matters like who gets stainless-steel wastebins and swiss-cheese plants in their open-plan empires. Imagine the VP of corporate logos, feeling the pressure from the VP of graphic design and advertising. Feel the tension as the VP of handout production vies with the VP of promotional materials. Thrill to the dilemma of F Charles Redfern, a mere manager of advertising of public relations, setting one faction off against another as he aims for the pinnacle of VP status.

The results are now in. The old logo featured the letters MDBS, written in circles in a diamond formation — and the exciting new logo features the letters mdbs, daringly transferred to lower case, with four circles in a diamond formation about it. And now a slogan has been added, after deep discussion with the VP of text design and sizing, saying 'The Knowledge Management Company'.

Or to put it in the words of F Charles: 'Our new logo is a clean, simple design. It symbolises the unification of all our products and services into one corporate umbrella.'

Let's hope the VP of umbrellas has been placated for the absence of his symbol from the new logo. Perhaps he has been given a stainless-steel wastebin.

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